5. Priority Actions at the Federal Level

5.1. Basic Principles of Criteria for the Identification of Priority Actions

● A system of criteria for the identification of priority actions for biodiversity conservation must be in correspondence with the goal and principles of the Strategy.

● At the federal and regional levels, such a system must include the following groups of qualitative and quantitative criteria:
- criteria for the choice of priority objects of biodiversity (ecosystems, communities, species, and populations);
- criteria for the choice of priority territories (regions at the federal level and sites the regional level);
- criteria for the choice of necessary actions and measures;
- criteria for the estimation of biodiversity conservation projects.

● Objects of biodiversity and territories should be estimated by three groups of criteria:
- estimates of the current state and trends of objects or territories (abundance and area, total size of ecosystems of a given type, extent of anthropogenic transformation, etc.).
- importance of an object or territory for the sustainable conservation of biodiversity, e.g. the likelihood of a decrease in total genetic diversity after the loss of a given species; role of a species in the ecosystem, importance of a habitat for species conservation, etc.);
- socio-economic and technological criteria (economic and cultural value of a species or ecosystem, threatening socio-economic processes, current measures and available technologies for nature conservation, necessary expenses, economic efficiency, etc.)

●Actions, measures and projects for biodiversity conservation should be estimated by three groups of criteria:
- agreement with the aims and principles of the Strategy;
- practicability (probability of successful realization of an action or project during the period of the Strategy);
- efficiency (cost to benefit ratio).

●Priority choice order:
- choice of priority objects of biodiversity and territories, choice of measures necessary for their conservation;
- choice of priority actions in the socio-economic sphere, choice of the ways for their realization;
- estimation and choice of projects for the Action Plan, formulation (search) of the order for aditional projects.

● When the choice of a single priority object or action is unfeasible (ineffective), simultaneous realization of a group of priority actions must be considered to ensure stability of the system in general (at the federal or regional level depending on the level of decision-making). The available funds should be distributed taking into account mutual influences between these actions and objects (e.g. non-realization of one project may considerably decrease the effectiveness of others; vice versa, successful realization of one of the projects is likely to facilitate implementation of the remaining ones; it is equally true of the objects of biodiversity conservation, i.e. a failure to protect one leads to the impairment of stability of others).

5.2. Current State of Biodiversity and Measures for Its Conservation

5.2.1. Species Conservation

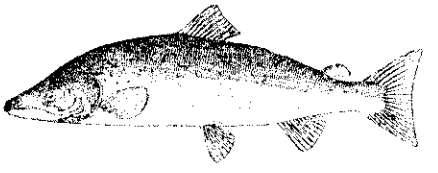
Conservation of species diversity in animals and plants is to be accomplished in the framework of the population-species approach.

Species diversity in Russia may be described as relatively safe. Russia remains to be one of the most important regions maintaining the global species diversity.

At the same time, economic developments in the second half of the 20th century have caused marked disturbance of floristic and faunistic complexes in some regions; as a result, many species fell in the category of critically endangered ones and had to be enlisted in the Red Data Book of Russian Federation.

Animals – 414 species and subspecies (Red Data Book of Russian Federation. Animals. 2001):
- Vertebrata – 259 (Cyclostomata – 3 , Pisces – 47, Amphibia – 8, Reptilia – 21, Aves – 126, Mammalia – 74;
- Invertebrata –156 (Annelida –13, Bryozoa –1, Pelicipoda – 1, Mollusca – 43, Arthropoda – 99.

Plants – 516 (Red Data Book of RSFSR. Plants. 1988):
- Angiospermae – 440;
- Gymnospermae – 11;
- Pteridophyta – 10;
- Lycopodiophyta – 4;
- Bryophyta – 22;
- Lichens – 29.



Fungi – 17 species (Red Data Book of RSFSR. Plants. 1988).

Major Threats to Species Diversity in Russia

- Destruction and disturbance of habitats.
- Extensive application of chemicals and industrial technologies in agriculture.
- Environmental pollution.
- Over-exploitation of natural populations of animals and plants.
- Acclimatisation and introduction of alien species, self-dispersal of invasive species, plant and animal diseases.
- Extensive use of transgenic (as a rule, more productive) forms of plants and animals which may lead to the replacement and eventual extinction of traditional varieties, cultivars, and breeds.

The Most Apparent Consequences of Negative Human Impact on Biological Characteristics of Species

- Population decline.
- Deterioration of physiological condition of organisms.
- Disturbance of reproduction.
- Increased mortality at the early developmental stages and in adults.
- Disturbances of life cycles including migrations.
- Disturbance of sex and age population structure.
- Disturbed genetic structure of populations, loss of genetic diversity.
- Disturbance of species population structure.
- Non-adaptive changes in animal behaviour.

These consequences may differ depending on the combination of factors influencing a given species and specific features of its environment. Collectively, however, they lead to a decline of individual populations and finally to the extinction of the species.

Priority Measures for Species Conservation

In species conservation programs, priority must be given to in situ protection because the long-term survival of a species and its continuous natural evolution are possible only under natural conditions. Those methods should be preferred which minimize disturbances to an object of biodiversity and facilitate its conservation in typical habitats.

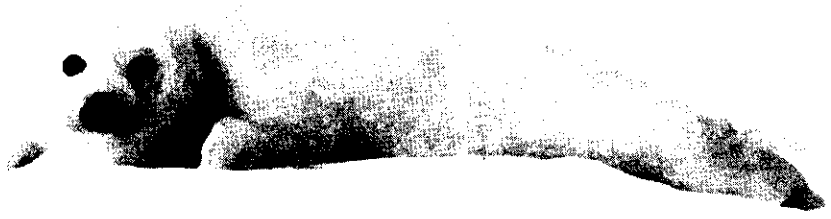
Ex situ conservation should by no means be considered as an independent problem. This approach must always be integrated into programs of species rehabilitation and reintroduction. Its application is in order in the following cases:

– if it is impossible at present to eliminate effect of main limiting factors;
– when population numbers are at a critically low level accounting for a high probability of accidental extinction of the species or one of its populations;
– when the genetic structure of populations is disturbed to the extent of decreased genetic diversity thus leading to inbreeding, reduced viability of individuals, and development of characters alien to the species;
– when serious disturbances of self-recovery mechanisms of a population necessitate its artificial reproduction.

