BIOSPHERE RESERVES OF THE VOLGA BASIN AREA

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Cover: The Svyato-Iversky Monastery on Valday Lake attracts many tourists and pilgrims. (photo by M. Mordasov); research at the reserve (photo by M. Shershnev); the Volga River (photo by G. Lebedev).

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Introduction

This brochure describes the Volga basin area and sustainable development efforts conducted by its 13 biosphere reserves included in the UNESCO's World Network.

UNESCO's biosphere reserves are specially governed territories that aim to ad- dress one of the greatest challenges of the 21st century: preservation of the diversity of plans, animals, and microorganisms, which constitute biosphere and are responsible for maintaining the balanced state of natural ecosystems. This must be accomplished while meeting the needs and wants of growing number of people in the world.

Timeline

1968 - The foundations for the Man and the Biosphere (MAB) Intergovernmental Program (MAB Program) are laid.

1971 - The MAB Program has been approved by the UNESCO General Conference and launched.

1983 - The First International Congress on Biosphere Reserves is held in Minsk, Belarus.

1992 - The office of the Director-General of UNESCO establishes the International Advisory Committee for Biosphere Reserves.

1995 - The International Conference on Biosphere Reserves takes place in Seville, Spain, where the Seville Strategy for Biosphere Reserves (the Seville Strategy) and Statutory Framework for the World Network get approved.

1998-2004 – The Russian Federal Targeted Program Volga's Renaissance is being implemented.

2001-2004 - The Volga Vision Interdisciplinary Initiative of UNESCO for the sustainable development of the Volga-Caspian basin in being implemented. 2006 г. - The UNESCO Moscow Office and Coca-Cola HBC Eurasia partner to implement large-scale Living Volga Ecological Program.

2008 - The Third International Congress on Biosphere Reserves is held in Madrid, Spain, where the Madrid Action Plan is proposed (2008-2013).

2010-2014 - The MAB seminars on contribution of the biosphere reserves to sustainable development of the Volga basin area are held annually at the Great Rivers International Forums in Nizhny Novgorod in 2006-2014.

Description of the Volga basin area

The Volga basin area spans 1,360,000 km2, which is about a third of the European part of Russia. Its western border is the Valday Hills and Central Russian Up- lands, while its eastern border is the Urals. The Volga river system comprises roughly 151 thousand tributaries (rivers, streams, and temporary streams) with the total length of 574,000 km, while the Volga itself has 200 immediate tributaries. Near Saratov, the basin becomes narrower; downstream of Kamyshin all the way to the Caspian Sea, the Volga has no tributaries.

Source of Volga. Photo by I. Nikolaev.

The source of the Volga. The source of the Volga River is a spring near Volgoverkhovye village in Tver region. As it crosses the Valday Hills, the upper Volga runs through 2 small lakes, Maloe and Bolshoe Verkhity, then crosses a system of larger lakes, known as Verkhnevolzhsky lakes (Sterg, Vselug, Peno and Volgo, which collectively form the Verkhnevolzhsky Reservoir).

The upper Volga River. A dam built immediately downstream of Verkhnevolzhsky lakes in 1843 helps maintain water level sufficient for navigation. The city of Rzhev is the closest to the source of the river large settlement. Three reservoirs were created between the cities of Tver and Rybinsk. The first one is the Ivankovo Reservoir, also known as the Moscow Sea. Its dam and associated hydroelectric station are located near the city of Dubna. The hydroelectric stations of the other two reservoirs, the Uglich and Rybinsk reservoirs, are located near the cities of Uglich and Rybinsk, re-

spectively. Between the cities of Rybinsk and Yaroslavl and south of Kostroma city, the river flows across a narrow valley as it crosses the Uglichsko-Danilovskaya and Galichsko-Chukhlomskaya uplands. Further, the Volga runs parallel to the Unezhenskaya and Balakhninskaya lowlands. Near Gorodets, north of Nizhny Novgorod, the Nizhny Novgorod Hydroelectric Station is built across the Volga, forming the Gorky Reservoir.

The largest tributaries of the upper Volga are the Selizharovka, T'ma, Tvertsa, Mologa, Sheksna, Kotorosl, and Unzha rivers.

The Volga River near the Zhiguli Mountains in the fall. Photo by Eternal Sledopyt

The middle Volga River. After the Oka River merges with the Volga, the middle Volga gets even wider as it flows along the northern edge of the Privolzhskaya Uplands. Here, the right bank of the middle Volga is more elevated than the left bank. The Cheboksary Hydroelectric Station, located near the city of Cheboksary, forms the Cheboksary Reservoir north of the station's dam. The largest tributaries of the middle Volga are the Oka, Sura, Vetluga, and Sviyaga rivers.

The lower Volga River. Once the Kama joins it, the Volga becomes truly large as it flows across the Privolzhskaya Uplands. Near Tolyatti, north of the Samarskaya Luka (Samara Bend), which is formed by the Volga River circling around the Zhiguli Mountains, the Zhiguli Hydroelectric Station is located. The Volga River floods the area north of the dam, forming the Kuybyshev Reservoir. Further downstream, near Balakovo, the dam of the Saratov Hydroelectric Station is located. The tributaries of the lower Volga (the Sok, Samara, Bolshoy Irgiz, and Eruslan rivers) are relatively small. The Akhtuba, the left distributary of the Volga, splits off 21 km north of Volgograd. Its length is 537 km, and it flows parallel to the Volga. Many old riverbeds and streams cross the large area between the Volga and the Akhtuba, which is known as the Volgo-Akhtuba plain. In the past, the rivers used to flood the area 20-30 km wide.

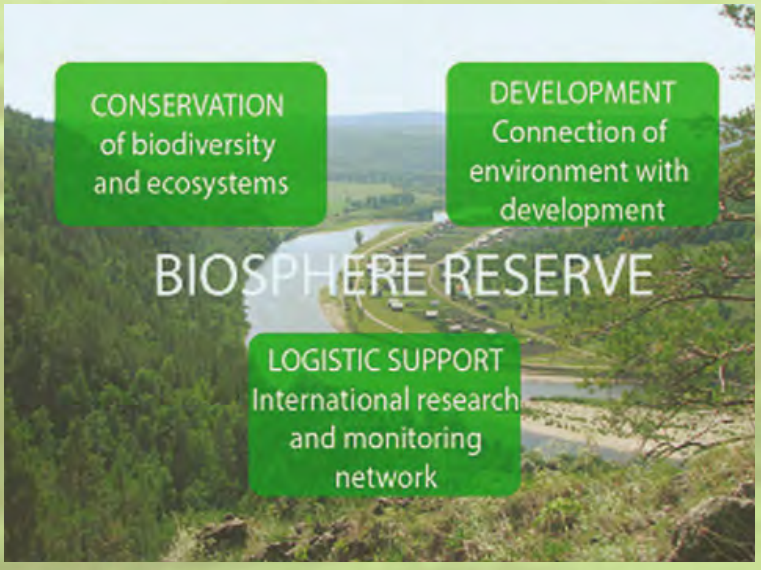
The Volga Hydroelectric Station is located between Volgograd and the point of Volga-Akhtuba split. North of the station's dam, the Volgograd Reservoir is located.

The Volga Delta is the region downstream of Volga-Akhtuba split, near Volgograd. It is one of the largest Russian deltas; it comprises roughly 500 distributaries. The major distributaries of the Volga Delta are the Bakhtemyr, Kamyziak, Staraya Volga, Bolda, Buzan, and Akhtuba. The Bakhtemyr is the only distributary open for navigation; it forms the Volga-Caspian Canal. The Kygach distributary crosses Kurmangazy district, Atyrau Region of Kazakhstan.

What is a biosphere reserve?

Modern society has reached a point, beyond which crisis-free economic development is only possible if due consideration is given to ecology and conservation of diversity of landscapes and species. Preservation of natural complexes in their native state should become one of the ways to achieve harmony in the relationship of the nature and the humankind. An extended network of specially protected natural territories can help accomplish this goal. These territories play role of cornerstones of ecological framework, which is resistant to anthropogenic influence, capable of preventing irreversible ecosystem changes, and enables sustainable use of natural resources.

Biosphere reserves are areas within terrestrial and coastal ecosystems that gained international recognition through their participation in the MAB Program. Together, biosphere reserves constitute the World Network of Biosphere Reserves. To join the Network, a reserve must be nominated by appropriate national authorities and meet the criteria developed by the MAB Program. This is a mandatory condition of inclusion in the World Network. A biosphere reserve performs 3 functions, which complement one another:



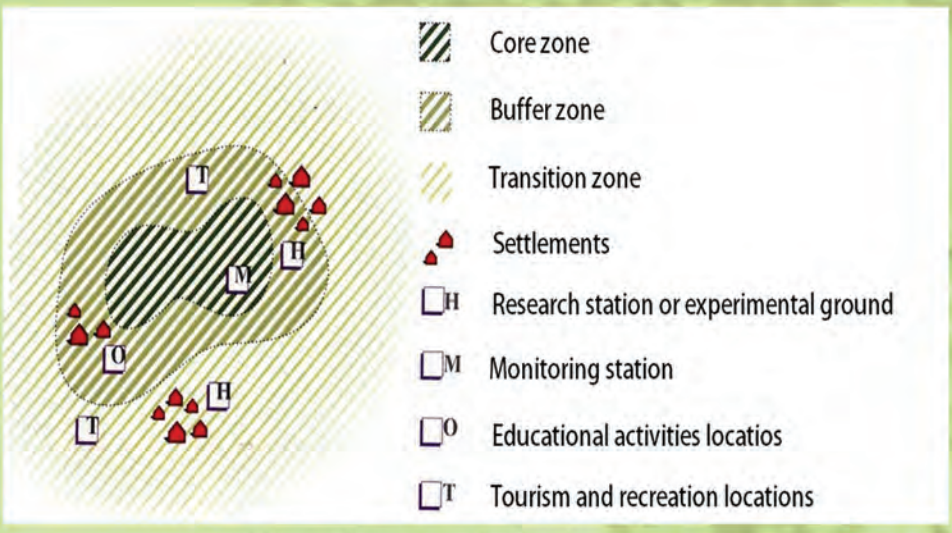
The three functions of a biosphere reserve.

Conservation - conservation of landscapes, ecosystems, biological species, and genetic diversity;

Development - local facilitation of economic development that is culturally, socially, and ecologically sustainable;

Logistic support - support of research, monitoring, education, and information exchange relevant to local, national, and global problems of nature conservation and development.

Areas protected by national legislation receive priority consideration in the process of a biosphere reserve designation. Commonly, a structure of a biosphere reserve depends on local factors; however, each biosphere reserve must comprise a core zone, a buffer zone, and a transition (cooperation) zone, which are discussed in detail below.



The zonal structure of a biosphere reserve.

Designation of a biosphere reserve and its subsequent participation in the World Network requires appointment of a governing body, such as coordination council, charged with planning and coordination of interests and activities within all 3 zones of the reserve. This unique zonal structure has its challenges. For example, a conflict may arise between local residents and a governing body of a reserve as it works to accomplish the reserve's goals. Resolution of such conflict is essential. Hence, a management strategy that is open, flexible, and well adapted to local conditions should be implemented. This may be challenging and require creativity and patience. This management approach may, however, have its rewards, since it allows local community to contribute to nature conservation and sustainable development of the area adjacent to biosphere reserve.

Tasks of biosphere reserves

Improvement of biodiversity conservation

Terrestrial and aquatic ecosystems suffering from anthropogenic stress have lesser diversity of plant species, animal species, and landscapes. Biodiversity reduction is a threat to the survival of the humankind since biodiversity is a potential source of food, fiber, drugs, and raw materials for manufacturing and construction. Hence, biodiversity is an important subject of research. Results of this research supply opportunities for education and recreation. Core and buffer zones of a biosphere re- serve simultaneously preserve biodiversity, display it, and provide research opportunities, which help us explore biodiversity further.

Visimsky Biosphere Reserve. Photo by E. Larin.

Biosphere reserves preserve samples of global flora and fauna for living and future generations. For example, 53% of plant species of the Central Urals and 76% of mammalian species of the western taiga were found and are being preserved within Visimsky biosphere reserve.

As a result of extensive research conducted by experts in many fields, Oksky biosphere reserve has become one of the best-studied territories in the region. To date, inventory of many groups of biota has been taken. Some of these groups, for example, vertebrate animals, have been analyzed multiple times, so the species and population size are well known. Furthermore, in this biosphere reserve, dy-

namic changes of many natural objects and processes have been followed continuously for a long time, for example:
• Meteorology and hydrology observations since 1938;
• Phenology observations since 1956;
• Quantitative analysis of berry crops since 1967;
• Monitoring of forest sampling areas since 1952;
• Monitoring of grassland sampling areas since 1962;
• Quantitative analysis of the number of birds since 1956;
• Analysis of mammalian tracks during winter since 1952;

Biosphere reserves of the Volga River basin area.
1. Astrakhansky,
2 – Bashkirsky Ural,
3 – Great Volzhsko-Kamsky,
4 –Valdaisky,
5 - Volga-Akhtuba Floodplain,
6 – Visimsky,
7 – Darvinsky,
8 - Nizhegorodskoe Zavolzhe,
9 – Oksky,
10 – Prioksko-Terrasny,
11 – Middle-Volga Integrated,
12 – Ugra,
13 – Tsentralno-Lesnoy.

Maintenance of ecosystems' health

Biosphere reserves have several important functions in an ecosystem. They help support ecosystems by reducing soil erosion, maintaining soil fertility, regulating river runoff, supplying water to aquifers, maintaining cycles of nutritious elements, and absorbing water and air pollutants.

Tsentralno-Lesnoy Biosphere Reserve spans the watershed of the Volga and the West Dvina rivers. One of its key ecosystem contributions is supplying pure water to many settlements.

Lotus research in Astrakansky Biosphere Reserve. Photo by N. Litvinov.

Establishment of a biosphere reserve in the Volga Delta in 1919 was essential for conservation and, later, restoration of life species of the Volga Delta. Caspian lotus is the symbol of the Astrakhan Region.

At the time of the biosphere reserve establishment, its habitat was only 0. 25 ha. Today, the lotus covers the entire delta area as a result of preservation efforts the reserve made.

Study of dynamic changes of natural processes

Structure of the minimally altered natural systems of a core zone and dynamic changes occurring within the core may be compared to those of altered natural systems of buffer and transition zones. These studies, commonly conducted over a long period of time, facilitate understanding of the dynamic changes that take place within these natural systems. Selection of similar regions for the research and the use a unified set of methods to conduct research allows the comparison of findings on regional and global levels. Ultimately, these data aid in understanding of changes in global environment.

Grounds of the background monitoring station in Prioksko Terrasny Biosphere Reserve.
Photo by A. Kulichenko.

Biosphere reserves play an important role in collection of data by providing grounds for ecology research and monitoring. Back- ground monitoring station of Prioksko-Terrasny Biosphere Reserve has been assessing the level of pollution in the air, rainwater, snow, superficial water, soil, plants, and bottom sediment and conducting radiation and weather surveys for over 30 years.

Conservation of cultural and biological diversity.

The Great Volzhsko-Kamsky Biosphere Reserve offers an excellent example of a re serve's contribution to conservation of cultural and biological diversity.

The Raifa Monastery of the Mother of God is located in the buffer zone of the Raifa clusted of the biosphere reserve. The reserve and monastery have been successfully

working together for many years.

The Raifa Forest, located within the Raifa cluster of the biosphere reserve, has been a specially protected land of its own kind for ages. Forest cheremis people, ancestors of the modern Mari people, used this forest as their main place of prayer, known as kusoto. Cheremis people prohibited settling, hunting, and other activities, even simply passing through this area on days other than special, holy days. In the 1770s, a monastery was established on the lake, which is known as the Raifa Monastery of the Mother of God today. The monastery had owned the forest for over 200 years. During this period, special forest guard protected the forest and maintained its special status. After the Bolshevik Revolution of 1917, the ownership of the forest has passed to the School of Forestry of Kazan State University. The school used it as a training ground. Hence, the Raifa Forest again avoided felling and has remained unchanged to date.

The oldest parts of the Raifa Forest are characterized by great biological diversity. Due to the area's unique relief, the entire range of forest zones of the European part of Russia is represented here. For example, an area spanning only 5 km in longitudinal direction boasts a diversity of forest types: broad-leaved oak and lime forest in the south; north of it, mixed broad-leaved and coniferous forest; further north lies mixed pine and spruce forest; and finally, pure pine forest in the north. Each type of forest has its unique system of plants, fungi, and animals. Not surprisingly, the Raifa Forest is often referred to as an outdoors forest museum.

The Raifa Monastery of the Mother of God. Photo by E. Prokhorov.

The Reserve Chamber visitor information center of the Great Volzhsko-Kamsky Biosphere Reserve Photo by E. Prokhorov.

A fragment of How Beavers Save the Reserve Reservoirs museum display in the visitor information center. Photo by E. Prokhorov.

In the cooperation zone of the reserve, two popular historic architectural complexes are located. Island-Town of Sviyazhsk, established in the 16th century, is located in the Sviyazhsky cluster; Bolgar Historical and Archeological Complex, established in the 19th century, is located in the Spassky cluster. The later has been inscribed in the UNESCO World Heritage list.