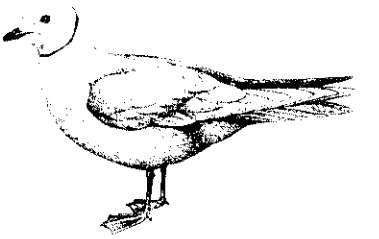
In parallel with the ex situ conservation of a species, reconstruction of its natural habitats must be undertaken concurrently with the elimination of major risk factors associated with the adverse human impact.

The ex situ conservation may be a self-contained task only in a special case of protection of species that have been extinct from nature and whose reintroduction appears impossible in near future. Such species need to be conserved for scientific and educational purposes and also as carriers of genetic information which may be potentially useful in the future.

Analysis of socio-economic conditions for the conservation of a species prompts the choice of methods for the purpose, their applications, economic and legislative mechanisms for the prevention of adverse anthropogenic effects, measures necessary for the formation of public consciousness and education.



5.2.2. Ecosystem Conservation



5.2.2.1. Ecosystems of Polar Deserts, Tundras and Forest-Tundras

The Arctic is a key region in terms of national interests of Russia and sustainable development of the whole circumpolar basin. Russia bears responsibility for biodiversity conservation in the Arctic and the well-being of indigenous peoples inhabiting northern Eurasia.

To-day, biodiversity of the Russian Arctic can be described as relatively safe owing to large tundra and water areas supporting autochthonous ecological communities and still avoiding considerable direct impact of economic activities.

In the past decades, however, industry has tended to spread from isolated centres over a larger territory thus threatening the integrity of Arctic ecosystems. Negative anthropogenic effects on these ecosystems are especially pronounced and dangerous resulting largely from the pollution brought in by the Gulf Stream, large rivers flowing to the north, and aerial transport from different parts of the globe and accumulated within a relatively small area. The situation is aggravated by the high vulnerability of Arctic nature and its weak ability to recover after damage because of low activity of biocenotic processes.

To-day, populations of many Arctic plants and animals as well as a large number of unique natural communities, ecosystems, and their territorial complexes are in critical if not catastrophic condition and require urgent protective measures at the federal level.

Major threats to biodiversity of Arctic ecosystems

- Environmental pollution from the following sources:
  - smelters in Norilsk, Pechenganikel, Severonikel, etc.;
  - oil and gas extraction and transport, exploratory drilling for oil and gas in coastal areas and on the Arctic shelf;
  - global pollution (Gulf Stream, Siberian rivers, aerial transport);
  - early nuclear weapon tests in the air and under the sea on Novaya Zemlya;
  - nuclear submarines and naval bases;
  - solid and liquid waste discharged by military holdings and industries.
- Industrial developments in the Arctic, uncontrolled use of off-road vehicles in summertime.
- Extremely poor government control over the use of biodiversity in the Arctic, ineffective protection of Arctic nature reserves.
- Indiscriminate exploitation of natural animal and plant populations in the form of fishing, hunting, and collecting biological materials for public and private museums (the latter activity has been increasingly popular in recent years and is especially detrimental for the well-being of rare and threatened species).
- Dying out and disappearance of ecologically-balanced systems of traditional nature use by indigenous peoples of the North ousted by mining companies.

Consequences of human impact on natural ecosystems

- Destruction, alteration, and fragmentation of natural ecosystems.
- Cryogenic erosion resulting from the disturbance of the natural vegetation cover and pollution.
- Invasion by alien species, replacement of aboriginal Arctic species by invaders from the south, cosmopolitan and synanthropic forms having advantage over local ones in anthropogenically transformed landscapes.
- Disturbance of biocenotic structure and impoverishment of food resources for animals caused by pollution and overgrazing.
- Deterioration of wintering grounds and migration routes of some species.

Priority measures for conservation of Arctic ecosystems

- Recognition of the necessity of a special nature management regime in the Arctic. Elaboration of the Arctic doctrine and basically new legislation on nature protection in the Arctic.
- Raising efficiency of environmental conservation in the protected land and water areas of the Arctic. More attention to small forms of territorial protection (natural monuments, "microreserves", nature sanctuaries) for the conservation of specific sites and habitats of narrow-ranged and endemic species, subspecies and populations. Involvement of aboriginal people of the North in these activities.
- Rehabilitation of the network of polar stations and reorganization of their work such as to include elementary biomonitoring. Restoration and enlargement of the fleet of research and patrol ships for the purpose of monitoring and exploration of Arctic biodiversity.

Regions and objects of biodiversity requiring special attention

- Arctic regions experiencing the largest human impact and threat to their ecosystems include the Kola Peninsula, the lower Pechora River, Bolshezemelskaya Tundra, Yamal Peninsula, the Gulf of Ob, south-west part of the Taimyr Peninsula, mining regions in the north of Yakutia and Chukchi Peninsula.
- Most important ecosystems and communities:

– meadow or forbs-low shrub communities on southern slopes;
– marches and maritime solonchak meadows;
– zoogenic (first of all, ornithophilous) biocenotic complexes of bird colonies and other sites of permanent or prolonged residence of animals;
– isolated forest massifs and brush groves penetrating to the north along river valleys and other elements of landscape, borderline forest communities at the polar tree limit on Bolshezemelskaya Tundra, Yamal and Chukchi Peninsulas;
– tundra-steppe communities (Pleistocene relicts in north-east Asia).