Conservation of "green" land use practices

Over the centuries, human civilization developed unique land use practices, which allow sustainable use of local natural resources. This valuable experience can improve modern land use. Biosphere reserve residents can preserve their traditions and improve their welfare by using culturally- and ecologically-appropriate technology, both modern and traditional. Moreover, ancient cattle breeds and grain species, which are of great genetic value to modern agriculture, can also be preserved through the practice of traditional agriculture.

Biosphere reserves allow preservation and expansion of traditional land use practices and values associated with these practices. Ugra Biosphere Reserve comprises 138 settlements; nearly a half of permanent residents and the majority of local enterprises are involved in agriculture.

One of the most important goals of biosphere reserves is to find ways to use land that allow local residents to improve their welfare while causing no harm to the environment. Research can help accomplish that. Results of research may be shared through education and demonstration of findings, which could take place in the reserve. Eventually, research findings could be translated into land use practices and applied in buffer and transition zones.

In addition, results of such research are beneficial to the work of government officials, local authorities, and scientists working on both national and international levels. Thus, establishment of the World Network and regional networks gave every biosphere reserve an opportunity to exchange research outcomes on local, national, and international levels.

A set of recommendations, proposals, and methods have been developed based on research conducted in Astrakhansky Biosphere Reserve. Just a few examples of recommendations already implemented in the Astrakhan Region and beyond are listed below:

- Recommended methods of conservation, restoration, and control of habitats of waterfowl living in the Volga Delta;
- Recommendations on construction of fish passage canals in the Volga Delta;
- Suggested approaches to preservation of the Volga Delta as spawning location for industrially important fish species;
- Suggested improvements of hunting practices in Astrakhan Region;
- Recommendations on work schedule of the Volga hydroelectric stations;
- Several methods of waterfowl quantitation;
- Scientific and methodological recommendations on hunting, population restoration, sustainable use, and improvement of the habitat of game species of Astrakhan Region;
- Suggestions on preservation of Astrakhansky Biosphere Reserve components in lieu of the Caspian Sea level increase.

Support of ecosystem approach implementation

Complexity of government machinery may interfere with accomplishment of nature conservation and sustainable development goals. Biosphere reserves represent a forum where conflicts of interest can be discussed and resolved by involved parties, for example, local administration representatives, landowners, nature conservation organizations, researchers, and private business owners. Communication helps find optimal solutions for a biosphere reserve development. Later, this experience in conflict resolution might be used to resolve conflicts that might arise on adjacent to the reserve territories.

Meeting of the Gray-haired Woodpeckers elite ecological club in session.
Photo by E. Prokhorov.

The members of the Gray-haired Woodpeckers elite ecological club have solved many problems. Members of the club are successful and creative lead- ers of the organizations located within the cooperation zone of Great Volzhsko-Kamsky Biosphere Reserve; some members come from organizations not immediately connected with the reserve.

Education for sustainable development

The approach of biosphere reserves of the Volga basin area to ecological upbringing of children and ecological education of adults follows the notion that ecological education needs to not provide knowledge per se, but rather help shape the system of views and values. An important education goal the reserves share is development of "green", socially responsible set of views in children. Reserves aim to help children become active members of community, capable of in-

spiring their community to protect the environment and use natural resources wisely.

Although education approaches vary with age and background of the audience, they share a common goal. This goal is to spread the knowledge about local nature and its unique value, to introduce principles of sustainable use of natural and secondary resources, and to engage community into preservation of local nature.

Also, biosphere reserves are active creators of "ecological tourism" opportunities. Educational tours, as well as meetings of reserve staff with grade school and college students meet the criteria of educational tourism.

Recently, Tsentralno-Lesnoy Biosphere Reserve has laid the foundation for tourism. Tourism infrastructure comprises two guesthouses, a dormitory, visitor information center, and nature museum. Large-groups activities are held in the clubhouse; a canteen provides food to visitors. Three ecological trails cross the buffer zone; three ecological tours have been developed. Several field stations have been established for work and rest. Tours to Tropetsky location, where brown bear is studied in the wild, and orphan bear cubs are being rehabilitated, are very popular. Local residents are very involved in the organization and facilitation of tourist activities.

Astrakhansky Biosphere Reserve conducts organized targeted ecological education activities with local residents who come from a variety of social and professional backgrounds. To date, the reserve has engaged the majority of its target audiences. It collaborates with government and community-based nature conservation organizations, educational and cultural institutions on several levels.

Reserves often engages in three types of activities with local residents:

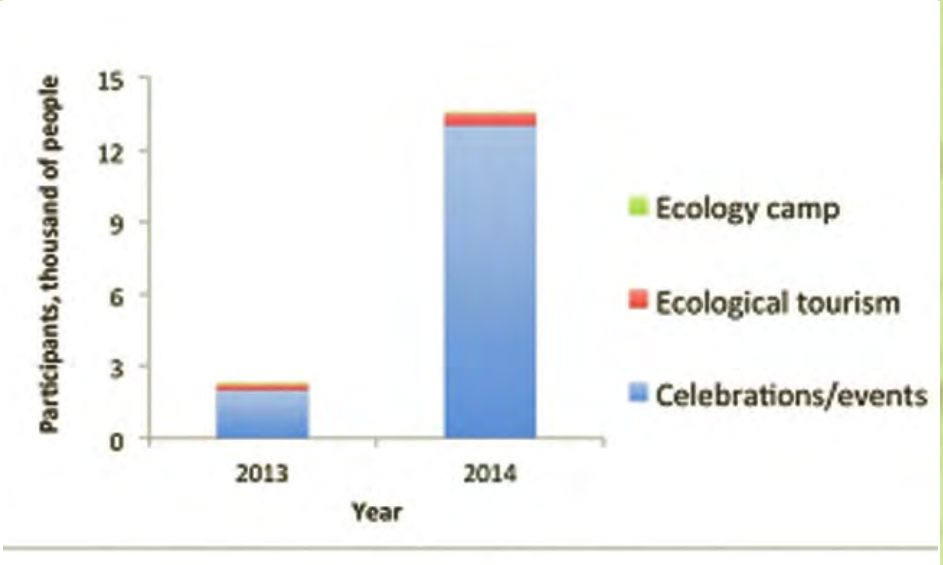
- Ecological celebrations and events, which are an effective way to attract attention of local residents to matters that reserves care about. Examples of such events are March of Parks and International Nature Conservation Day.

- Ecology camps for grade school students. Camps organized by Astrakhansky Biosphere Reserve effectively educate residents who live close to the reserve's core. This form of educational activity helps local population to become familiar with the work conducted in the reserve and particularly with its role in conservation of the Volga Delta biological diversity.

- Ecological tourism is a traditional and highly effective form of interaction with local residents. Its distinct feature is great learning potential, which makes ecological tourism very engaging. The opportunity to experience untouched nature attracts many and thus helps increase the number of partners and supporters of a biosphere reserve.

Work with youth is centered on activities that help young reserve visitors develop ecological way of thinking and culture. Great creative potential of young people may be used to promote care towards nature. Much attention is given to long-term projects that facilitate organization of active nature conservation efforts, protection of natural resources, and introduction of technology that helps preserve them.

Astrakhansky Biosphere Reserve increasingly focuses on interaction with local population, adding to the number of participants of each type of interaction described above.



The number of participants of ecological events and tourism continues to grow.

Astrakhansky Biosphere Reserve increasingly focuses on interaction with local population, adding to the number of participants of each type of interaction described above.Breeding center of rare crane species based in Oksky Biosphere

What is the structure of a biosphere reserve?

A biosphere reserve has three main zones: a core zone, a buffer zone, and a transition, also known as cooperation, zone. These zones allow to carry out the coordinated activities mentioned above aimed to conserve and sustainably develop natural resources.

A biosphere reserve comprises three interconnected zones: a core zone, a buffer zone, and a transition zone. This structure enables the reserve management to effectively conserve and use natural resources of the reserve. This structure is not rigid but rather flexible. This flexibility is one of the strengths of the biosphere reserve concept that allows the international use of the concept.

Core zone

A core zone of a Russian biosphere reserve (including the reserves of the Volga basin area) is a specially protected natural territory. The borders of a core zone of a biosphere reserve must be defined legally. Legal status ensures long-term protection of landscapes, ecosystems, and species that inhabit this zone. Hence, the territory of a core zone is sufficiently large for successful conservation of biological and landscape diversity. In some biosphere reserves, for example, Great Volzhsko-Kamsky Biosphere Reserve, several core zones of a smaller size representing each of the notable ecosystems within the reserve are designated. Anthropogenic activity other than research and monitoring is prohibited within a core zone.

Buffer zone

A buffer zone immediately surrounds a core zone, or is adjacent to it, as needed, for example, in particularly important areas. A buffer zone has clearly defined borders. In a buffer zone, anthropogenic activity should align with conservation goals set for a core zone, and such activity should facilitate accomplishment of these goals.

In Russian Federation, buffer zones are often referred to as conservation zones. Local and Federal legislation regulate designation and function of conservation zones. Russian legislators coined the term "special biosphere area", which describes a functional analog of a conservation zone. Special biosphere area is a specially protected nature territory that can be considered a distinct zone of a biosphere reserve. A special biosphere area may be used for research or sustainable nature use; the use of special biosphere areas is defined on a case-by-case basis by governing authorities of a biosphere reserves.

Research aimed at development of approaches to management of forests, meadows, farmland, and fishing ponds should be conducted in a buffer zone. This research should aim at development of strategies that allow maximal increase of productivity of these areas. Similarly, the buffer zone may serve an experimental ground for research on strategies for optimal recovery of degraded land. Buffer zone is also suitable for education, professional training, tourism, and recreation.

Transition (cooperation) zone

Transition zone is the outermost zone of a biosphere reserve: it surrounds a biosphere reserve and may include areas used as residential, agricultural, and for other purposes. Local communities, nature conservation organizations, private businesses, and other entities should work together to find ways to manage and sustainably use this territory in a manner that brings the greatest benefit to the territory's residents. Since biosphere reserves are the driving force behind promotion of sustainable use of region's resources, transition (cooperation) zone plays a major role in economic and social development of the region. Transition zone is the ideal place for demonstration of optimal approaches to sustainable use of natural resources. These approaches ultimately aim at to benefit local residents.

Residents of a transition zone have the greatest influence on a biosphere reserve. Residents' interests and economic needs, for example, agriculture, forestry, and mining needs, deserve careful consideration. Collaboration with local communities is a direct way for a biosphere reserve to plan development and conservation efforts in the region. Likewise, local residents must be given a right to participate in planning of the biosphere reserve's development and management efforts.

Benefits the existing biosphere reserves offer

Farmland, forests, and fishing ponds

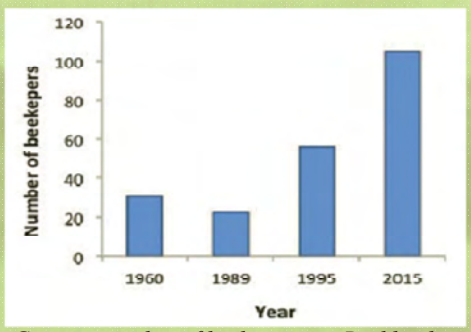
Biosphere reserves provide access to opportunities to showcase alternative land use and management strategies. These strategies help preserve valuable aspects of environment, such as soil fertility, water quality, and optimal population size of game species. Hence, these strategies help make the best use of available human and financial resources.

Elk in Great Volzhsko-Kamsky Biosphre Reserve. Due to special regulations that affect a core of a biosphere reserve, up to 80% of flora and fauna of the regionis preserved in the core. Photo byD.Gorshkov.

Reserve participates in reintroduction of rare crane species: Siberian crane into the West Siberia, red-crowned crane and white-naped crane into the Russian Far East. To date, 144 Siberian cranes, 4 red-crowned cranes, and 1 white-naped crane have been reintroduced. Eggs of Siberian cranes laid in the breeding center were added to nests of a common crane in the areas of their modern habitat in Kunovatsky nature refuge in Yamalo-Nenets Autonomous Okrug. Several dozen eggs of red-crowned cranes and white-naped cranes have been sent to the Far East station for Rare Bird Species Reintroduction, where these eggs will hatch and the young birds will be released into the wild. Breeding cranes for various purposes, for example, for zoos, helps preserve wild crane populations since that reduces the need to capture wild birds. Over the recent years, 233 cranes bred in the center were sent to Russian zoos, and 99 cranes were sent to zoos overseas.

Local residents

Local residents are indigenous people, village inhabitants and owners of country residences located on the territory of a reserve. Local residents benefit from the proximity to a biosphere reserve in several ways: core land and aquatic resources are protected; regional economy is more stable and diverse; additional employment opportunities exist; opportunities to get involved in decision-making concerning local land use exist; conflicts with managers of protected areas and other interested parties are uncommon; opportunities to maintain existing traditions and way of life exist; and healthy environment is available for local residents to enjoy now and in the future.



Growing number of beekeepers in Bashkirsky Ural Biosphere Reserve.

Biosphere reserves help maintain and develop traditional land use practices. Wild-hive beekeeping in Bashkirsky Ural Biosphere Reserve is an excellent example of this role.

Wild-hive beekeeper at work. Photo by Kh. Yagudin.

Oksky Biosphere Reserve is another example. A large share of interaction between the reserve and local residents is dedicated to ecological education. A few examples of this work are described below:

- Tourism. A 1. 5-hour-long Introduction to the Reserve tour is offered to visitors year-round. The tour covers the history of the reserve and includes a visit to the bison breeding center, a visit to the breeding center of rare crane species, a visit to an overpass on the bank of Pra river, a visit to the ruins of pre-revolution glass factory owned by Russian-Belgian Society, and a visit to the nature museum. Specialized ecological tours are also offered, namely, Visit Beaver's and Desman's Homes, Observing Birds in the Wild, and Crane on the Ground tours.
- School student education. Several clubs operate in the biosphere reserve, for example, Brykinoborochka children's ecological club, Glynka clay toy shop, horseback riding club, and Sinaya Ptitsa children's ecological theater.
- Special events. The annual chalk sidewalk-painting contest is held on June 1st, the Children's Defense Day. Ecological camps offered to schoolchildren are based in the reserve and Gorodkovich middle school. During these and other events, children's art and craft contests take place. Local students help remove trash from the biosphere reserve territory and help raise crane nestlings in the breeding center of rare crane species.
- Celebrations and festivals. Ecological celebrations, such as Earth Day and Crane's Day, became a tradition. Traditional holidays celebrated in the reserve, such as Maslenitsa and Children's Defense Day, have become ecologically relevant. The reserve hosts several annual events, for example, March of Parks, International Nature Conservation Day, and Birds' Day.
- Ecological education seminars. School science conferences and seminars are held annually. The reserve staff scientists visit local schools to meet with students and faculty.
- Media relations. District newspaper publishes The Reserve Page column on a regular basis. Larger publications cover the reserve as well.

Regional and federal television channels run several stories covering the reserve a few times a year.

- Exhibitions. The reserve routinely organizes exhibitions of photography, art, and clay and other natural material crafts. These exhibitions are held in Ryazan and other Russian cities.
- Relations with other community-based environmental organizations. The reserve maintains a professional relationship with each of the following organizations: organizing committee of Ecological Danger Defense Day (collaboration), Ryazan Center for Children and Youth Arts (collaboration, participation in center-organized contests and in the March of Parks), Biodiversity Conservation Center (participation in the March of Parks), EcoCenter Zapovedniks (methodological and informational support), EcoTravel center, Birds and People club, International Socio-Ecological Union (methodological support, joint ventures), Wild World Foundation Friends Club (methodological support).

Annually, 10 thousand people visit the information center of Oksky Biosphere Reserve.

The traditional craft of clay toy-making revived. Photo by Oksky Biosphere Reserve.

Researchers of natural and social processes

Biosphere reserves support research, for example, studies of ecological processes and dynamic changes in biodiversity. The reserves contribute to continuously growing database, which can be used to form hypotheses and conduct data analysis. Furthermore, biosphere reserves provide long-term protection to areas where continuous research and monitoring are conducted. This allows conducting long-term studies that reveal trends, and compare these trends to short-term fluctuations caused by climate and precipitation changes. Biosphere reserves offer multiple opportunities for interdisciplinary research, comparative studies, and information exchange. Results of research and monitoring in the core of a biosphere reserve offer insight into the natural state of an ecological system.

Sample collection in Astrakhansky Biosphere Reserve. Photo by G. Rusanov.

The value of research results increases drastically if these results find practical application. Let's consider an example. The marsh area located in the north part of Volga-Akhtuba floodplain has shrunk considerably over the course of recent decades. This was a consequence of regulation of the floodwater of the Volga near hydroelectric station, and also of local anthropogenic forces. These local forces may stem from seemingly minor disruptions of the normal state of environment, such as dams, which have potential to disrupt certain local ecosystems entirely.

Land restoration proposals are being implemented in the reserve. The Development Program of the United Nations/Global Ecological Foundation and Coca-Cola Hellenic Russia has sponsored these efforts.

To restore water level in Sotovo Lake, the dam, which separated the lake and Sotovy channel, was destroyed in the spring of 2009. As a result, the lake started to receive floodwater in the spring; multiple waterfowl species arrived and settled on the lake, and several game fish species started to spawn.

Sotovoe Lake in Volga-Akhtuba Floodplain Biosphere Reserve before and after restoration. Photo by I. Kushakova

Governing authorities

Biosphere reserves provide accurate information on natural resources and on technical and organizational capabilities of natural resource management to governing authorities. Reserves also help governing authorities promote nature conservation efforts. In addition, reserves serve examples of sustainable management of natural system at several distinct levels (local, national, and international), and help clarify the need for certain administrative and legal tools that could help manage natural systems. Hence, a reserve may use national, as well as foreign, funds to support its operations.

St-Petersburg State University students visiting Valday. Photo by A. Knyazev.

Recruitment of students to participate in execution of environmental programs run by biosphere reserves is essential. Such participation may entail regular monitoring of environmental factors at specially established grounds. Through such participation, students acquire valuable practical work and life skills, which is particularly important since many of the students will pursue career in government upon graduation.

Governing authorities often ponder ways to improve quality of local residents' lives. Recently, rural tourism has drawn attention of authorities as another possible solution to this problem. Rural tourism development was discussed with much enthusiasm during the session of the Civic Camber of Russian Federation in March of 2013. In 2014 in Belgorod, during the Second Rural Tourism Forum, proposal of the Federal Law on Rural Tourism was discussed.

The development of rural tourism in biosphere reserves started in 2001-2002. Recommendation on business administration and development were distributed among owners of guesthouses. Promotional materials and tourist guides have been published to support this new initiative. By 2004, Ugra Biosphere Reserve had around 60 guesthouses that could accept visitors. This was accomplished with support of Targeted Regional Program for Rural Tourism. In Kaluga region, rural tourism has special support: providers of agricultural tourism opportunities receive subsidies, which help them improve their business.

The Man and the Biosphere (MAB) Program participants

Biosphere reserves demonstrate ways to resolve land use conflicts and conserve biodiversity to global community by actively engaging in education and communication of their goals and values.

The National Committee of Russia for the MAB Program joined forces with its partners to bring together all active biosphere reserves located in the Volga basin area. Representatives of all 13 biosphere reserves of the Volga basin area have been meeting annually for over 10 years. These meetings serve forums for discussion of research and practical use of its output. Undoubtedly, this collaboration model should be adapted by the reserves of other regions and countries.

By exchanging experience biosphere reserves facilitate a variety of initiatives.

Selection of territories for biosphere reserve designation

Biosphere reserves represent diverse territories: mountains and valleys, shores, islands and continental bodies of forest, tropical desert and polar tundra, severely altered and intact ecosystems. To receive a biosphere reserve designation, a territory must:

- Represent an important biogeographical region that experiences a range of human interventions;
- Represent landscapes, ecosystems, or plant and animal species and variants of thereof in need of conservation;
- Allow development and practice of approaches to sustainable development of a region, in which

the reserve is located
- Possess a size sufficient to serve the 3 main functions of a biosphere reserve;
- Possess a zonal structure that includes a legally constituted core zone, a clearly define buffer zone, and a transition zone.

Biosphere reserve management plan must accommodate participation of regional government, local residents, and private businesses. The National Committee for the MAB Program is responsible for preparation of the documentation necessary for the inclusion of a territory into a World Network of Biosphere Reserves. The UNESCO Science Advisory Committee for Biosphere Reserves reviews the application and provides recommendations for consideration by the International Coordinating Council of the MAB Program. Ultimately, the Council makes the decision to designate the territory as a biosphere reserve; the Director-General of UNESCO then shares this decision with the applicant country.
After a reserve has been designated, local residents must be made aware of this change. One way to accomplish that is to post signs and distribute information explaining the implications of the change for local residents, for example, the meaning of the special status of the reserve.
Biosphere reserves commonly include valuable objects of historic and cultural heritage. In fact, this is often a reason for the designation of a territory as a biosphere reserve and for its protection under the International Convention Concerning the Protection of the World Cultural and Natural Heritage as well as for its protection under a variety of international laws governing preservation of aquatic ecosystems of global importance. For example, the Kapova Cave in Bashkirsky Ural Biosphere Reserve is a unique display of Paleolithic drawings dating back to 14-17 thousand years ago. Similarly, Mesolithic drawings have been discovered in the Staromuradymovskaya Cave, which is also located in the reserve. Hence, inscription of these caves in the UNESCO World Heritage list has been proposed, and appropriate application has been prepared. Multiple Upper Paleolithic settlements have been discovered in areas adjacent to Bashkirsky Ural Biosphere Reserve. The search for more continues today.

Who is involved in biosphere reserve's work?

Locally, researchers, authorities, non-governmental organizations, and local residents participate in biosphere reserve's work.
Nationally, this work focuses on execution of the Convention on Biological Diversity and corresponding economical development. Involved in these economical development efforts are various government offices and organizations involved in nature conservation and sustainable use of natural resources.
Globally, many governmental and non-governmental organizations are involved in the World Network of Biosphere reserves. These organizations are also involved in practical application of the biosphere reserve concept on the local level..


Организация Объединенных Наций по вопросам образования, науки и культуры

Программа "Человек и биосфера"

The certificate that a biosphere reserve receives as a sign of its designation to the World Network from UNESCO upon recommendation of the UNESCO Science Advisory Committee for Biosphere Reserves.

The World Network of Biosphere Reserves

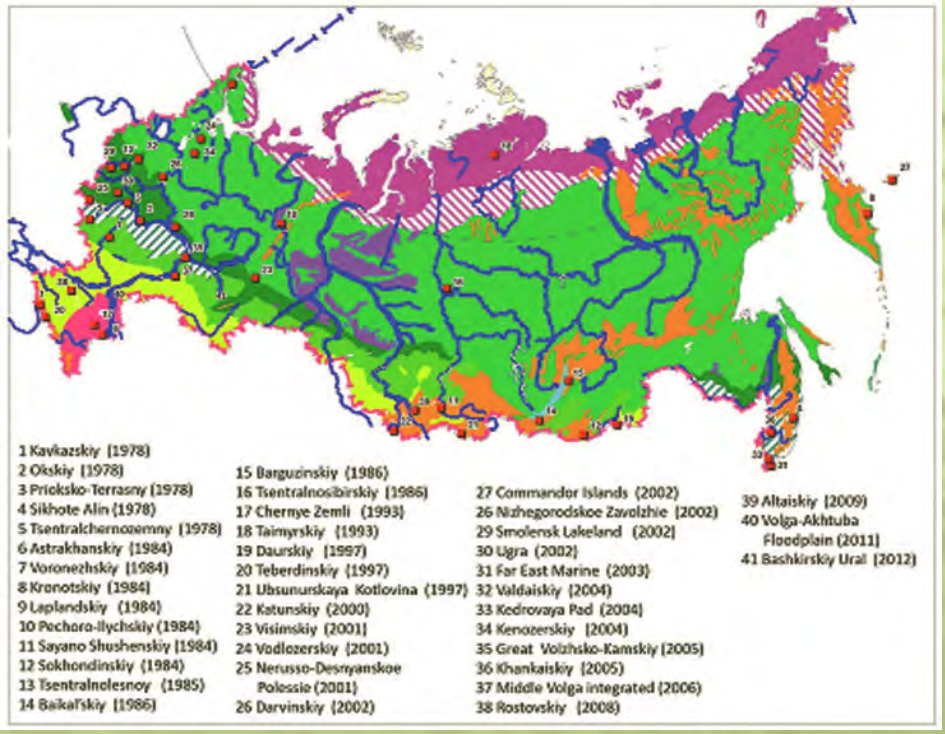
Despite geographical, economical, and cultural features that distinguish biosphere reserves, all biosphere reserves share a common goal: to identify specific strategies of biodiversity conservation and sustainable use of natural re-

sources that create value for local residents. The World Network complies with the resolution adopted by UNESCO at the 28th session of its General Conference. This resolution defines specific characteristics of biosphere reserves and requires the periodic evaluation (once in 10 years) of biosphere reserves' operations. The Seville Strategy and Madrid Action Plan list the key requirements for the World Network and participating reserves.

Network of biosphere reserves of Russia

Russian system of specially protected territories has unique structure and boasts notable accomplishments. In 1978, the system served a foundation for first biosphere reserves. Today, 35 Russian zapovedniks, 7 national parks, and 1 regional nature park have been designated as UNESCO biosphere reserves.

Legal support of existing reserves is one of the key focus areas of the National Committee of Russia for the MAB Program. Currently, Russia lacks legislation that allows division of each reserve into 3 zones. Legal support of sustainable development of these territories is also lacking. The Russian Ministry of Natural Resources and State Duma have not yet considered UNESCO's recommendations summarized as the "model law" proposal and experience of other countries that have successfully addressed similar issues.



Map of Russian biosphere reserves.

Russian network of biosphere reserves comprises 2 geographical divisions: East Asian Biosphere Reserve Network (EABRN) and European Biosphere Reserve Network (EuroMAB). Sixteen reserves located in the Siberia and Far East are included in East Asian Biosphere Reserve Network while the remaining 25 reserves located to the west of The Urals are a part of EuroMAB Network. Russian network of biosphere reserves remains the largest in Eurasia.

Nine Russian reserves have been inscribed in the UNESCO World Natural Heritage list, which is the best way to protect these territories, considering the lack of appropriate legislature. Acknowledging the important role of trans-boundary cooperation in preservation of biological and landscape diversity, attendees of EABRN conference held in Mongolia in 2013 recommended to initiate a conversation with UNESCO about development of the International Convention on Trans-Boundary Protected Areas. Many countries whose natural ecosystems are divided by international borders acknowledge the need to improve trans-boundary cooperation. However, success of such cooperation depends largely on harmonization of laws of countries considering such cooperation. Inaction and validation of international conventions is one of the best ways to make laws of countries involved consistent. Hence, inaction of aforementioned UNESCO convention to support sustainable trans-boundary cooperation will help realize the goals of several other international conventions, specifically, the International Convention Concerning the Protection of the World Cultural and Natural Heritage, Convention on Biological Diversity, and Convention on Wetlands of International Importance especially as Waterfowl Habitat. This gives hope that most UNESCO member countries will support such convention.

Seminar Participants of the seminar held in Berezinsky Biosphere Reserve, Belarus. Photo by E. Sitnikova.

In 2014, the national committees of Russia and Belarus for the MAB Program with support of UNESCO Office in Venice organized international seminar Trans-boundary Cooperation for Conservation and Sustainable Use of Ecosystems: Establishment of Model Territory with Green Economy within Baltic Region. Representatives of several biosphere reserves, including those located Ukraine, were invited to the seminar, which was held in Berezinsky Biosphere Reserve, Belarus, to share their experience. As a result, participants proposed an action plan to fulfill recommendations of the Rio+20 Conference on "green economy" development and MAB seminars held in 2013 in Nizhny Novgorod. Conditions of integration of the 21st Century Agenda in the southeast of the Baltic Region were considered during the seminar. Hence, since signing the treaty on strengthening of trans-boundary cooperation, the national committees of Russia and Belarus for the MAB Program are charged with an important task, which they will have to collaboratively implement in the nearest future.

Development of the biosphere reserve concept in Russia

In 1978, 7 zapovedniks of the Soviet Union have become a foundation for the first biosphere reserves.

In 1983, Minsk, Belarus, hosted the First International Congress on Biosphere Reserves, proposed by the Soviet Union and supported by UNESCO, the United Nations Environment Program (UNEP), Food and Agriculture Organization of the United Nations, and International Union for Conservation of Nature and Natural Resources (IUCN). To fulfill recommendations of the Minsk Congress, the Soviet Union established 8 complex background monitoring stations based in biosphere reserves. This initiative was supported by the hydrometeorological service of the Soviet Union. After the collapse of the Soviet Union, the National Committee of Russia for the MAB Program continued to guide efforts to carry out the MAB Program. The lack of funding made that task rather difficult. For example, during the "golden era" of the MAB Program in the Soviet Union, conferences and meetings were held annually, which helped connect 4000 professionals involved in 1000 field projects. Transition to new, market economy has changed that. However, despite the shortage of funds to support such field projects and international collaboration, some of these MAB projects received awards, and their results have been applied practically.

Endorsement of the Madrid Action Plan. Photo by M. Brynskikh.

Currently, the absolute majority of Russian biosphere reserves meet the expectations set for biosphere reserves and national parks. Naturally, most of these expectations overlap with those of the Seville Strategy and Madrid Action Plan. These expectations include strict protection of natural complexes within a core zone, scientific research, background monitoring, and education of general public. However, it is important to stress that all this work is done within the boundaries of biosphere reserves and national parks. Activity of biosphere reserves and national parks

in the cooperation zone is rather limited and is not supported by law.

To summarize, the Madrid Action Plan is being implemented in Russia; however, its implementation has a unique, Russian flavor. Some aspects of the plan are being implemented fully, while other aspects are not being implemented at all. The authors of this brochure are hopeful that Russian biosphere reserves will soon gain necessary legal support in Russia and will continue to actively participate in the MAB Program.

Collaboration of the MAB Program with other programs within the Volga basin area

Multiple, diverse projects are being concurrently carried out within the Volga basin area. For example, employees of Astrakhansky Biosphere Reserve served expert consultants on the joint initiative of UNDP Program in Russia and Global Environmental Facility called "Conservation of Wetlands Biodiversity in the Lower Volga Region". The proposal they developed was accepted by Global Environmental Facility without revisions and funded. Currently, technical aspects are being settled in preparation to the implementation of the core phase of the project. The reserve participated in UNEP/Russia project called "Integrated Water Resources Management for Sustainable Freshwater Supply and Conservation"; it participated in the development of strategic and national action plans within the framework of Caspian Ecological Program and UNESCO project called "Complex analysis of the influence of the Volga runoff control on floodplain and delta ecosystems". Next, we will discuss experience the MAB Program gained through collaboration with other international programs and initiatives across the entire Volga basin area.

The International Hydrological Program

The International Hydrological Program (IHP) is an international UNESCO research program, which focuses on hydrology research, water resources management, education and capacity-building in this field (for more information, please visit http://www. ihp-russia. ru/).

IHP UNESCO is the only large-scale program of the United Nations in this field, focused on hydrology research and formation of strategy and political approach that support sustainable, effective management of water resources. A few key aspects of IHP are:

- Water resources under the pressures of global climate change;
- Ground water resource assessment;
- Urban water management;
- Water and community;
- Water resource education.

In Russia, hydrological and meteorological monitoring and implementation of IHP are curated by the Federal Service for Hydrometeorology and Environmental Monitoring of Russia (referred to as the Federal Service for Hydrometeorology below). Within the frameworks of the IHP and MAB programs, the national committees for these programs, specially protected natural territories and the Federal Service for Hydrometeorology have collaborated closely for many years. To maintain the interaction between biosphere reserves and the Federal Service for Hydrometeorology, the Programs and Actions Within the Frameworks of Complex Background Monitoring and Sustainable Use of Natural Resources in Biosphere Reserves Roundtable was held at the Great Rivers 14th International Scientific and Industrial Forum in 2012. Organizers of the forum were the Federal Service for Hydrometeorology, Hydrometeorology department of Privolzhsky Federal Okrug,

National Committee of Russia for the MAB Program, and National Committee of Russia for the IHP. Representatives of research institutions affiliated with the Federal Service for Hydrometeorology, Academy of Sciences, Nizhny Novgorod State University of Architecture and Civil Engineering, and biosphere reserves of the Volga basin area participated in the roundtable.

General committee of the roundtable on collaboration of IHP and biosphere reserves. Nizhny Novgorod, 2012. Photo courtesy of IHP website.

Roundtable participants concluded that complex background monitoring is one of the best approaches to monitoring of the environment state in biosphere reserves.

The outcomes of complex background monitoring efforts were summarized in the presentations delivered by roundtable participants. Several biosphere reserves of the Volga basin area were used as examples: Nizhegorodskoe Zavolzhye, Great Volzhsko-Kamsky, and Valdaisky.

Implementation of complex background monitoring strategy helps accomplish sustainable development goals within a given region. Participation of all involved parties is essential for success of these efforts. For example, regional offices of the Federal Service for Hydrometeorology, research institutions, and educational institutions (universities), as well as local governing authorities should be involved.

Roundtable participants recommended using background monitoring program of Valdaisky Biosphere Reserve as a template for development of background monitoring programs in the other reserves of the Volga basin area. It was also recommended to develop general methodological guidelines for natural systems monitoring.

The Great River Forums and UNESCO Chairs

Multiple of scientific and industrial seminars were held within the framework of the Great Rivers Forums in Nizhny Novgorod. These seminars aimed to solve a number of problems of Russian cultural and natural heritage conservation.

The Great Rivers Forum is one of the most highly respected international exhibition/meeting projects focused on sustainable development of humankind in basin areas of large rivers, and on conservation of nature, natural resources, and heritage.

Fourteen forums have been held to date. The main aims of these forums were:

- Exchange of global experience in solving sustainable development problems and restoration of ecological balance within the large river basin areas;

- Analysis of successful application of "basin" approach to solving sustainable development problems;
- Exhibition of novel practical accomplishments of participating nations in the fields of social and economic development.