5.2.2.2. Forest Ecosystems

Forests are most important for the maintenance of biospheric processes including prevention of unfavourable climatic changes; also, they are a potent renewable source of raw materials. In Russia, forests have always been one of the main components of the national wealth. Russia has been and remains the most forested country in the world.

Despite intensive exploitation, forest ecosystems of Russia have been preserved better than those in other countries. During the last decade, forested areas have enlarged due to a sharp decrease in logging and agriculture. However, intensive felling in the past especially in the European part of Russia has led to a significant deterioration of the quality of forest stands, change in their age and species composition, altered vegetation structure, and reduced biodiversity.

Main threats to biodiversity of forest ecosystems

- Forest fires and related undesirable pyrogenic successions, especially in Siberia and the Far East.
- Biologically unsound felling systems and poor utilization of logging residues.
- Reafforestation without regard for biodiversity conservation.
- Allocation of forest lands for purposes unrelated to forestry (for industrial and urban construction, mining, building of roads, cableways, and other linear structures).
- Technogenic degradation of forest stands under the influence of discharges from smelters, chemical plants, power stations, and traffic.
- Illegal tree-cutting and other forms of illegal forest use ousting populations of rare and threatened species from forest communities.
- Negative anthropogenic impacts on protective forest stands in the forest-steppe zone and its natural communities (long-lasting intense forest exploitation and agricultural use, hydrotechnical works, grazing livestock, the use of pesticides, etc.).
- Uncontrolled recreational activity.

Consequences of human impact on forest ecosystems

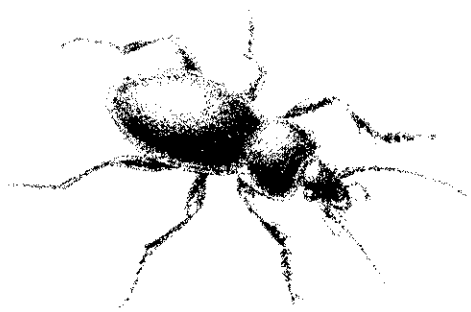
- Decrease in the total wooded area and disappearance of characteristic landscapes.
- Decreased area of undisturbed forests.
- Fragmentation of forest massifs.
- Changes in age and species composition of forests, increased proportion of young deciduous stands and brushwood communities replacing one another in succession.
- Disappearance of primary forest communities, impoverishment of tree and bush vegetation, decline in consort species diversity, disturbed biocenotic structure.
- Impaired or lost ability for self-recovery.
- Decreased carbon sequestration.
- Decreased resistance of forests to unfavourable environmental factors, wide distribution of fungal diseases and heavy infestation by pest insects, increased frequency and severity of forest fires.
- Bogging and sodding of large forest clearings, upset biological equilibrium of swamp and meadow forest complexes, soil degradation, disturbed hydrological regime.
- Disappearance and degradation of town parks, suburban foresrs, and green belts as a result of inadequate planning of urban development and uncontrolled recreational activity.

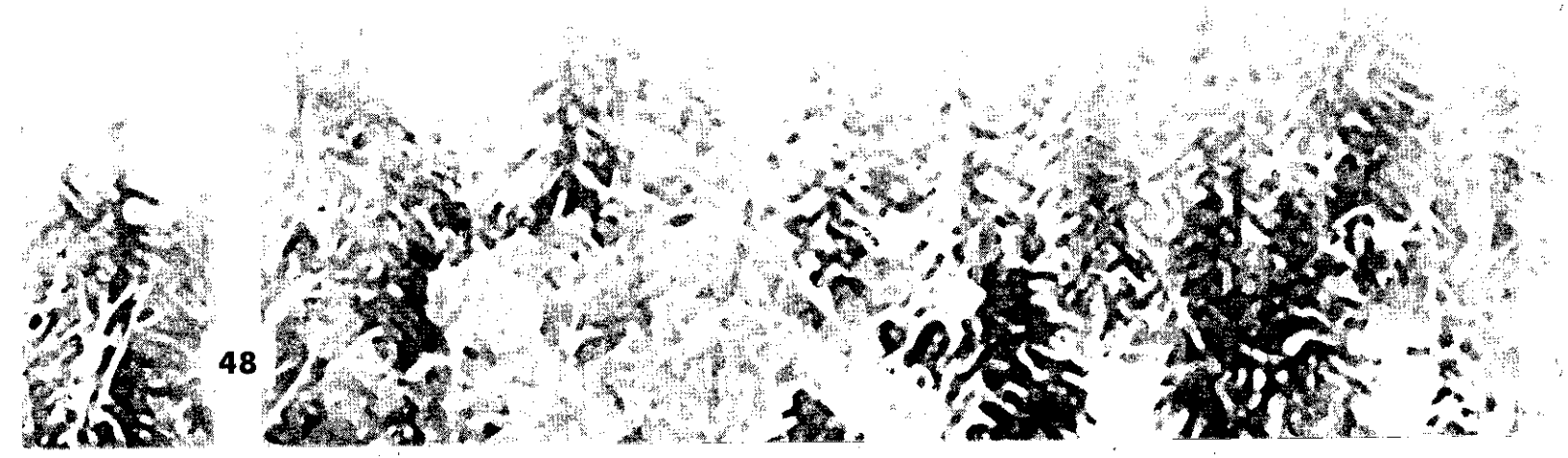
Priority measures for conservation of forest ecosystems

- Development of a long-term national forest policy conceivable and beneficial for the population. Sustainable forest management equally advantageous from the ecological, social, and economic standpoints.
- Elaboration of a forest management strategy oriented towards conservation of biodiversity as a necessary condition for the existence of forests; development and implementation of forestry techniques ensuring conservation and reproduction of biodiversity and adapted to specific regional conditions.
- Development of a network of specially protected territories sufficient for the conservation of landscape, ecosystem, and species diversity.
- Development of forestry strategies and economic mechanisms of forest management (co-ordinated with international ones) giving impetus to the improvement of ecological characteristics of forest ecosystems and their biodiversity conservation.
- Completion of the inventory of old stands and promulgation of a law granting them special nature conservation status.