In 2012, the Great Rivers 14th International Scientific and Industrial Forum was dedicated to the 20th anniversary of the Rio+20 Conference. The forum was held within the framework of the following United Nations programs:
- Water for Life International Decade for Action
- United Nations Decade of Education for Sustainable Development
- Johannesburg plan
- The 21st Century Agenda

The forum complied with program documentation approved by the President of Russia, Government of Russia, Copenhagen International United Nations Conference, and Clean Water Russian Federal Targeted Program. Representatives of 13 international organizations, 20 ministries and offices of the Russian government, 28 research institutions, 27 universities, more than 700 businesses and community-based organizations attended the forum. Thirty-five federal divisions and twenty-one countries participated in the Sustainable Development of Large River Basin Areas Forum. The leading theme of the international scientific conference held within the framework of the forum was formulated as Technologies of Ecological Development, Conservation of Energy and Other Resources, and Improvement of Environment Health. Materials of this and other meetings are published. These extensive publications summarize unique scientific, technological, socio-economical, and cultural experience of improvement of the health of large river basin areas around the world.

Since 2010, annual seminars that cover various aspects of work conducted in the biosphere reserves of the Volga basin area have been held within the framework of the Great Rivers Forum. These seminars has been supported by several partners: UNESCO Office in Moscow as a part of UNESCO/Coca-Cola HBC Eurasia partnership program Living Volga, the National Committee of Russia for the MAB Program, and Nizhny Novgorod State University of Architecture and Civil Engineering UNESCO Chair (also referred to as Ecologically Safe Development of the Large Region of the Volga Basin). The National Committee of Russia for the IHP also supported the initiative. Detailed information on the seminars is available online on "Local Sustainable Development" blog page (http://fsde-journal. ru/). Annually, 50-60 people participate in the seminar, which includes students of Nizhny Novgorod State University of Architecture and Civil Engineering, representatives of all biosphere reserves of the Volga basin area, regional research institutes, and the national committees for UNESCO's MAB Program from Brazil, Belarus, China, USA, and Ukraine.
The first seminar in this series, held in 2010, was focused on sustainable development of biosphere reserves of the Volga basin area. The main objectives of the seminar were:
- To develop specific plan of actions, which would remove obstacles biosphere reserves face as they strive to comply with the requirements of the Seville Strategy and the Madrid Action Plan;
- To improve approaches to maintenance of sustainable ecosystem functioning under pressures of global climate change;
- To facilitate collaboration between biosphere reserves and UNESCO Chairs in the Volga basin area.

The next seminar was help in 2011. At this seminar, entitled "Sustainable Development

of Biosphere Reserves of the Volga Basin Area: The Past and The Future of the MAB Program", comparative analysis of distinct features of these biosphere reserves' function was conducted. The contribution each reserve made over the last few years to fulfill the goals of UNESCO's MAB Program was assessed.

Also, suggestions on implementation of recommendations of the 10th Conference of the Parties of the Convention on Biological Diversity, Nagoya, Japan, (October, 2010) were made. These recommendations were to be later included into the Action Plan for Biodiversity Conservation and Restoration as the essential conditions of the future sustainable development of the Volga basin area.

At the Sustainable Development of the Volga Basin Area: Contributions of Biosphere Reserves and Local Residents Seminar (2012), the Federal Service for Hydrometeorology and National Committee of Russia for the IHP co-hosed a discussion of key accomplishments and future avenues for the implementation of complex background monitoring program in reserves. Participants of this discussion also analyzed effectiveness of biosphere reserves' efforts to engage local residents, which helped unveil main issues of these efforts and propose solutions.

The biosphere reserves continued to exchange their experience of implementation of the Seville Strategy and Madrid Action Plan at the 2013 Seminar entitled "Ensuring Sustainable Development of the Volga River Basin: Input of Biosphere Reserves into Implementation of the Recommendations of the Rio+20 Conference". The results of previous seminars held within the framework of the Great Rivers Forums were taken into account. The focus of the 2013 seminar was on existing opportunities for implementation of the recommendations of the Rio+20 Conference regarding implementation of the 21st Century Agenda on many levels in the Volga basin area. Two large, notable roundtable sessions were held within the framework of the seminar: "Collaboration of UNESCO Chairs and biosphere reserves to achieve sustainable development" and "Improvement of laws governing specially protected natural territories in order to enable reserves to accomplish their objectives". Recommendations proposed at these roundtables address a broad range of issues and will improve functioning of biosphere reserves and help them accomplish sustainable development of the Volga basin area.

The 2014 seminar entitled "Ecosystem conservation and application of green economy principles in biosphere reserves" focused on the following:

- Means of improvement of the quality of studies of protection and restoration of anthropogenically altered natural ecosystems;
- Strengthening of international and cross-regional collaboration of businesses and local residents in order to improve management of ecosystem resources and restoration of altered ecosystems.

Special attention was given to development of proposals regarding participation of the Volga basin area reserves in implementation of sustainable development practices locally and in expansion of international experience exchange, a process that is key to success of sustainable development.

As mentioned above, these seminars served a forum for biosphere reserves of the Volga basin area where these reserves exchanged their experience in implementation of the Seville Strategy and Madrid Action Plan. Much attention was given to ways to implement recommendations of the Rio+20 Conference at several levels. Implementation of

Declaration on Implementation of the Green Economy Principles in Russia and other proceedings of the 4th Russian Environment Conservation Meeting were also discussed. The seminars have drawn attention to the unresolved problems that prevent biosphere reserves from realizing their full potential. The reserves are still unable to implement UNESCO recommendations, and legal support of biosphere reserves' effective operation is completely lacking. One of the key accomplishments of the MAB seminars is establishment of the Expert Council on Specially Protected Natural Territories. The council is affiliated with the Ministry of Natural Resources and Environment of the Russian Federation and includes a working group on biosphere reserves. These organizations are anticipated to contribute to solution of long-standing problems of biosphere reserves, which prevent reserves' effective functioning.

The handshake marks the beginning of collaboration of UNESCO Chairs of Nizhny Novgorod State University of Architecture and Civil Engineering and the Federal University of Para, Brazil. Photo by O. Voronetskaya.

Ecological education of local residents is an important part of biosphere reserves' work. Specifically, biosphere reserves should inform and educate local residents about main functions and roles of ecosystems. Importantly, UNESCO was responsible for implementation of UN Decade (2005-2014) for education for sustainable development. International Coordinating Council of the MAB Program requires that all biosphere reserves and regional networks of thereof must propose ways to accomplish this important goal. Reserves should also engage community and non-governmental organization in the education process. It is obvious that business entities need to be engaged, but, unfortunately, biosphere reserves have so far had limited success in this arena. Strengthening connections with business community and engagement of business into ecological education and other projects is a high priority. The other projects that could benefit from collaboration with businesses are natural and cultural heritage conservation, and conservation of biological diversity of Russia for future generations.

In addition to aforementioned types of partner organizations, UNESCO Chairs may and are expected to help biosphere reserves accomplish this important goal.

To date, several UNESCO Chairs have been established and actively collaborate with biosphere reserves of the Volga basin area. This collaboration has been established to fulfill recommendations of the 3d International Congress on Biosphere Reserves held in Madrid in 2008. The UNESCO Chairs of the Volga basin area are located in Puschino, Tolyatti, Kazan, Astrakhan, and Nizhny Novgorod (with its satellite Chair in Volgograd). Nizhny Novgorod State University of Architecture and Civil Engineering UNESCO Chair entitled "Ecologically safe development of the large region of the Volga basin" has established the best collaborations with the MAB Program and leads implementation of the program. For example, at the Sustainable Development of Biosphere Reserves of the Volga Basin Area Seminar held during the Great Rivers 7th International Scientific and Industrial Forum in 2010, the collaboration of UNESCO Chairs of Nizhny Novgorod State University of Architecture and Civil Engineering and the Federal University of Para, Brazil was established. Also, a decision to expand collaboration between biosphere reserves and UNESCO Chairs was made. UNESCO Chairs play a role of scientific and educational clusters positioned at the leading edge of innovative research in their respective fields. The Chairs play an important role in the knowledge and information exchange, which facilitates sustainable development. The benefits of close collaboration of UNESCO Chairs and biosphere reserves are clear; examples include:

- Practical application of theoretical scientific knowledge;
- Engagement of experts with a broad range of expertise (social, technical, and natural science) in search of sustainable development solutions;
- Creation of opportunities for interdisciplinary research;
- Conducting research that is directly linked to management of biosphere reserve and planning of land use.

In 2004, Great Volzhsko-Kamsky Biosphere Reserve hosted a meeting that representatives of all biosphere reserves of the Volga basin area attended. The meeting, supported by UNESCO Office in Moscow, aimed to address sustainable development and biodiversity conservation issues faced by 39 territories that comprise the Volga basin area. An important item on the agenda of this meeting was analysis of recommendation of the Volga Vision Project, one of the key interdisciplinary projects of UNESCO. The Volga Vision Project was initiated in 2001 by a committee of leaders of 5 intergovernmental UNESCO programs: IGCP, IHP, IOC, MAB and MOST. Representatives of Nizhny Novgorod State University of Architecture and Civil Engineering UNESCO Chair actively participated in the initiative. The aim of the project is to offer recommendations on sustainable development of the Volga basin and the Caspian Sea areas and to prepare interdisciplinary forecast for the Volga basin area, its delta, and the Caspian Sea shore. Such long-term forecast is extremely valuable because it serves a reference point for development of policies and tactics of natural resources management. Several international organizations and programs active in the region, and national programs like the Revival of the Volga Russian Federal Program and Great Volga Route Project are among the participants.

The Living Volga Ecological Program

UNESCO Office in Moscow and Coca-Cola HBC Eurasia have been collaborating on implementation of the Living Volga Ecological Program since 2006. This partnership was established in the framework of Water for Life International Decade for Action (2005-2014) and United Nations Decade of Education for Sustainable Development (2005-2014). The program provides ecological education to local residents and helps them respect, plan and sustainably manage water resources and processes and conserve fresh water, land, and biodiversity resources. Activities within the program focus on preservation and rational use of the Volga ecosystems.

The program is carried out chiefly on the territories of the Volga basin are biosphere reserves, specifically, Astrakhansky, Darvinsky, Great Volzhsko-Kamsky, and Middle-Volga Integrated reserves. Since 2006, program leaders have built solid partnerships with many organizations active in the Volga basin area:

- The National Committee of Russia for the MAB Program;
- The National Committee of Russia for the IHP
- Nizhny Novgorod State University of Architecture and Civil Engineering UNESCO Chair entitled “Ecologically safe development of the large region of the Volga basin”;
- UNDP Program in Russia and Global Environmental Facility initiative entitled "Conservation of Wetlands Biodiversity in the Lower Volga Region";
- The noncommercial partnership Biosphere Reserves of Eurasia;
- Dront Ecological Center (Nizhny Novgorod);
- Zelenaya Orbita Ecological Center (Volgograd).

Year after year, project leaders successfully draw public and professional attention to the project. The ecological education level of region’s residents is high, as evidenced by an ever-growing number of attendees of events the program plans. So far, 7 Volga basin cities have hosted these events: Yaroslavl, Astrakhan, Samara, Saratov, Nizhny Novgorod, Volgograd, and Kazan. For example, the volume of trash collected each year from an area of over 50 km2 has reached 50 tons. Roughly 4 thousand people helped clean the river and its banks. The Volga Day is a holiday that is now listed in the International Ecological Calendar thanks to efforts of program leaders. It has been celebrated on May 20th every year since 2008. The holiday aims to attract public attention to the Volga River ecosystem preservation and sustainable use of its resources. Events of the Volga Day include not only celebrations and cleaning of the outdoors areas, but also science meetings, seminars, and roundtables. Over the course of 7 years, over 300 experts attended science meetings, and thousands of adults and children joined public celebratory events. Journalists, artists, and students are invited to participate in creative contests.

Today, the Volga day is celebrated in Nizhny Novgorod, Samara, Saratov, Volgograd, Astrakhan, Kazan, Yaroslavl, Tutaev, Tolyatti, and in biosphere reserves of the Volga basin area.

Participants of the Living Volga Ecological Program developed and published an educational packet with information on the Volga River for children 12 years of age and older and junior college students.

The cover of the Living Volga educational brochure and the Living Volga game

The packet includes a brochure with information on ecological classes and seminars and an educational ecological game. The game comprises 5 sets of cards covering 5 topics: “Flora”, “Fauna”, “Water”, “Sustainable development”, and “We are ecologists”, and well as game rules. In 2014, games and classes that utilized the Living Volga packet were held in 40 schools partnered with UNESCO.

Biosphere reserves of the Volga basin area

The area of the Volga basin is unique. This is the only large basin of Russia that includes 13 biosphere reserves. This reserve network has the capacity and is expected to supply objective data on the condition of the biosphere and major ecosystems. Information on each biosphere reserve of the Volga basin is briefly summarized below. Ways in which the reserves accomplish some of their goals are discussed.

ASTRAKHANSKY BIOSPHERE RESERVE

Astrakhansky Biosphere Reserve

The reserve is based on Astrakhansky State Nature Zapovednik.

The core zone gained legal status of zapovednik on April 11, 1919.

Biosphere reserve designation: 1984.

Area: total – 435,878; core zone – 67,917 ha, buffer zone – 31,000 ha, proposed special biosphere area – 336,961 ha.

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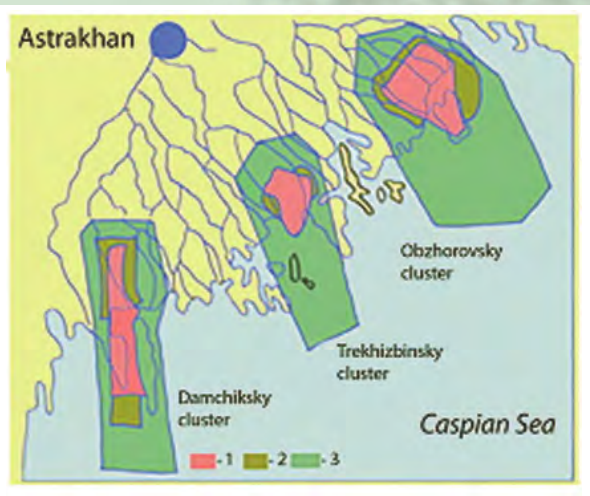
Astrakhansky Biosphere Reserve is located in the lower Volga Delta. Its core comprises three clusters: Damchiksky (Western Delta), Trekhizbinsky (Central Delta), and Obzhorovskiy (Eastern Delta).



Zones and clusters of Astrakhansky Biosphere Reserve.
1 - the core zone;
2 – buffer zone;
3 – proposed special biosphere area.

Scientific research has been conducted in the reserve since the foundation of Astrakhansky State Nature Zapovednik in 1919. This research spans decades and has produced sets of continuous data, which are of the greatest value to researchers studying the dynamics of natural processes. For example, research of aquatic, parasitic and mammalian species has been conducted continuously since the 1930s, water systems research – since 1947, fish research - since the 1950s, insect research - since the 1960s, and bird research – since 1961.

Preservation and study of the aquatic birds of this area were the key reasons for establishment of Astrakhansky State Nature Zapovednik. Years of research resulted in understanding of biology, ecology, migration terms and patterns of many waterfowl species.

Flora of the reserve comprises 314 species included in 64 families of higher plants. Four types of plants are common: bushes, forest plants, meadow plants, and aquatic plants. Sacred lotus is a notable rare plant species; currently, sacred lotus is present in the area of 5,000 ha within the core zone.

A diversity of fish species that inhabit the reserve (56 species, 12 families) is a consequence of a diversity of aquatic ecosystems. Depth, current speed, and pres-

ence of aquatic plants vary very broadly across aquatic ecosystems of the reserve. Migratory and semi-migratory fish species are in majority. These species spawn in the reserve. Salt-water species, which originate in the sea, are also present. Migratory fish species, such as sturgeon and herring, enter the reserve only when they migrate from the sea to the Volga to spawn, and back.

The most common amphibian species is the marsh frog. Marsh frogs inhabit multiple channels of the reserve and the avant-delta. European green toad and European tree frog inhabit the reserve as well. Common reptilian are grass snake, dice snake, European pond turtle, and sand lizard.

Of 283 bird species that inhabit the reserve many are present in high numbers. Such great species diversity stems from unique ecological conditions of the Volga Delta. Waterfowl species are especially numerous: swans, geese, ducks, cormorants, herons, sea gulls, and white terns. Lots of birds cross the borders of the reserve on their way to nesting and overwintering locations; many stay awhile to feed and rest.

Willow groves of the delta serve home to large colonies of cormorants and herons. These birds feed on the shore, since they can easily find food, such as fish and invertebrate animals, there. Two examples of species listed in the Red Data Book of the Russian Federation and of Astrkhan Region are white-tailed eagle and Dalmatian pelican.

Soil researcher I. Zhuzhneva at work. Photo by V.Malov.