Regions and objects of biodiversity requiring special attention:

- broad-leaved forests in the central part of European Russia;
- climax forests of the taiga zone including large massifs of virtually undisturbed coniferous forests in north-west Russia and the Urals;
- coniferous/broad-leaved forests of the South Urals;
- mountainous dark-coniferous forests of western and eastern Siberia (Yenisey Ridge, Salair, Altai, Sayan, Khamar-Daban);
- coniferous/broad-leaved forests of Khabarovsk and Primorye regions;
- cedar pine forests (Altai, Tuva, Khakassia, Tomsk region);
- urban forests and green belts.





5.2.2.3. Ecosystems of Forest Steppes, Steppes, and Semi-Deserts

Steppes and forest-steppes have undergone the most severe transformation and complete destruction by man. Having featured a large-scale natural object in the past, they are presently on the verge of extinction in Russia. Today, small steppe fragments persist in the countryside dominated by arable lands, fallows, pastures, and other elements of rural infrastructure. Steppes and forest-steppes in the European part of Russia have been exploited by man and transformed to farmlands since ancient times (40-90% have been put to cultivation by now). The extent of the transformation decreases eastward, with 20-30% of steppe landscapes in Siberia remaining only slightly changed. Where steppe ecosystems experience heavy human pressure, they have virtually lost the ability for self-recovery. Being abandoned by man, such areas fail to develop normal successions of the vegetative cover characteristic of natural steppe associations and instead give room to alien communities. Highly efficient management is needed if natural steppe features are to be reconstructed on these territories.

The critical condition of forest-steppe, steppe and semi-desert ecosystems is aggravated by high human population density and concentration of agricultural activities, and also by the fact that increasing numbers of people in intensified farming areas are no longer seeing steppes as a natural and cultural phenomenon valuable of itself and worthy of conservation (in contrast to the view of forests).

Any possibility to rehabilitate forest-steppe, steppe and semi-desert communities may be completely lost as soon as the first half of the 21th century unless extraordinary measures for their salvation are taken. Biodiversity conservation of both natural ecosystems and stable natural-cultural complexes is an indispensable prerequisite for the conservation of the fertility of these lands which are the main source of agricultural production for the country.

Major threats to biodiversity of steppe ecosystems

- Extensive use of chemical products and industrial technologies in agriculture leading to:
  - disappearance of all pieces of fallow land and excessive grazing;
  - inadequacy of agricultural technologies to specific agro-climatic and ecological conditions of steppe landscapes;
  - monocultural agroecosystems;
  - excessive use of fertilizers and pesticides;
  - loss of diversity of cultivated plants and domestic animals;
  - spread of pests and animal diseases, weed infestation.
- Destruction of floodplain forests and insular groves in the forest-steppe zone leading to desiccation of the soil aeration zone and aridization of meadow steppes.
- Over-exploitation of natural populations of animals and plants in the form of poaching, collecting wild-growing food and medicinal plants (especially their subterranean parts such as roots, bulbs, etc.), direct extermination of important species of animals and plants.
- Radioactive pollution of Kursk, Lipetsk, Voronezh, and Tambov regions affected by the Chernobyl accident; pollution in

the Chelyabinsk region and south-west part of Novosibirsk region brought in by multistaged missile fragments which are shed as the flight progresses and fall down to the ground.

- Accidental and planned introduction of alien species, pests, and agents of plant and animal diseases.
- Frequent uncontrolled and untimely burning of vegetation.

Consequences of human impact on steppe ecosystems

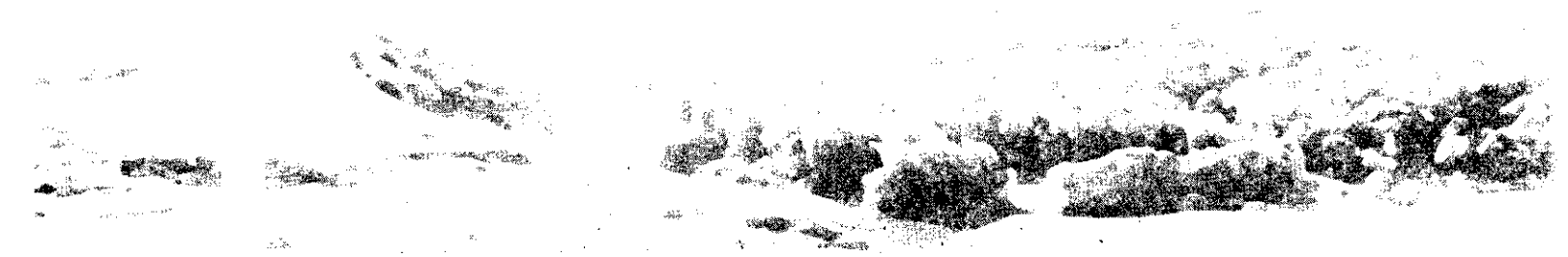
- Soil degradation due to over-grazing, enlarged areas exposed to water and wind erosion. Erosion affects about 60% of the arable land in the European part of Russia and rapidly developes in its Asian regions by virtue of the uncontrolled use of agricultural technologies designed for the European steppe zone.
- Decline in species diversity and the diversity of steppe communities and ecosystems; disturbed biocenotic structure of steppe communities, loss of ability for self-regulation and spontaneous recovery.
- Aridification resulting from deforestation and extensive ploughing.
- Locust and other pest outbreaks provoking the use of chemicals for their control.
- Epizootics of rabies and other endemic diseases in wild animals.