A common landscape of the reserve is a web of channels separating many alluvial islands visible above the water level. Soil scientists conduct research to understand the process of soil formation that takes place on these islands. Research resulted in development of soil map of the lower Volga Delta, and understanding of mechanism and distinct features of soil formation in the Volga Delta.

Geobotany studies conducted here help trace dynamic changes of protected ecosystems and common plant species of the reserve. This research helped describe major trends in ecosystems' lives. Rare plant species listed in the Red Data Book of the Russian Federation, such as Caspian lotus and water chestnut, are also of interest to researchers. Studies of population structure, blooming, yield volume, spread dynamic, and diseases of rare plants are conducted annually.

Reserve employees have developed and clearly defined methods of protection, restoration, and rational use of waterfowl of the Volga Delta.

G.M. Rusanov watches birds. Photo by A.Gorbunov.

Many of the 30 mammalian species of the reserve inhabit azonal riverside ecosystems.

One of the strongest anthropogenic forces that affect ecosystems of the reserve is regulation of the Volga runoff by hydropower dams. The dams have altered terms and scale of spring and summer floods and increased the scale of water release during the winter.

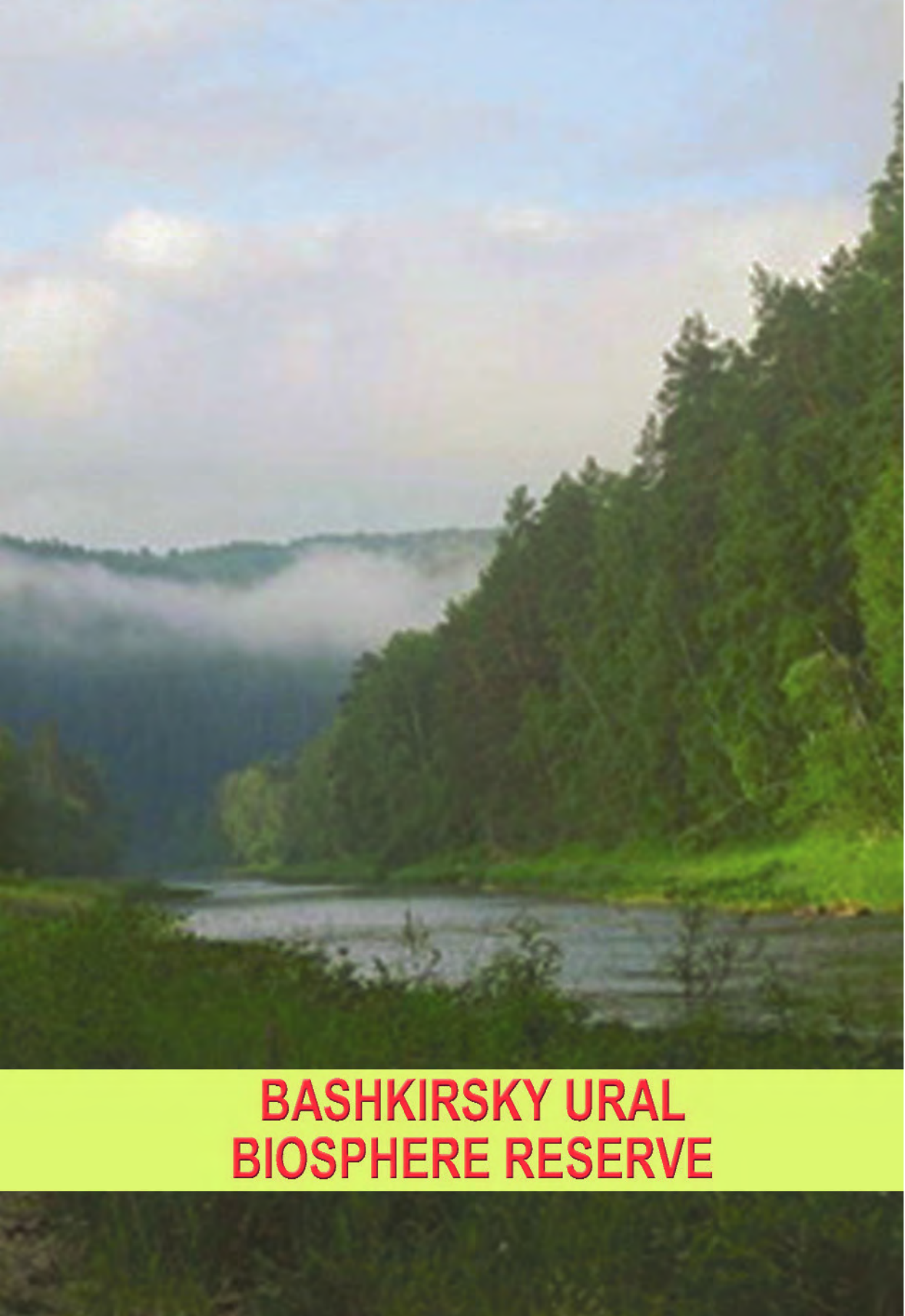
Fishing, tourism, hunting, and agriculture are typical transition zone activities. Fishing and hunting are traditional in the Volga Delta. Cattle-breeding is the main component of agriculture. Islands of the delta supply pasture and hay. When these pasture areas are overused, plant ecosystems get disrupted, which results in soil salinization. Islands are also used as leveed rice, tomato, and potato fields. Hence, flooded areas that fish use for spawning are dramatically reduced. The Volga Delta has recently started to attract many tourists. Tourism remains largely uncontrolled. Fishing and hunting are particularly popular among tourists. Ecologically conscious tourists represent only a minor share of all tourists; hence, tourism continues to have negative influence on the Volga Delta. Another major negative force is forest fire, which sometimes reaches the core zone of the reserve.

Lotus research in Astrakhansky Biosphere Reserve. Photo by N.Litvinov.

Two educational packets have been developed based on information the reserve employees provided. Ecological Education packet was developed for educational institutions, students and youth, while Informational packet was intended for distribution among businesses, community-based and governmental organizations, media, and local residents.

These packets help share sustainable development principles and include:

- Strategic and action plans to raise awareness of general population of the value of the Volga basin waters;
- Brochure on ecological state of the Volga basin;
- Flyers targeting a variety of audiences;
- Map with depicted biosphere reserves and World Heritage objects of the Volga basin;
- Posters and postcards with images of local flora and fauna.



BASHKIRSKY URAL BIOSPHERE RESERVE

Bashkirsky Ural Biosphere Reserve

The reserve is based on several natural territories: Shulgan-Tash State Nature Zapovednik, Bashkiria National Park, Muradymovskoe Ushelye Nature Park, Altyn Sokol animal and insect refuge, and Iksky animal refuge, Bashkortostan Republic. The reserve is under the management of Coordination Council comprising 23 people. The council was elected on April 12, 2013.

Biosphere reserve designation: 2012.

Area: total area - 345,700 ha; core zone area - 47,900 ha; buffer zone area - 90,400 ha; transition (cooperation) zone area - 207,400 ha.

Address: 4, Zapovednaya Street, Yrgizly, Burzyan district, Bashkortostan Republic, Russia.

Phone/fax: +7 34755 33500; +7 34755 33710 / +7 (34755) 3-37-21

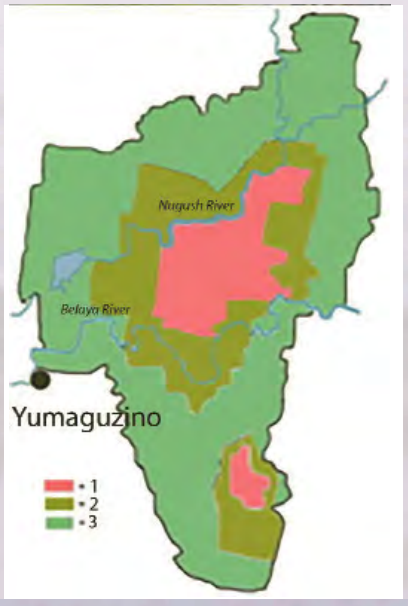
E-mail: info@shulgan-tash.ru

Web: http://www.shulgan-tash.ru/

The reserve is an example of the nature of the Southern Urals region. This region is one of 200 priority ecological regions of the world, valuable from the perspective of biodiversity conservation. The diversity of species is the reflection of the diversity of landscapes: they range from steppe to south taiga.

The reserve is located on the western slope of the Southern Urals, in the part of Bashkortostan Republic with prominent forest and mountain landscapes. Hilly plateau the reserve is located on has multiple karst formations, for example, the world-renowned Kapova Cave (Shulgan-Tash) with Paleolithic drawings 14-15 thousand years old.

The reserve boasts a vast diversity of landscapes, which include mountain river canyons, cliffs with flat tops, steep ranges, river floodplains, and reservoirs.



Zones of Bashkirsky Ural Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – cooperation (transition) zone.

Great diversity of landscapes translates into diversity of species. Remarkably, the border between geographic ranges of European and Asian flora and fauna runs across the reserve, which explains the diversity of species. To date, 2007 plant species have been identified in the reserve. Of 895 species of higher plants, 34 species are endemic to Ural and Povolzhye regions, and another 30 are relics or Pliocene, Pleistocene, and Early Holocene periods.

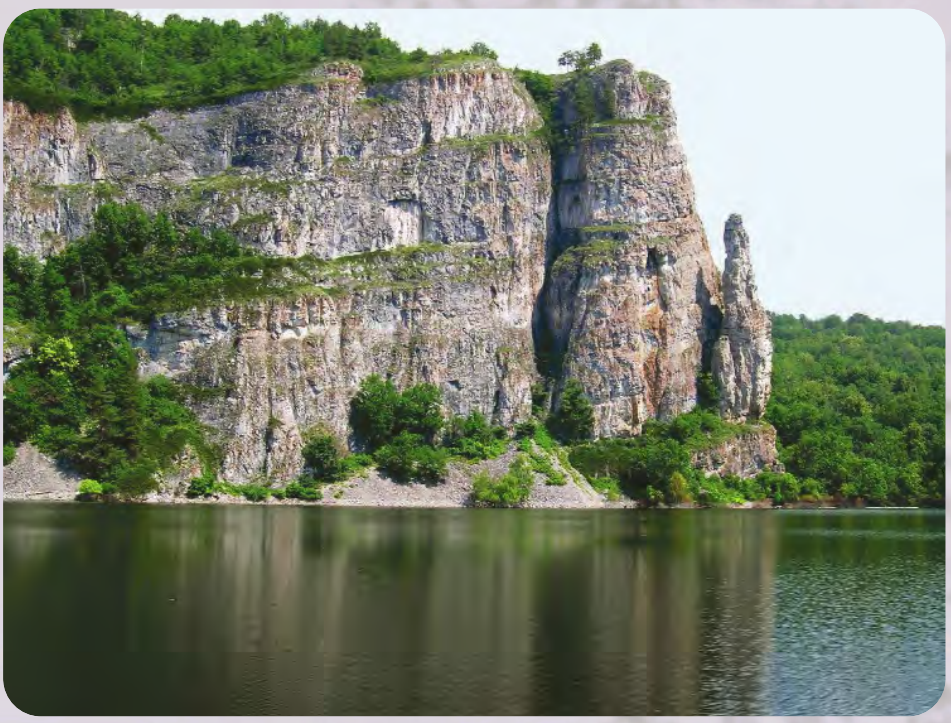
The total number of animal species that inhabit the reserve is 2157, of which 1800 are invertebrate, 31 are fish, 9 are amphibian, 9 are reptilian, 237 are birds, and 71 are mammals. One hundred and seventy-seven species are listed in the Red Data Book of the Russian Federation and in the regional Red Data Book. Two ornithological areas of Europe-level importance are Belso-Nugushskoe interfluve and Uruk.

Honeybees, both wild and domesticated, inhabit broad-leaved forests of the reserve. The bees may live in the wild, in artificial tree-trunk hollows, and in man-made hives. Wild-hive beekeeping is an ancient craft estimated to be 1. 5 thousand years old. In the reserve, it exists in its original form. Wild-hive beekeeping is the main source of income of roughly one-third of local families living in the reserve. One-third of all lime trees in the world grow in Bashkortostan Republic. These trees are an excellent source of honey.

Black forest honeybee has inhabited this area for ages, but, since 1960s, it started to crossbreed with other breeds of bees from mobile bee farms that visit the area. Although introduction of these bees in Burzyan district was strictly banned, a way to enforce this ban was lacking. In 1958, efforts to preserve the core bee population and ancient wild-hive beekeeping craft were launched. Creation of artificial tree-trunk hollows for bees to live in allowed preservation of the bee population. The effort was successful: traditional craft was preserved, and marketing of wild bee honey made honey very popular and desirable product. Wild-hive beekeeping once again became a part of local residents' lives. The biosphere reserve plans to establish a bee-breeding center to supply local beekeepers with purebred bees for free and also to sell some purebred bee family. The common goal of local residents and reserve employees is preservation of genetically pure aboriginal honeybee population in the wild, in artificial trunk hives, and common beehives.

Wild-hive beekeeper harvests honey from man-made tree trunk hollow hive. Photo by Kh. Yagudin.

The distinctive feature of the reserve is the high rate of karst processes on its territory. Discovered in the reserve are 166 caves, some of which have no analogues in the world: the Kapova (Shulgan-Tash) Cave, Novomuradymovskaya Cave, and Sumgan Dip. Surficial karst objects are common, including karst funnels, bridges, canyons, chimney rocks, and karst lakes. Native people reflected on natural beauty and diversity of local landscapes in folk eposes Ural-Batyr and Akbuzat.



The Belaya River landscape. Photo by Kh. Yagudin.

GREAT VOLZHSKO-KAMSKY BIOSPHERE RESERVE

Great Volzhsko-Kamsky Biosphere Reserve

The reserve is based on several natural territories: Volzhsko-Kamsky State Nature Zapovednik, Spassky Wildlife Refuge of regional significance, and Sviyazhsky State Nature Refuge of regional significance. The core zone gained legal status of zapovednik on April 13, 1960.

Biosphere reserve designation: Raifa and Sarali clusters designated on June 29, 2005; Sviazhsky and Spassky units designated on September 18, 2007.

Area: Total – 537,199 ha; core zone area – 420,012 ha; buffer zone area – 25,139 ha; transition (cooperation) zone area – 92,048 ha.

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E-mail: vkz@mail.ru

Web: http://volkam.zapoved. ru/

Zonal structure of Great Volzhsko-Kamsky Biosphere Reserve.
1- core zone;
2 – buffer zone;
3 – transition (cooperation) zone.

The reserve is located in the eastern part of the Russian Plain, in the North Povolzhye, in Eurasian massive of sub-taiga and broad-leaved forests.

Since the 1870s, research has been conducted in the core zone. The reserve's staff scientists are studying almost every component of the reserve ecosystem, for example, relief, soil, waters, flora, and fauna.

The reserve's water network includes the Kuybyshev reservoir, Sviyaga River, Sulista River, Kubnya River, Orya River, Bezdna River, Sunka River Akhtay River, and Ser-Bulak River. Two karst lakes are located in the valleys of the two latter rivers. Areas of these lakes are 0. 4 and 32 ha, and their maximal depth is 19 meters

Monitoring of aquatic ecosystems helps

track their dynamic changes and estimate the condition of each ecosystem at a given moment in time.

Low-lying alluvial plain landscape is a common intrazonal landscape of the reserve. Diversity of its stows and facies stems from characteristics of the area's relief and result in great species diversity.

The key components of the reserve's flora are coniferous forest species. Species associated with lakes, meadow steppe, herbaceous bogs, and sphagnum bogs are also common. In Sarali, Sviyazhsky, and Spassky clusters, steppe and forest plants are common. The reserve serves habitat to 866 species of higher plants, which accounts for over 85% of aboriginal flora of this region and roughly 60% of Eastern European subtaiga flora. Also, 210 species of mosses, 240 species of lichens, 800 species of fungi, and 600 species of algae have been registered in the reserve. Eight plant and fungi species are listed in the Red Data Book of the Russian Federation and 165 species are listed in the Red Data Book of the Tatarstan Republic.

Collection of samples for hydrobiology research. Photo by E. Prokhorov.

Fauna comprises 59 mammalian species and 230 bird species. One species of mammals, 14 species of birds, and 5 species of invertebrates of the reserve are listed in the Red Data Book of the Russian Federation.

Sixty capercaillie birds live in a small area of Raifa unit core (6,000 ha), located just 10 km away from Kazan, a 1. 5 million-people city, indicating that this area is preserved very well.

White-tailed eagle is a species that attracts close attention of researchers. This species is on the IUCN list of Threatened Species. Currently, twenty pairs of white-tailed eagles have built their nests in the reserve. Each year, by the end of mating season, white-tailed eagle population reaches roughly 80 birds. Cameras streaming live video to research laboratories help researchers learn more about biology of these birds.

Raifa unit is adjacent to Kuibyshev reservoir, so changes in the water level of the reservoir negatively affect aquatic and semi-aquatic ecosystems of the unit. Erosion processes that take place in agrocoenoses cause shallowing of water bodies, drying of landscapes, and reduction of biodiversity in coniferous forests. Transfer of organic waste and fertilizers from adjacent farmland to the reserve's bodies of water causes level of organic components to reach 2- to 145-times maximally permitted level.