Priority measures for conservation of steppe ecosystems

Sustainable development in the steppe zone is possible only if a complex of natural ecosystems and agroecosystems is capable of self-regulation and requires minimal management to maintain ecological balance. Special measures to this effect should take into account specific features of the steppe zone in European Russia, West, Central, and East Siberia.

The following actions are necessary:

- Application of ecologically safe agricultural technologies, transition from the extensive use of chemicals and industrial technologies to adaptive agriculture:
  - development and application of methods adapted to regional and local soil and climate conditions;
  - changes of land use strategies including conversion of marginal agriculture areas, strict regulation of the use of land with a high agricultural potential;
  - specialization of agriculture in the steppe zone, restoration of traditional cattle breeding taking into account natural and socio-economic conditions of different regions;
  - cultivation of plant and animal species and varieties adapted to local conditions; optimization of livestock structure and composition;
  - optimization of grazing strategies with regard for conservation of biodiversity of wild plants and animals;
  - development of infrastructure for sustainable processing and trade in agricultural produce;
  - reconstruction of historical and ecological centres of traditional agriculture; estimation of the efficiency and ecological safety of traditional agricultural practices;
  - development of ecologically stable agrolandscapes, enhancement of their structural diversity.
- Development of a network of specially protected natural and historico-cultural territories. Today only few specially protected natural territories in the steppe zone covering its negligible percentage in relation to the total area. Sustainable conservation of natural ecosystems is feasible only in the framework of an integrated system of specially protected territories connected by "ecological corridors" in the form of forest and brushwood belts, roadside groves, vegetation surrounding

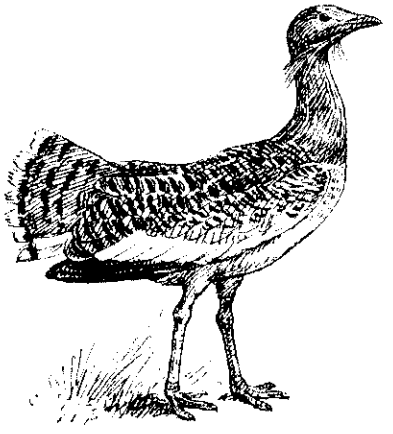


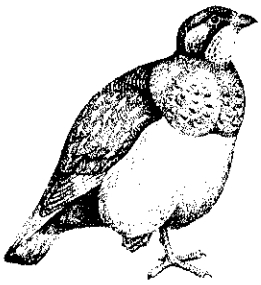
man-made constructions, and other lands unfit for agriculture. Such a network must include the existing nature reserves and newly created protected areas. The cluster siting of nature reserves is recommended in correspondence with the distribution of habitat diversity of a landscape. New nature reserves are needed in frontier areas betweeen administrative regions of Russia and along its borders with other countries such as Kazakhstan, China, and Mongolia. Certain lands (especially former military holdings) should be reserved for further designation as specially protected natural territories. Planning biodiversity conservation must take into consideration structural features of agricultural landscape.

- Maintenance and rehabilitation of the existing protective forest belts (Stavropol, Krasnodar, and Rostov regions); creation of new forest belts (West Siberia, Central Selenga depression in Buryatia) and protective tree and bush cover to combat erosion (Central Chernozem regions).
- Fixation of sands in dry steppes and semi-deserts (Buryatia, south-east of Stavropol region, and Kalmykia).
- Conservation of steppe ecosystems and their species diversity in military holdings.
- Development and enforcement of legislative mechanisms for the protection of steppe ecosystems on agricultural lands.
- Ecological rehabilitation of steppe landscapes including reconstruction of typical steppe and bush ecosystems, ravine forests, insular and floodplain forests, and wetlands.
- Creation of economic incentives for an alternative (non-agricultural) use of steppe areas.
- Protection of aquatic ecosystems and natural water sources, reconstruction of traditional sources of water supply.
- Shaping positive attitudes towards steppe conservation; formation of public consciousness to the same end.

Regions and objects of biodiversity requiring special attention:

- true and meadow steppes of European Russia most heavily affected by man;
- dry steppes and semi-deserts in the south of European Russia supporting viable saiga populations (Kalmykia and southern part of the Volga basin);
- Central Siberian and Transbaikalian complexes of dry steppes and semi-deserts (Tuva, Buryatia, and Dauria).





5.2.2.4. Mountainous Ecosystems

Mountains cover approximately a quarter of Russia's territory; they occur in 43 of the 89 administrative units of the Russian Federation.

Mountainous ecosystems play a unique role in the maintenance of global biodiversity. They are characterized by an extremely high species and ecosystem diversity and support many endemic forms. High evolution and speciation rates are a charecteristic feature of mountain biota. It accounts for mountainous ecosystems harbouring a large fraction of global biological diversity and greatly contributing to its active formation.

Mountains give home to a variety of historico-cultural ethnic complexes with unique traditions of sustainable nature use. Mountains are a great tourist attraction and provide numerous opportunities for ecological tourism.

Mountain ecosystems are characterised by high vulnerability to anthropogenic influences due to a high rate of downward matter transfer and high risk of natural and technogenicdisasters. The biotic component of mountain landscapes serves as the most important stabilizing factor and provides a solid basis for the sustainable development of these regions. However, recent strategies of exploitation of mountain complexes have led to the loss of biodiversity, destruction of biota, and destabilization of mountainous ecosystems and landscapes.