VALDAISKY BIOSPHERE RESERVE

Valdaisky Biosphere Reserve

The reserve is based on Valdaisky National Park. The core zone gained legal status of zapovednik on May 17, 1990.

Biosphere reserve designation: 2004.

Area: total area – 243,932 ha; core zone area – 23,418 ha; buffer zone area – 70,514 ha; transition (collaboration) zone area – 150,000 ha.

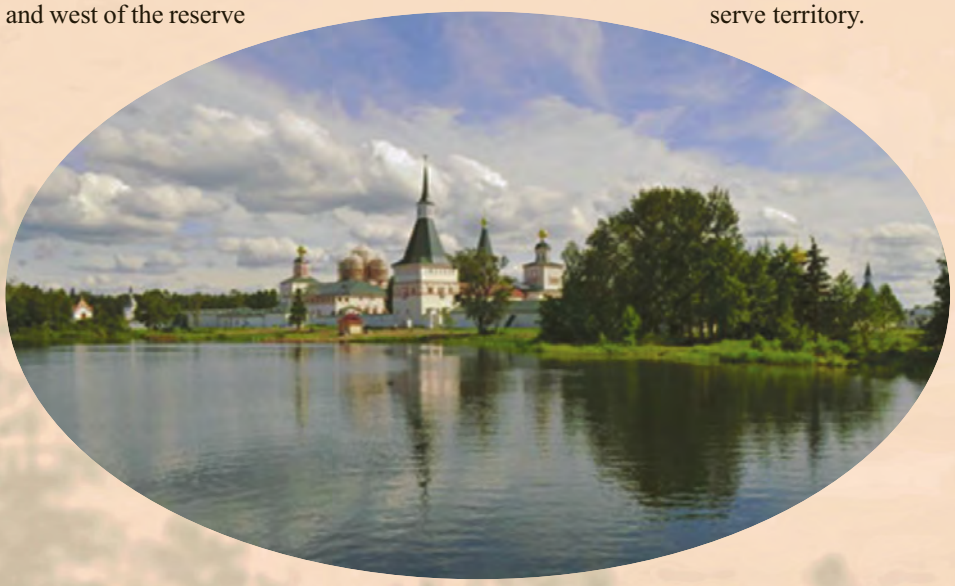
Address: 2 Pobeda Street, Valday, Novgorod Region, Russia 175400

Phone/fax: + 7 816-66 21809 /none

E-mail: valdpark@novgorod. net

Web: http://valdaypark. ru/

The key ecological function of Valdaisky Biosphere Reserve is preservation of watershed of Baltic, Black, and Caspian seas. Vast areas to the north, south, east, and west of the reserve depend on its ecological condition because the basins of the largest European rivers, specifically, the Volga, Dnepr, West Dvina, Msta, and Pola rivers, overlap on the reserve territory.



The Svyato-Iversky Monastery on Valday Lake attracts many tourists and pilgrims. Photo by M. Mordasov.

Unique systems of lakes and rivers of the reserve comprises 76 lakes, 56 of which are larger than 20 ha. Valday Lake is the largest, the deepest (up to 52 meters deep), and the most well known. The Svyato-Iversky Monastery is located on one of lake's picturesque islands. Seliger and Velye lakes are also very popular thanks to their beautiful shorelines, large stretches, and islands covered with pine forests. Origin of Valday lakes varies: some are glacial and have runoff, while others do not. Other characteristics of these lakes, such as depth, bottom, hydrochemical and hydrobiological features, vary as well, and remain subjects of research.

Hydrological refuge of the Polomet River basin occupies a quarter of the re-

serves territory. Ecologically clean drainage basin of this river is the oldest field grounds for hydrology research: research studies have been continuously conducted in this area since 1933. The Polomet River is a hydrology reference point for small rivers and a temperature reference point for all rivers of Russian Northwest. The river is listed on the International List of Specially Protected Small Rivers.

Of special value are forests, which span 85% of the reserve's territory. These forests are diverse: they include pine, spruce, birch, speckled alder, aspen, oak and other trees growing on land and swamp.

Understanding of natural complexes and species of the reserve continues to improve. Flora of the reserve includes 800 species of higher plants and 125 species of mosses. Habitats of species listed in the Red Data Book of the Russian Federation and over 30 species of plants rare in the region have been identified.

Employees of Valdaisky Biosphere Reserve exchange research experience and results. Photo by E. Litvinova.

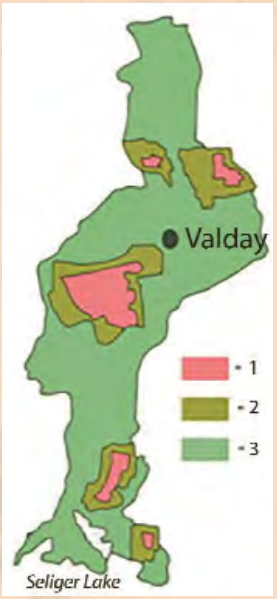
Roughly 40 fish species have been registered in the reserve. These include valuable game species: zander, peled (also known as northern whitefish), and European eel. Rare species, many of which inhabit small mountain rivers that run down the slopes of the Valday Hills, are river trout, grayling, brook lampray, and European bullhead. Nikolsky fish factory, the oldest in Russia, operates on the biosphere reserve territory.

Bird species are typical for Russian Northwest; 206 species have been registered in the reserve, and 172 species nest in the reserve. Occasionally, birds listed in the Red Data Book of the Russian Federation, for example, black-throated loon, osprey, white-tailed eagle, and greater spotted eagle are seen in the reserve. Rare and vulnerable species that nest in the reserve are Eurasian bittern, common crane, Eurasian curlew, Eurasian three-toed and white-backed woodpeckers.

Fauna includes 50 species of mammals; brown bear, wild boar, elk, beaver, and European pine marten are common. Lynx, European mink, and European otter represent rare species. Wood

lemming is another notable species living in the reserve.

Local residents have used the territory of Valdaisky Biosphere Reserve for many centuries. The area has well-established residential and transport infrastructures, development of which continues today.



Zonal structure of Valdaisky Biosphere Reserve. 1 – core zone; 2 – buffer zone; 3 – transition (cooperation) zone.

Currently, 169 settlements are located in the reserve. The total population of the reserve is 50 thousand people, 12 thousand of whom live in the buffer zone. In the summer, the population doubles due to influx of temporary residents who move to the reserve to vacation in their summer homes.

Traditionally, harvesting of timber, wild berries, mushrooms, and medicinal plants plays a very important role in the lives of residents. Local fishermen mainly use common bream, northern pike, zander, burbot, European perch, and European smelt.

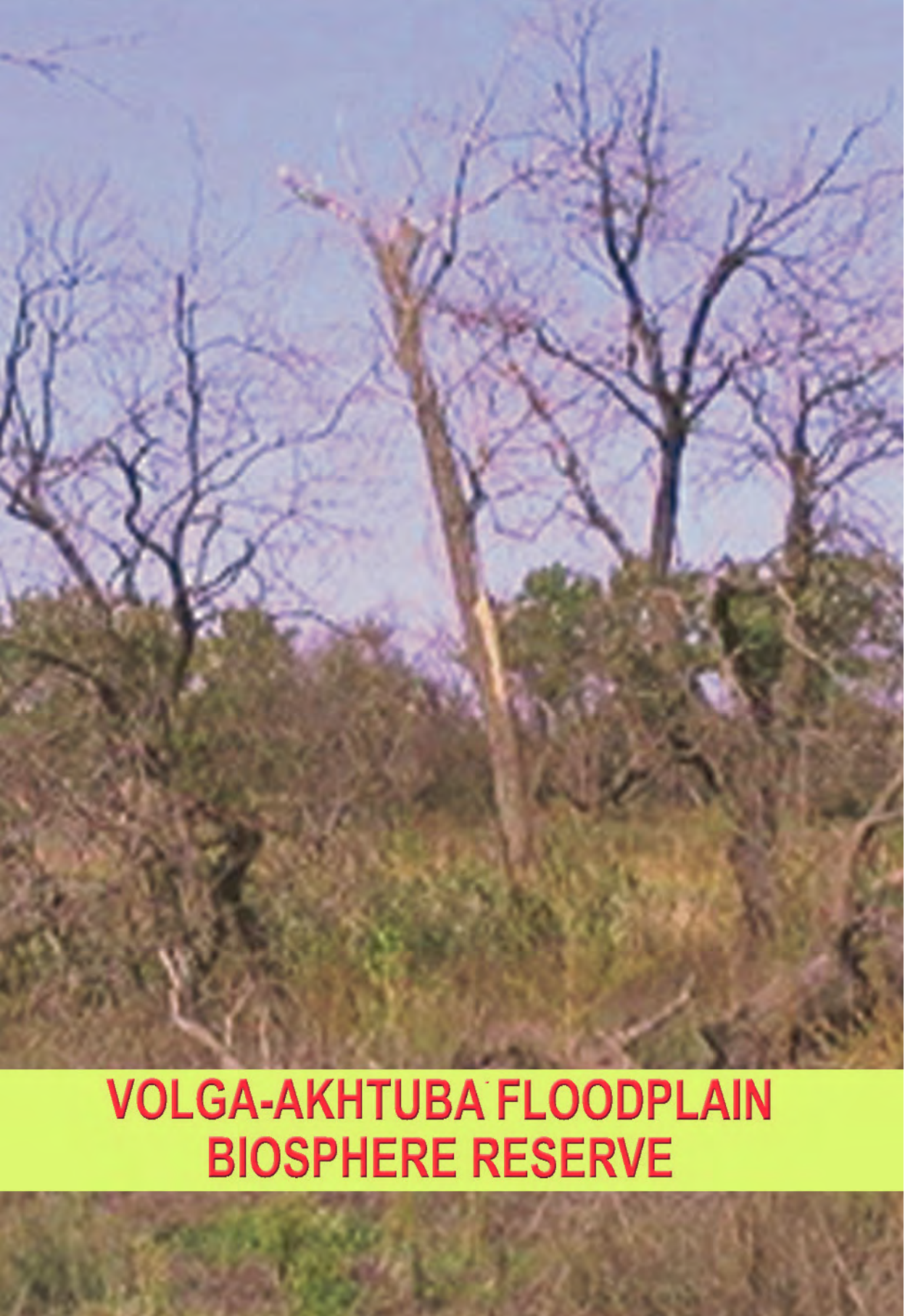
Agriculture is not a threat for nature complexes of the reserve. Agriculture affects only small plots, where vegetables and grain are grown. The absolute majority of cattle farms active in this area during the Soviet period, which used to pollute local waters, ceased to exist in the 1990s. However, a number of water bodies have been substantially altered by anthropogenic forces, such as agriculture, industry, and community, prior to establishment of the reserve.

Currently functioning industrial objects are an insignificant source of pollution since they use relatively clean manufacturing practices. Imperfect sewer systems of large settlements may pose a threat to adjacent bodies of water. Lack of stormwater sewer system also impacts these water bodies negatively. Most municipal heating systems use gas, and private households use primarily wood, which is relatively ecologically clean and releases little toxic waste into the atmosphere.

The greatest source of pollution in the reserve is highway, which connects cities of Moscow and Saint Petersburg and crosses the reserve. In addition to heavy traffic, salt and sand mixes used to clear the highway of ice are very detrimental. The total length of roads within the reserve is 552 km.

Forest fires are typically a result of careless fire use. Forest rangers are usually able to prevent the spread of forest fires. Highly professional firefighter crews ensure that the total area affected by forest fires annually does not exceed 3-5 ha of forest. This damage results from 20-30 fires that happen during an average dry season.

Valday lands attract a large number of tourists, and this number continues to grow. Tourism infrastructure, including lodging associated with lake beaches, develops rapidly. According to local government, quality of local residents' lives has improved due to the business opportunities tourism creates. Hence, monitoring and management of tourism resources, ecological education, and control and restoration of areas used in tourism and recreation are becoming very important.



VOLGA-AKHTUBA FLOODPLAIN BIOSPHERE RESERVE

Volga-Akhtuba Floodplain Biosphere Reserve

The reserve is based on Volga-Akhtuba Floodplain Nature Park, Volgograd Region.

Biosphere reserve designation: 2011.

Area: total area – 180,400 ha; core zone area – 41,101 ha; buffer zone area – 67,200 ha; transition (collaboration) zone area – 72,100 ha.

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Phone/fax: + 7 (84479) 5-34-41 / +7 (84479) 5-17-97

E-mail: poima-park@mail. ru

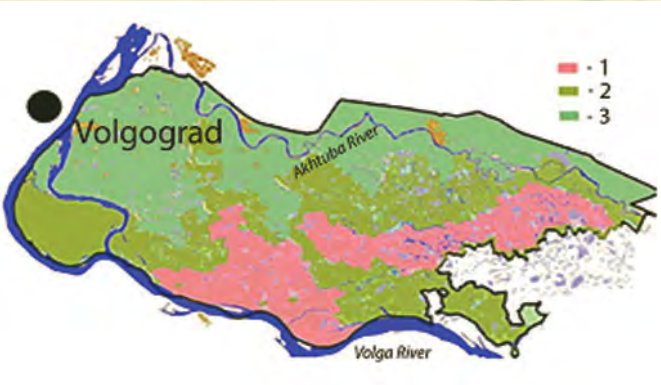
Web: http://volga-poyma. ru/

http://valdaypark.ru/

The reserve is located in the northern part of floodplain of the Volga and Akhtuba rivers, which is one of the largest river valleys in the world.

Meadow flooded by the river. Photo by A. Popov.

Volga-Akhtuba floodplain is a unique natural area amid semidesert landscape of the south of Russia. The floodplain is located in the southeastern part of the East European plain in the Pricaspian Lowlands in the Volga River basin. The reserve is located within the natural borders of the area that gets flooded by the Volga River and its left distributary Akhtuba. This stretch of the Volga River valley is the only one that still has natural hydrological conditions. Such "Oases" of a river valley in the desert are very rare: there are just a few of them in the world, and Volga-Akhtuba floodplain is one of them.



Zonal structure of Volga-Akhtuba Floodplain Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – transition (cooperation) zone.

In comparison with surrounding arid areas, Volga-Akhtuba floodplain stands out due to mosaic nature of its landscape, high number of bodies of water (roughly 3,000, a great number, considering semidesert surroundings of North Pricaspian area), highly productive floodplain meadows, valuable spawning areas, unique oak forests, and high fertility of soil.

White-tailed eagle is a hallmark of Volga-Akhtuba Floodplain Biosphere Reserve. Photo by A. Popov

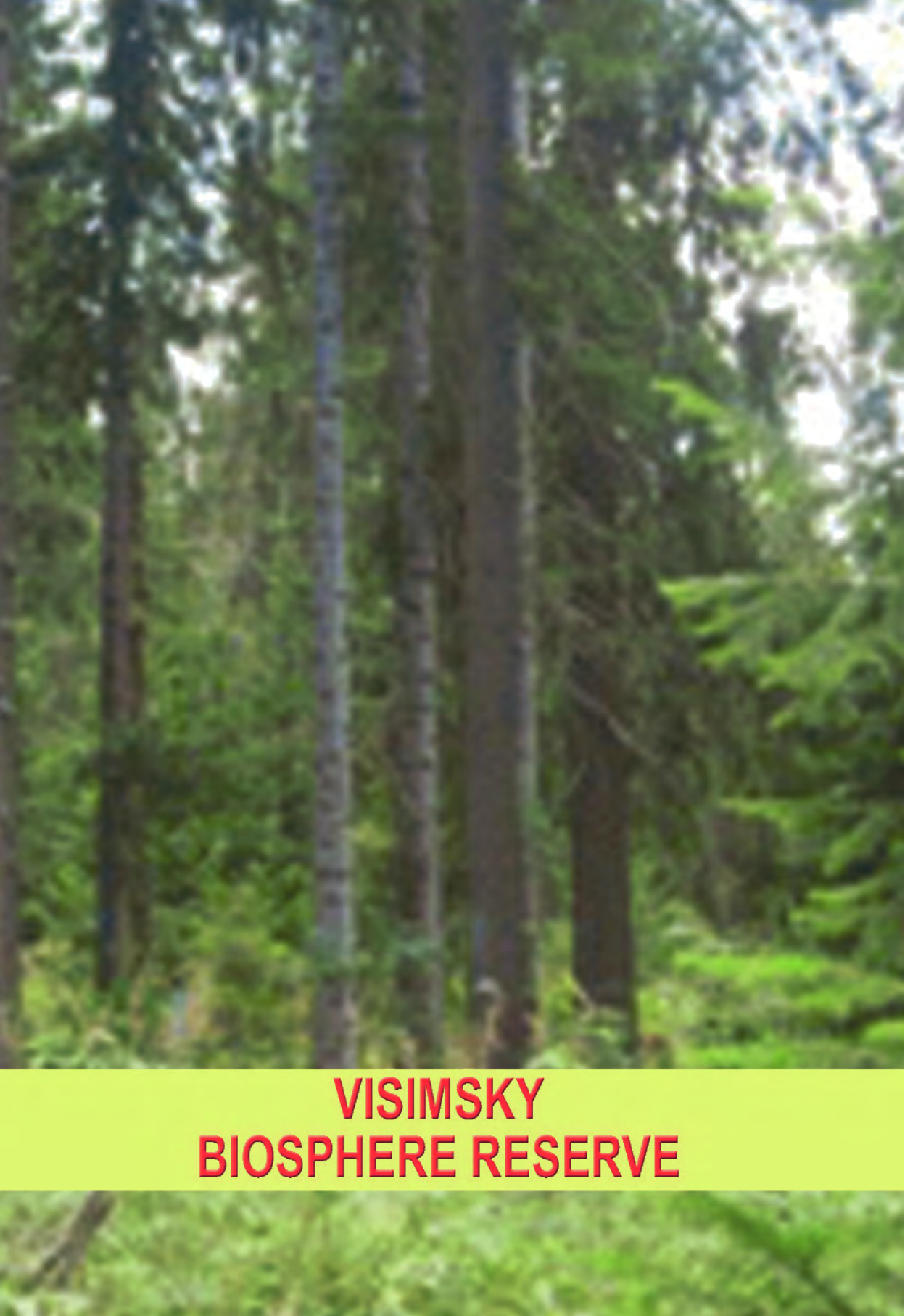
The reserve's territory is rich with landscapes and species, in particular, endangered species of animals and plants; 775 species of higher plants, 30 species of mammals, and over 200 species of birds have been registered in the reserve.

Global Afro-Eurasian flyway, one of the biggest waterfowl flyways, crosses the territory of the reserve. Floodplain area has roughly 10 large permanent bird colonies, which include geese, herons, and waders, among other species.

Historical and cultural heritage of the reserve is rich. It includes 168 notable sites: 128 archeological, 39 historic, and 1 architectural landmark. Saray-Berke, the last capital of the Golden Horde, historic Russian settlements Tsarev and Zaplavnoe, the Silk Road, isolated burial mounds and their complexes are just a few examples of notable heritage landmarks located within the reserve. Another examples of cultural landmarks is a group of historic settlements of ethnic Tatars located in Malyevka and Bakhtiyarovka villages of Leninsky District.

Currently, the reserve is under the influence of several detrimental forces: shallowing of groundwater aquifers due to construction of the Volga Hydroelectric Station, mass unorganized tourism, fires, forest felling, overuse of pasture, and shortage of alluvium influx from the river.

Flood on the Akhtuba. Photo by A. Popov



VISIMSKY BIOSPHERE RESERVE

Visimsky Biosphere Reserve

The reserve is based on Visimsky State Nature Zapovednik. The core zone gained legal status of zapovednik on July 6, 1971.

Biosphere reserve designation: 2001.

Area: total area – 179,834 ha; core zone area – 33,501 ha; buffer zone area – 46,333 ha; transition (collaboration) zone area – 100,000 ha.

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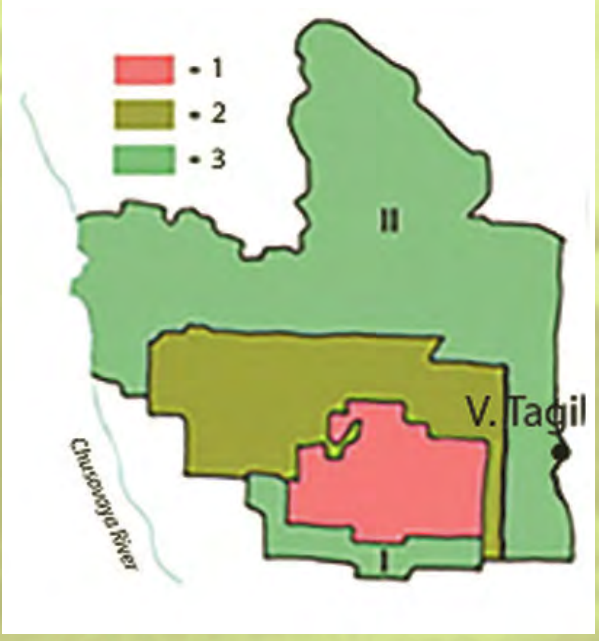
Phone/fax: +7 (343 57) 3-36-56; +7 (343 57) 3-36-62; +7 (343 57) 3-16-03 / none

E-mail: viszap@yandex. ru

Web: http://visimskiy. ru/

The territory of the reserve is covered by one large mass of forest, majority of which is located in the west slope of the Central Urals. The Central Urals are relatively short: the height of the tallest mountains of the main mountain ridge ranges between 400 and 699 meters above the sea level. The forests here have a mixture of nemoral and taiga features. Notably, Siberian and European spruce habitats meet here, and southwestern border of natural cedar (also known as Siberian pine) habitat crosses the territory of the reserve.

Climate is moderately continental: winters are long and cold, and summers are short and moderately warm. An average annual temperature is +0. 9°C; average temperatures of the warmest (July) and the coldest (January) months are +16°C and -17°C, respectively. The duration of foliated period just over 141 days. Each year, roughly 600 mm of precipitation occurs. The reserve is buried under the snow for the majority of a year (202 days); the height of snow may reach 80-100 cm.



Zonal structure of Visimsky Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – special biosphere area (I) and transition (cooperation) zone (II).

Most of the reserve's territory is located in the Sulem River basin area (Sulem is the tributary of the Chusovaya River, which belongs to the Volga-Kama rivers basin). The extreme east of the reserve overlaps with the Tobol River basin (Tobol is a part of the Ob River basin).

The main type of soil in the reserve is mountain-forest brown soil; basic soil is common on the mountaintops, while soil rich in humus is more common in lowlands.

The forest bears the signs of three hundred years of taiga exploration. It's a mosaic of areas of native dark-needle taiga and younger forest, which emerged after recent forest felling.

Dark-needle taiga. Photo by R. Sibgattulin.

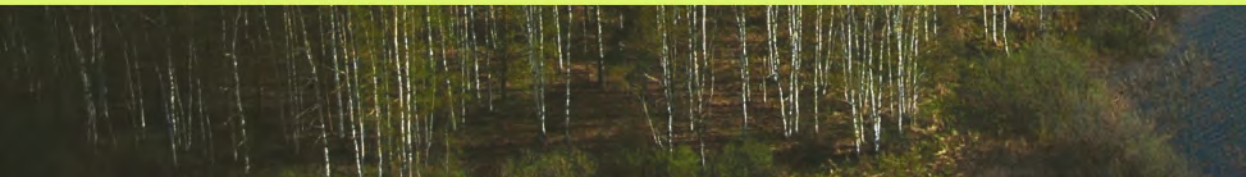
The reserve territory is a habitat for 53% of plant species of Chusov geographic region, and 76% of animal species of west The Central Urals. Overall, 466 species of higher plants, 48 species of mammals, and 185 species of birds have been registered in the reserve.

The fauna is typical of The Central Urals: it comprises 3 hooved mammalian species, 12 predatory mammalian species, and 10 species of insectivorous mammals. Rodents are the largest group, which includes 17 species. Birds of the reserve belong to 37 families of 12 classes.

Uncontrolled forest felling, pollution, forest fires, and poaching are the main threats the reserve faces

Special patrol surveys the core zone of the reserve.
Photo courtesy of Visimsky Biosphere Reserve.

DARVINSKY BIOSPHERE RESERVE



Darvinsky Biosphere Reserve

The reserve is based on Darvinsky State Nature Zapovednik. The core zone gained legal status of zapovednik on June 15, 1945.

Biosphere reserve designation: 2002.

Area: total area – 377,951 ha; core zone area – 112,673 ha; buffer zone area – 55,278 ha; transition (collaboration) zone area – 210,000 ha.

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Phone/fax: + 7 820 2 666970 / none

E-mail: dgpbz@rambler. ru

Web: http://www. darvinskiy. ru/

The reserve is located on the tip of the peninsula, which extends into the Rybinsk Reservoir from northwest to southeast. The peninsula is the only part of the Mologo-Sheksninsk Lowlands that has evaded flooding by waters of the reservoir.

Temporarily flooded area of the reserve. Photo by A. Kuznetsov

The Rybinsk Reservoir used to be the biggest in the world. The reserve was established to assess possible consequences and risks associated with flooding of such a large area.

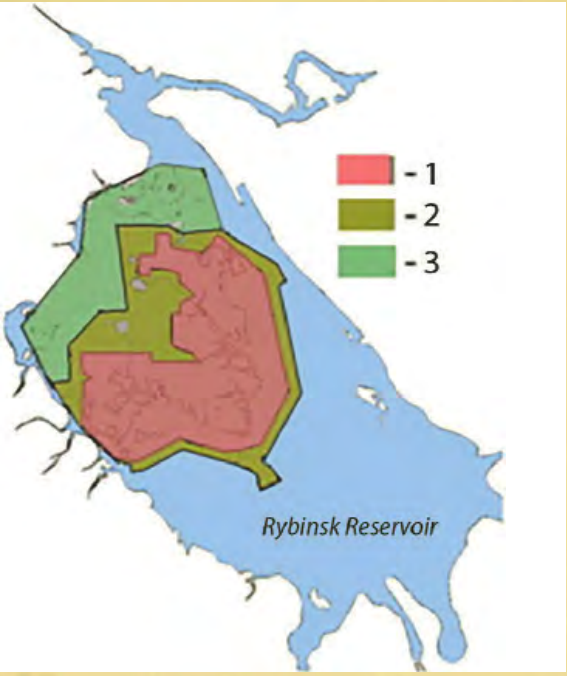
The relief of the reserve is uniform: it's a flat lowland plain with occasional short crests. Pristine swamps are common and cover large areas. Any change in the ecosystem of these swamps may have neg-

ative effect on ecological state of the core zone, hence preservation of all of the peninsula swamps is of paramount importance; drainage for irrigation and peat sourcing are unacceptable. Numerous shallow bays of the reserve are primary location for spawning and feeding of all industrially valuable fish of the reservoir; the reserve serves habitat to 30 fish species.

Osprey. Photo by A. Kuznetsov

The reserve has become the center of preservation of species listed in the Red Data Book of the Russian Federation: black-throated loon, osprey, white-tailed eagle, golden eagle, greater spotted eagle, Eurasian eagle-owl, and willow ptarmigan. The density of osprey population on the peninsula is the highest in Europe and perhaps in the world. Population of white-tailed eagle is also very large. High prevalence of rare birds in the reserve distinguishes this area stand in comparison with other areas of Russian Northwest. Black-throated loon builds its nests on the lakes and swamps of the reserve. This bird is extinct in most areas of the European part of Russia. Since the 1980, after a 50-year-long gap, swans started to appear in the reserve again. Although these birds are extremely rare in the neighboring areas, their population in the reserve continues to grow; it has reached 150 birds. Willow ptarmigan has been listed in the Red Data Book of the Russian Federation in 1997 due to rapid shrinkage of its population everywhere except the reserve core, where the density of its population is still reasonably high.

Migratory waterfowl birds gather along the shore of the reservoir in areas of shallow water during migration period. In the spring, roughly 10-15 thousand bean and greater white-fronted geese gather in the reserve. Diving ducks (tafted duck, greater scaup, common goldeneye, smew, mergus, and other species) also gather in this area, forming groups of several hundred to several thousand birds. Swans stop here during their spring and fall migration, forming groups of up to 50-70 birds.



Zonal structure of Darvinsky Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – transition (cooperation) zone.

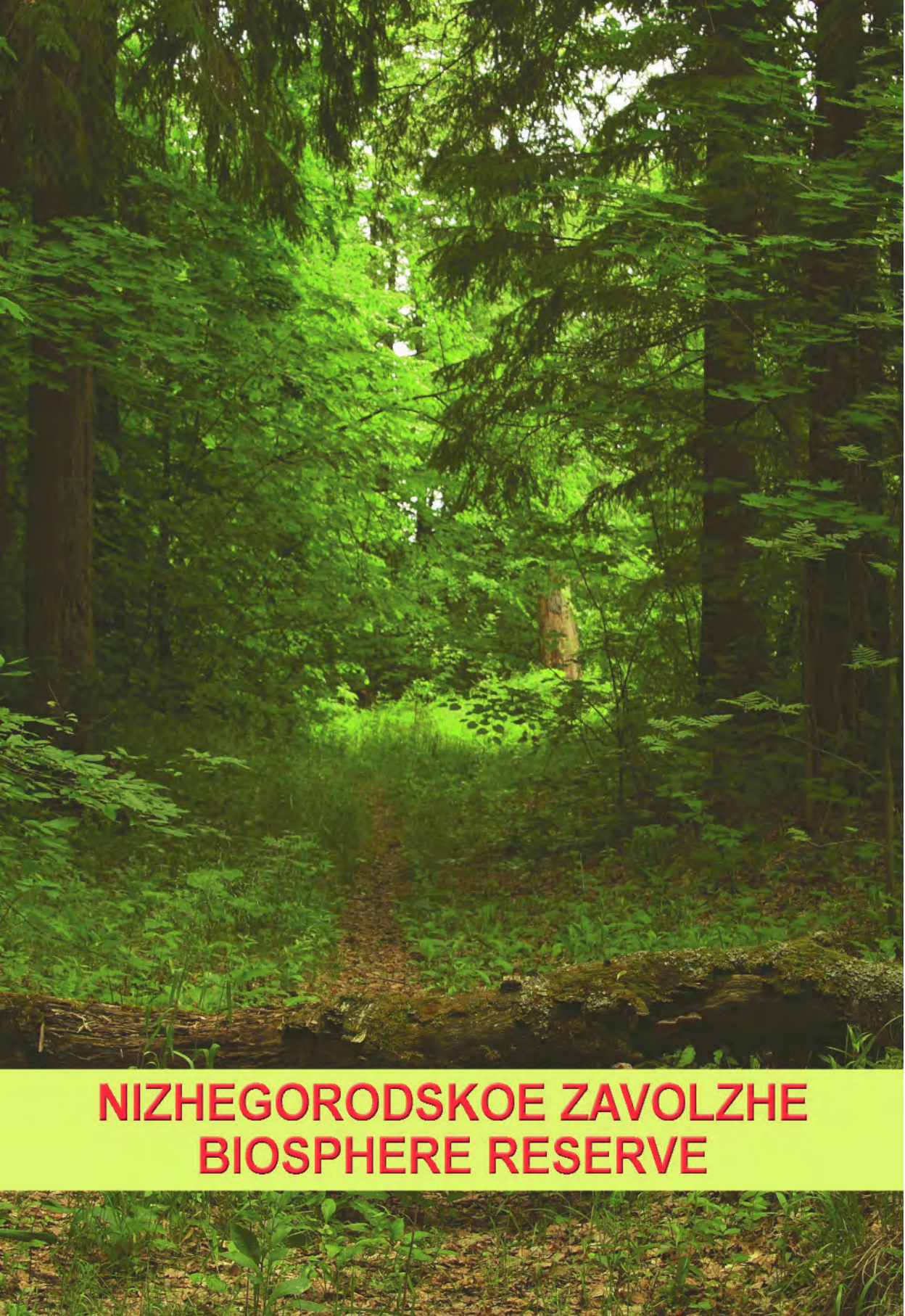
Migratory waterfowl birds gather along the shore of the reservoir in areas of shallow water during migration period. In the spring, roughly 10-15 thousand bean and greater white-fronted geese gather in the reserve. Diving ducks (tafted duck, greater scaup, common goldeneye, smew, mergus, and other species) also gather in this area, forming groups of several hundred to several thousand birds. Swans stop here during their spring and fall migration, forming groups of up to 50-70 birds.

Several game species - elk, boar, and bear - populations of which have shrunk outside the reserve, are still numerous in the reserve core zone. The core serves a safe shelter for these animals. Beaver has started to appear in the reserve in the 1980s, and its population is now very large.

Peat islands are a unique feature of the reserve. Many peat bogs got flooded when the reservoir was created. Large sheets of peat floated to the surface of the water and eventually became covered with plants like grass and even birch and willow trees. Today, these islands continue to drift on the surface of the water.

The reserve plays an important role in the Rybinsk Reservoir by restoring its biological resources and maintaining natural potential of the reservoir.

Residents of a local settlement participate in an annual Folk Grove event. Photo by O. Poroshina.



NIZHEGORODSKOE ZAVOLZHE BIOSPHERE RESERVE

Nizhegorodskoe Zavolzhe Biosphere Reserve

The reserve is based on Kerzhinsky State Nature Zapovednik. The core zone gained legal status of zapovednik on April 23, 1993.

Biosphere reserve designation: 2002.

Area: total area – 57,466 ha; core zone area – 30,957 ha; buffer zone area – 10,660 ha; transition (collaboration) zone area – 15,829 ha.

Address: 23 Rozhdestvenskaya Street, Nizhny Novgorod, Russia 603001

Phone/fax: + 7 831 4313191 / none

E-mail: kerzhenskiy@kerzhenskiy. ru

Web: http://www. kerzhenskiy. ru

A. B. Filippov, the manager of The Forest, shares sustainable forestry experience. Photo by M. Yazikov.

The reserve is located in the north Povolzhye, 90 km north of the point where the Oka and Volga rives merge. The reserve comprises Kerzhensky State Nature Zapovednik and its protection zone, two state refuges, 20 nature landmarks, and a timber industry lot. The reserve is primarily located in the watershed of the Kerzhenets and Vetluga rivers. Pristine ecosystems of peat bogs and boreal and mixed coniferous/broad-leaved forests are of great value to the reserve. Areas of undisturbed and well-preserved natural systems of lakes, sphagnum bogs, river valleys, and aged forests coexist with anthropogenically-altered areas of forest felling, of settlement, and areas previously affected by forest fires.