Threats to biodiversity of mountainous ecosystems

- Extraction of minerals and mining industry.
- Abusive exploitation of forests, clearing of forest lands for the development of - agriculture.
- Unsustainable agriculture and over-grazing.
- Over-exploitation of economically important species, first of all mammals.
- Invasion by spreading plants and animals.
- Growth of uncontrolled tourism.
- Climatic changes.

Consequences of human impact on mountainous ecosystems

- Erosion of mountain slopes, catastrophic landslides and mudflows.
- Degradation of soil cover.
- Decline in species and ecosystem biodiversity, replacement of highly specialized mountain forms by invasive species, destruction of biocenoses, loss of their ability for self-regulation and self-recovery.
- Destruction and disappearance of ecologically-balanced natural-cultural complexes, loss of environmentally friendly forms of traditional nature use and management

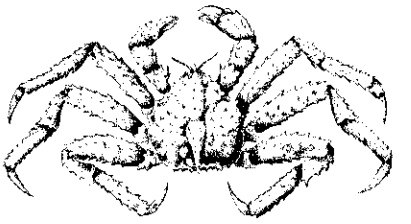
Priority measures for conservation of mountainous ecosystems

- Elaboration of a national policy of sustainable development of mountain regions taking into account specific local conditions and concrete needs of biodiversity conservation.
- Organization of federal and regional coordinating centres for the sustainable development and conservation of biodiversity of mountainous ecosystems. Such coordination is indispensable for the implementation of a policy of conservation and sustainable use of biodiversity because many mountain regions are jointly controlled by several regional administrations of the Russian Federation.
- Further development of the network of specially protected natural territories in mountain regions. Granting special status to territories occupied by indigenous peoples and national minorities with their traditional subsistence economies beneficial for ecological equilibrium of mountain ecosystems; development of a network of historical-cultural territories.

Regions and objects of biodiversity requiring special attention

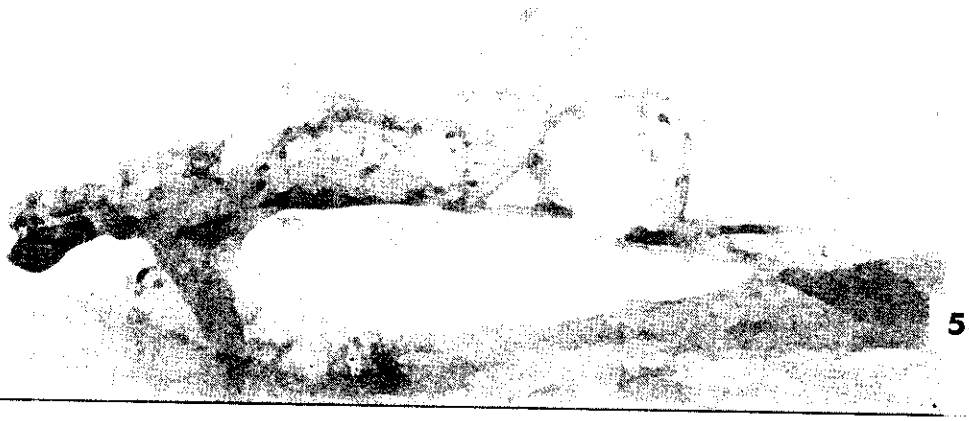
– the Caucasus;
– Khibiny Mountains;
– the Urals;
– mountain massifs in the southern Far East;
– Altai Mountains

5.2.2.5. Marine and Coastal Ecosystems



Russia is bounded by thirteen seas: the Sea of Azov, Caspian, Black, Baltic, Barents, White, Kara, Laptev, East-Siberian, Chukchi, Bering Seas, the Sea of Okhotsk, and the Sea of Japan. Considerable portions of their coasts undergo anthropogenic transformation. Some marginal areas of the Barents Sea (the Kola Bay), Arctic (Ob, Lena, Yenisey, and Kolyma Deltas) and Pacific (Peter the Great Bay, certain areas of the Sakhalin Shelf in the Sea of Okhotsk) seas are fairly free of pollution. Ecosysyems of the Sea of Azov, Caspian and Blak Seas are severely affected by regulation of large rivers, such as the Volga, Don, and Dnieper. They also suffered from the man-assisted invasion of alien species, e.g. Mnemiopsis.

Natural annual fluctuations of aquatic species composition must be taken into consideration when it comes to the elaboration of measures for biodiversity conservation in the marine environment.



Major threats to biodiversity of marine and coastal ecosystems

- Pollution by:
  - hydrocarbons and drilling fluids during oil-field developments and as a result of oil spills from pipelines in the south-eastern part of the Barents Sea, the northern part of the Caspian Sea. and on the north-eastern shelf of Sakhalin;
  - waste matter from sea vessels and ports;
  - industrial and municipal effluents containing heavy metals, phenols, surfactants and other pollutants;
  - agricultural waste containing phosphorus, nitrogen, pesticides, etc.;
  - radioactive and toxic substances from military facilities, testing sites and bases.
- Engineering works and mining activities in the coastal zone.
- Invasion by alien species.
- Legal and illegal over-exploitation of natural populations of marine organisms (fishes, invertebrates, and algae); use of fishing gear and techniques undermining natural communities.

Consequences of human impact on marine and coastal ecosystems

- Disturbance of marine and coastal ecosystems resulting from pollution, regulation of river channels and flow of sediments they carry into the sea, eutrophication.
- Reduced numbers and biomass of valuable aquatic species resulting from their over-exploitation.
- Sharp decrease in abundance of aboriginal marine organisms resulting from invasion by alien species.

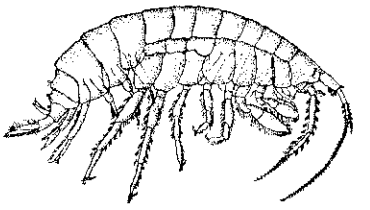
Priority measures for conservation in marine and coastal ecosystems

- Prevention of pollution of the coastal environment by industrial waste and petroleum hydrocarbons extracted and transported in shelf areas.
- Development and application of methods to control dangerous alien species.
- Cessation of excessive exploitation of marine biological resources (regulation of catches); implementation of multi-species fishery strategies for better conservation of natural diversity of marine species and ecosystems; development and use of ecologically safe fishing gear and techniques.
- Establishment of protected marine natural territories (nature reserves and sanctuaries) starting from the extension of buffer zones of the existing inland nature reserves to the adjoining offshore waters.

Regions and objects of biodiversity requiring special attention:

- Baltic Sea;
- coastal areas of the Barents Sea;
- breeding grounds of marine mammals on the coastline and islands of the Arctic and Pacific Oceans;
- seabird colonies on the coastline and islands of Arctic and Pacific Oceans;
- coastal areas of southern Primorye and Sakhalin Island;
- Caspian Sea;
- Sea of Azov;
- Black Sea.

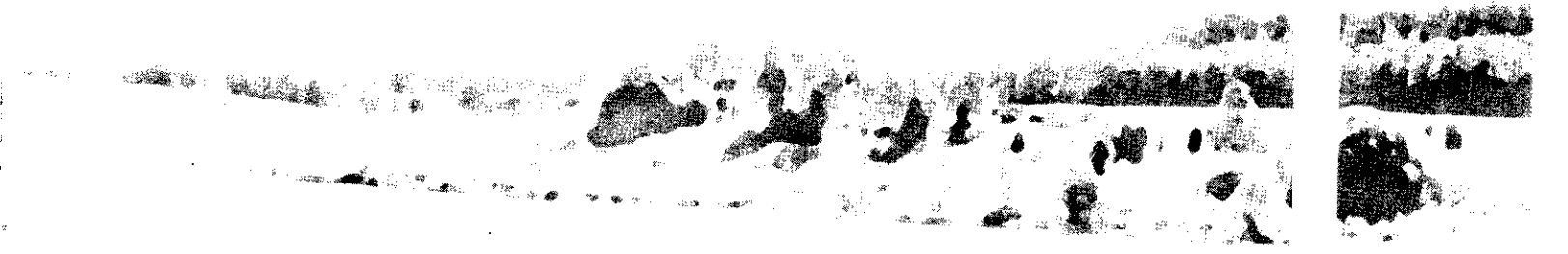
5.2.2.6. Freshwater Ecosystems



The quality of surface water in the majority of Russian water bodies fails to meet the relevant criteria despite a decline in industry and reduced discharge of waste matter. The situation is especially serious in the Volga basin, north-western regions, certain regions in the North, and in the basins of the Don, Kuban, Ob, Yenisey, and Pechora Rivers whose waters are described as polluted (heavily polluted in their tributaries). The total volume of polluted effluents emptied annually into the surface run-off is estimated at 55 cub.km including 20.3 cub.km undergoing poor preventive treatment or no treatment at all. Negative effect of pollution on Lake Baikal, a World Heritage Site, has never been stopped. The welfare of aquatic ecosystems will further deteriorate while the anthropogenic pressure remains at the present level.

Major threats to freshwater ecosystems

- Hydroengineering works cause degradation of natural complexes in large rivers and lakes. Regulation of river channels disturbs reproduction and migration of hydrobionts, construction of dams leads to the loss of spawning grounds for acipenseriform fish, fluctuations of water level in artificial reservoirs affect many other species leading to the drying up of their breeding sites. Risk of catastrophic accidents increases because of the poor condition of hydrotechnical constructions.
- Pollution:
  - by industrial discharges;
  - by domestic and municipal effluents;
  - as a result of agricultural activity;
  - as a result of oil developments;
  - as a result of forestry and logging;
  - by motor vehicle emission;
  - secondary pollution of lakes and water reservoirs by harmful substances accumulated in bottom sediments;
  - as a result of trans-boundary aerial transport of pollutants including acid rains (especially harmful for small and medium-sized lakes in the north of Russia).
- Ecologically-unsound water use by industries and other economic activities and direct transformation of natural freshwater ecosystems.
- Excessive and poorly controlled norms of water consumption for industrial, agricultural, and domestic needs.
- Invasion by alien species including their release with water from ballast tanks.
- Excessive catch of commercial hydrobionts and poaching.
- Destruction of aquatic habitats by dredging river channels for navigation, sand and gravel extraction.
- Navigation.
- Explosions related to the exploration for mineral deposits and construction work.
- Regional and global changes of climate.



Consequences of human impact on freshwater ecosystems

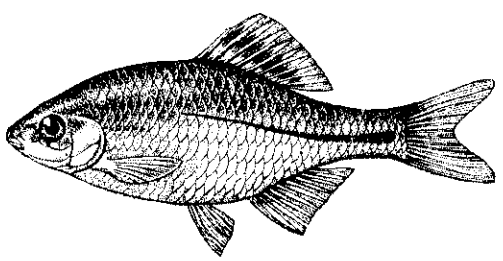
- Poisoning of water bodies by heavy metals, phenols, hydrocarbons, and other toxicants.
- Upset of the balance of nutrients carried into water bodies, altered equilibrium between production and decomposition processes in freshwater ecosystems, disturbed natural cycles of biogenic elements, eutrophication of water bodies resulting from pollution by agricultural and domestic waste.
- Acidification of water bodies by atmospheric precipitation containing products of fossil fuel combustion and other production processes. This type of contamination is especially dangerous for northern freshwater ecosystems because of their low capacity for neutralizing acid precipitation.
- Thermal pollution of water bodies by cooling water of thermal and nuclear power plants changes their temperature regime and promotes eutrophication.
- Disturbance of natural succession of ecosystems including that by altered hydrological conditions.
- Disappearance of "key species" of hydrobionts leading to degradation of food chains and ecosystem structure.

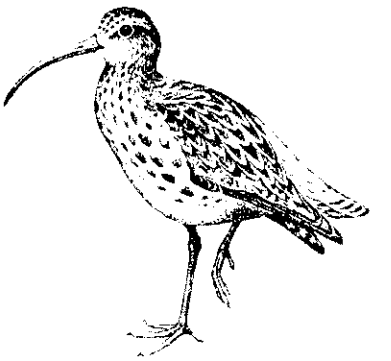
Priority measures for conservation of freshwater ecosystems

- Prevention of negative effects of hydroengineering works, co-ordination of water discharge past the dams of hydroelectric power plants during fish spawning seasons with fish industry and research institutions, improvement of sanitary and technical conditions of reservoirs, bank strengthening.
- Preliminary measures aimed at preventing discharge of all kinds of pollutants into rivers and water bodies, application of resource-saving and environmentally friendly technologies, improvement of water purification techniques, preventive treatment of waste water.
- Use of ecologically safe technologies in agriculture and forestry.
- Decrease in wastage of water in production processes, use of recycled water, decrease of water consumption, application of fish-protecting devices.
- Control of permitted catches of commercial hydrobionts. Protection of species and ecosystem biodiversity in natural complexes through the implementation of multi-species fishery strategies.
- Recovery of the most important natural spawning grounds.
- Prevention of invasion by alien species.

Regions and objects of biodiversity requiring special attention:

- deltas and estuaries of large rivers;
- lakes Onega and Ladoga;
- freshwater ecosystems in northernmost regions;
- water bodies and small rivers in the Central-Chernozem, North Caucasus, and Southern administrative regions; Lake Abrau;
- the Volga River basin, especially its smaller rivers;
- the Ob River basin;
- lakes of Altai;
- Lake Baikal and its basin;
- lakes of Transbaikalia
- Lake Khanka.





5.2.2.7. Peatland Ecosystems

Peatlands occupy over 20% of the territory of Russia. They provide a variety of functions including maintenance of biological diversity and regulation of the global carbon and water cycles. Peatland ecosystems support high species diversity due to their frequent location in frontier areas between other types of ecosystems. This creates favourable conditions for co-existence of organisms belonging to different ecological groups while highly variegated environment promotes spontaneous hybridization, adaptive evolution, and development of new morphological traits. Peatlands represent the sole type of habitat for many groups of organisms. Also, they form a characteristic landscape element in many regions. Large mire systems provide a source of many indispensable resources including peat and medicinal plants. They are extensively exploited by agriculture, forestry, and commercial hunting.

Peatland ecosystems have been changed significantly as a result of large-scale, often unwise drainage for agriculture and forestry, extraction of peat for fuel and fertilizers, and ecologically-unsound hydrotechnical works. Marked regional differences in the extent of human exploitation and economic value of different types of mires account for a significantly different magnitude of their anthropogenic modification.

Major threats to peatland ecosystems

- Changes in natural hydrological conditions after the construction of roadways, oil and pipelines, and other linear structures and hydrotechnical works.
- Agricultural use and extraction of peat in regions with small mire massifs.
- Tree cutting in floodplain swamp forests at the southern border of the forest zone.
- Pollution of peatlands by agricultural, industrial, and domestic waste and runoff from highways.
- Disturbance and pollution caused by oil developments.
- Haphazard siting of kitchen-gardens, week-end dwellings, and second homes in floodplains and other lowland mires in densely populated regions.
- Use of surface and underground water sources feeding peatlands for domestic and technological needs.
- High recreational activity, collection of berries and mushrooms, hunting (in certain regions).

Consequences of human impact on peatland ecosystems

- Conversion of natural peatland systems into agroecosystems and urban areas; disturbance of natural succession of peatland vegetation.
- Man's interference with natural carbon and water cycles, turnover of other elements and substances, hydrologic, climatic, and other regulatory functions intrinsic in peatlands.

- Changes in peatland function as a source of natuiral resources and in other economically and socially important functions.
- Disappearance of organisms and groups of organisms characteristic of peatland ecosystems.
- Adverse effects on migratory birds associated with peatlands.

Priority measures for conservation of peatland ecosystems

- Forbidding extraction of peat as a practically non-renewable resource, for fuel.
- Decrease of peat extraction as a fertilizer in regions with a poorly developed network of mires.
- Prevention of disturbances to the natural hydrologic balance of peatlands resulting from hydrotechnical and other construction works.
- Prevention of negative consequences of oil and gas extraction and transportation.
- Minimal reclamation of new peatland areas for agriculture and forestry, promotion of the sustainable use of the previously reclaimed areas including their rehabilitation.
- Limitation on the conversion of floodplain and other lowland mires in densely populated regions.
- Prevention of pollution by agricultural and domestic waste and runoff from highways.
- Control of water consumption from water sources feeding peatlans.
- Prohibition of tree-cutting in floodplain forests at the southern border of the forest zone.
- Priority designation of peatlands of international importance as Ramsar sites.
- Incorporation of peatlands into the system of specially protected natural territories at regional and local levels.
- Rehabilitation of peatland ecosystems in regions of their intense degradation.
- Regulation of harvesting berries and mushrooms and hunting on heavily exploited peatlands.

Regions and objects of biodiversity requiring special attention:

- peatlands designated to the Ramsar List by the Decree of the Government of the Russian Federation No. 1050 of 13 September 1994; also, those included in the Shadow List of internationally important wetlands in Russia;
- floodplain and other lowland mires in densely populated regions;
- peatlands at the southern limit of their distribution;
- northern peatlands with poor ability for spontaneous recovery in oil and gas-development areas;
- peatlands traditionally involved in subsistence economy of local communities.