An area of limited forest use has existed in the reserve for 25 years. The Forest, a local business, has partnered with the reserve to use forest resources of this area sustainably.

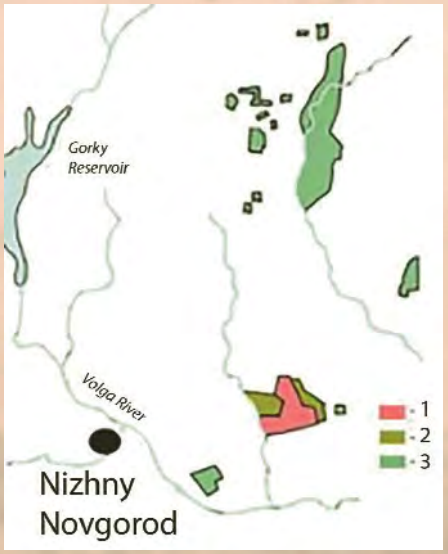
New pine forest is common in the reserve. Older pine forest, spruce, and broad-leaved forests exist in small areas scattered across Kerzhenets valley and cover crests rising above the surface of bogs. Flora comprises 629 species of higher plants, 184 species of mosses, 206 species of lichens, 812 species of algae, and 369 species of fungi. Despite substantial damage forest felling and fires caused to the area that is now the core zone of the reserve, quite a few vulnerable and endangered species still inhabit the core.

Forty-six mammalian species and 153 bird species inhabit the reserve. Several bat

species, European otter, and forest dormouse are listed in the Red Data Book of the Nizhny Novgorod Region.

One of the reserve's primary efforts is restoration of species that no longer inhabit this area. Russian desman has been re-introduced to the reserve, re-acclimatization of willow ptarmigan has been considered. Both species are listed in the Red Data Book of the Russian Federation and IUCN list of Threatened Species. In 2014, Ministry of Natural Resources and Environment of the Russian Federation supported the initiative to restore wild forest reindeer population in the reserve.

The Sacred Forest tourist route runs by 350-year-old oak tree. Photo by M. Yazikov.



Zonal structure of Nizhegorodskoe Zavolzhye Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – transition (cooperation) zone.

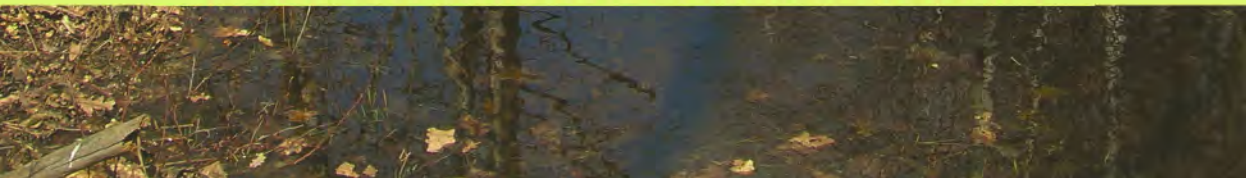
One of Svetloyar lakes located in the buffer zone of the reserve is a Federal Nature Landmark. It attracts many tourists inspired by the legend of an invisible city of Kitezh, which is concealed by the waters of the lake. To facilitate ecological tourism in the Voskresensk Region, Voskresenskoe Povetluzhye Nature Park was established in

2008. Svetloyar Lake with adjacent lands is a part of the park. Efforts to expand tourism include engagement of local residents in tourism service. These efforts are aligned with traditional local knowledge and values

Svetina folk celebration held as a part of City of Kitezh festival. Tourists and locals flock to Vladimirskoe village to experience the spirit of Russia.
Photo by M. Yazikov.

Reserve's staff scientists, visiting scientists, and faculty of leading universities of Nizhny Novgorod Region and Russia conduct research in the reserve. Studies of forest, rivers, and bogs are a priority. Efforts are made to update lists of species annually and to assess game species population size. Catastrophic fires of 2010, which affected the reserve, have encouraged research of nature restoration processes in the reserve, specifically, restoration of plants, birds, reptiles, amphibians, and small mammals.

OKSKY BIOSPHERE RESERVE



Oksky Biosphere Reserve

The reserve is based on Oksky State Nature Zapovednik. The core zone gained legal status of zapovednik on February 10, 1935.

Biosphere reserve designation: 1986.

Area: total area – 78,925 ha; core zone area – 22,604 ha; buffer zone area – 33,346 ha; transition (collaboration) zone area – 22,975 ha.

Address: Brykin Bor, post office Lakash, Spas District, Ryazan Region, Russia 391072

Phone/fax: + 7 49135 72274 / none

E-mail: obz@mail.ru

Web: http://oksky-reserve. ru/

Oksky Biosphere Reserve is located in the southeast part of the Meshera Lowlands, in the Ryazan Region. The Meshera Lowlands has landscape traditionally referred to as "polesye", an area with prominent river floodplains and dunes scattered across watersheds. Soils comprise peat, sand, clay, and podzol, and combinations of thereof.

Zonal structure of Oksky Biosphere Reserve.
1 – core zone;
2 – special biosphere area;
3 – buffer zone.

The relief of the reserve is rather flat; elevation varies from 70-80 м in the southeast to 140-160 м in the northwest of the reserve. Sandy plains with hills and river valleys are common in the reserve's landscape.

The Meshera's climate is moderately continental. Water system of the reserve comprises several left tributaries of the Oka River: the Pra, Lamsha, Narma, and Kursha rivers, as well as multiple lakes located inside and outside of the rivers' floodplains. Large bogs are located in the central and northwestern regions of the reserve. Water level rises in the spring substantially: from 2. 5 – 5 m in the Pra River to 5 – 8 m in the Oka River. Spring flood peaks in mid-April and lasts 25 ¬– 65 days. In addition to meadows located in floodplains of the rivers, bogs and forests often get flooded as well. Occasionally, half of the reserve's territory ends up under water.

Such prominent floods play special role in ecosystems of the reserve and the region. Iron-enriched water springs are common in the reserve, and they are often associated with the Pra River, staining its water the color of rust. Hence, iron-enriched sandstones make up the banks of the Oka and Pra rivers.

The Pra River near Brykin Bor. Photo by M.Dydorchuk.

Early on, this specially protected territory was known as Oksky State Desman Reserve because its main goal was restoration of desman population. Russian desman is a relic species endemic in Russia. Later on, the reserve's responsibilities expanded substantially; today, they include preservation of all nature complexes of the reserve in their natural dynamic states.

Today, the territory is a classic nature reserve that has its own self-regulating herds of large hooved animals (elk, boar) and large predators (wolf, lynx).

Each spring, thousands of birds flock here: geese, cranes, seagulls, shorebirds, and roughly a hundred species of sparrows. Black stork has become a hallmark of the reserve, since it is common in the area. An extremely rare orchid, the lady's-slipper orchid grows in the reserve. Relic water nut can be found in floodplain waters. Currently, 61 species of mammals, 238 species of birds, and 913 species of higher plants have been registered in the reserve. Famous Oka meadows boast a diversity of colors and fragrances.

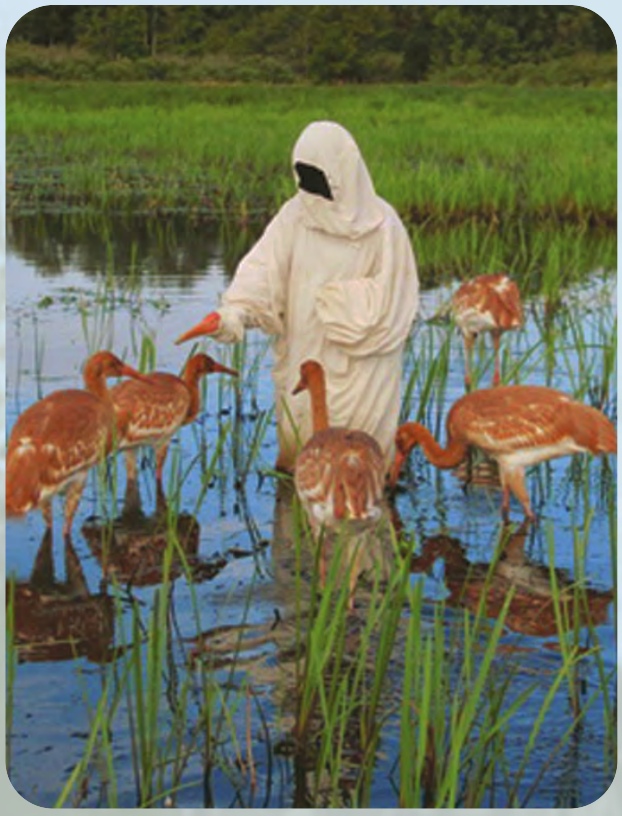
Scientists of Oksy Biosphere Reserve have developed various methods of population assessment, speciation, and capture of animals. These methods are currently used in many other regions. Examples of these methods include:

- Tracking of animals using their snow traces in the winter,
- Assessment of desman, beaver, and muskrat population sizes,
- Determination of species, age and gender of ducks based on the appearance of their wings, and
- Land-based assessment of waterfowl population size.

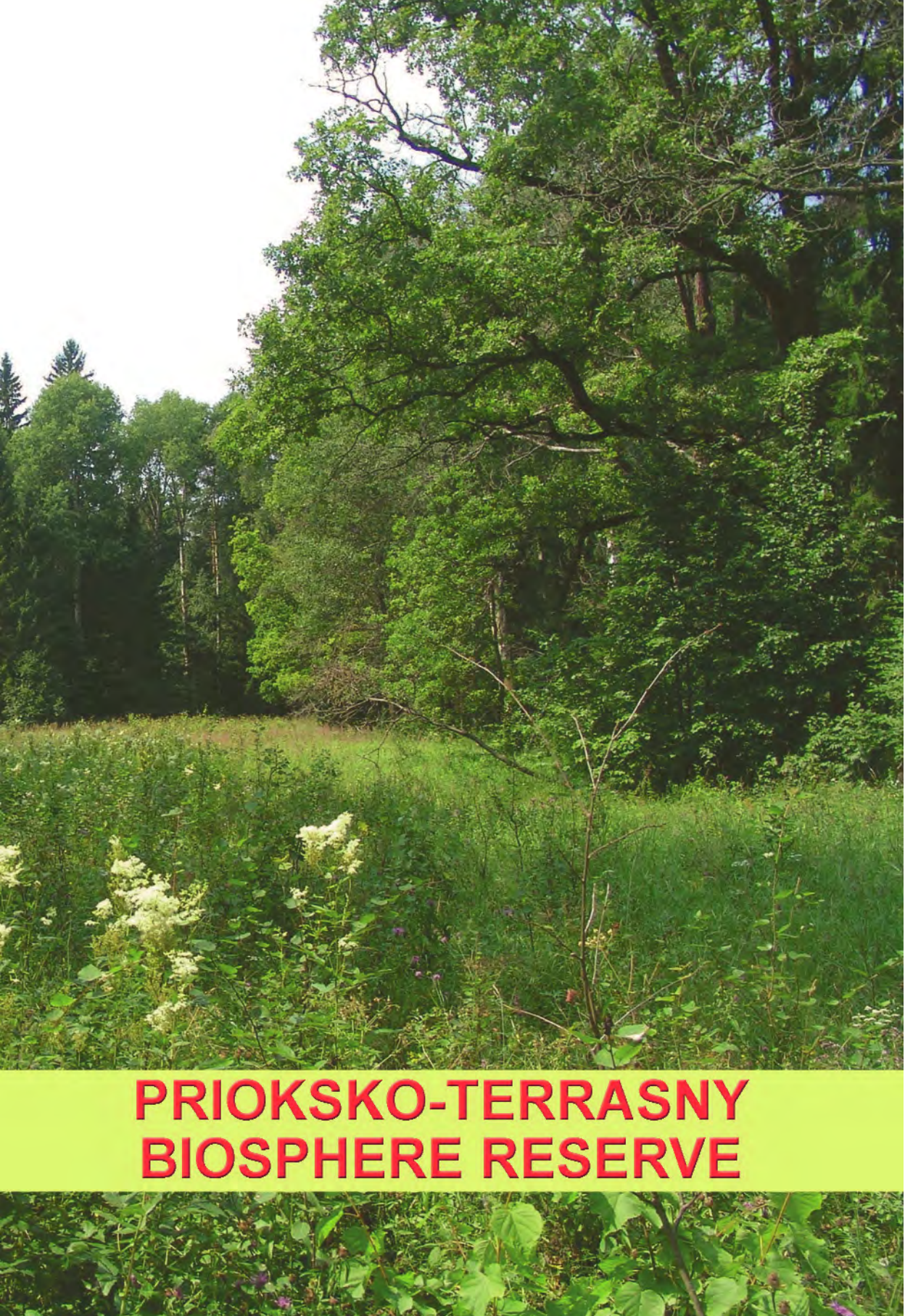
Several rare species preservation programs are based in the reserve: bison and crane breeding centers have been established in 1959 and 1979, respectively. Other the years, more than 400 bison and 600 cranes of 8 species have been brought up in these centers.

The green economy principles implemented in the reserve help preserve its nature. Alternative energy sources are being explored in the reserve. Currently, 2 field cordons use solar power sources.

In 2002, ecological education department has been established in the reserve. Introduction to the Reserve tour is 1. 5-hours long and it is offered to visitors year-round. The Earth Day, Crane's Day, March of Parks, Ecological Danger Defense Day, and Birds' Day ecological events have become a tradition. School science seminars and conferences are held annually. In 2012, the reserve has established a visitor's information center where local residents and tourists can learn more about the reserve and the opportunities to get involved in its work.



Training of young cranes. Photo by M.Dydorchuk.



PRIOKSKO-TERRASNY BIOSPHERE RESERVE

Prioksko-Terrasny Biosphere Reserve

The reserve is based on Prioksko-Terrasny State Nature Zapovednik. The core zone gained legal status of zapovednik on June 19, 1945.

Biosphere reserve designation: 1978.

Area: total area – 41,393 ha; core zone area – 4,945 ha; buffer zone area – 4,700 ha; transition (collaboration) zone area –31,748 ha, including the town of Puschino, Moscow Region, which has been approved for addition to the reserve.

Address: Danki, Serpukhov District, Moscow Region, Russia 142200

Phone/fax: +7 4967 707149 / none

E-mail: ptz@ pt-zapovednik. ru

Web: www. pt-zapovednik. ru/

Zonal structure of Prioksko-Terrasny Biosphere Reserve.
1 – core zone;
2 –buffer zone;
3 – transition (cooperation) zone

The reserve is located in the center of Middle Russian Upland roughly 100 km south of Moscow. It occupies the area of just over 40,000 ha, 30,000 of which are wooded. The name of the reserve reflects the stair (terrace)-like landscape that descends towards the Oka River, from the elevation of 190 meters in the north of the reserve to 106 meters in the south, which is also the level of water in the Oka River. The reserve territory comprises watershed area, floodplain area, and terraces of the left bank of the Oka River. Three types of terraces exist: upper terraces, lower terraces, and terrace-like ledges sloping towards the Oka River. Carboniferous period limestone is covered with glacial sediment and moraine sands. The landscape of lower terraces comprises dunes and small hills.

The Oka River represents the natural border between climate sub-zones in the reserve area. Photo by A. Kulichenko.

Climate is moderately continental with warm summers and cold winters. Average annual temperature is +3. 9°C, average January temperature is -10,6°C, and average July temperature is +17. 7°C. Average annual precipitation volume is 500-500 mm. Snow covers the ground in early December and lasts through mid-April. An average thickness of the snow cover is 50-55 cm.

Two small rivers cross the reserve in north-to-south direction: Tadenka and Ponikovka. Tadenka is a tributary of the Oka; it is roughly 10 km long, 4 m wide and 1 m deep. Ponikovka is a bit smaller: 6 km long, 1. 5 m wide, and 0. 5 m deep. The Sushka River crosses the buffer zone. This tributary of the Oka River is 10 km long, 2 m wide, and up to 0. 7 m deep. The maximum width of the Oka River in the reserve reaches 200 m. The reserve has no large lakes.

Peat bogs are common primarily in the central part of the reserve. Floodplains of small rivers comprise valley swamps. The total area of all bogs and swamps is roughly 3,600 ha.

The complex background monitoring station has been functioning in the reserve since 1984. Photo by A. Kulichemko.

Soils that comprise terraces are very diverse. Soddy lightweight soils are common. This type of soil has formed in coniferous, mixed, and broad-leaved forests, where grass and moss grow on sandy soil with clay under layer or, occasionally, on limestone. In the areas where limestone is located near the surface, a thick layer of soddy carbonate soil may be present above the limestone.

Fauna of the reserve is typical of mixed coniferous and broad-leaved forests of the European part of Russia. Over 50 types of forest have been identified on a relatively small territory of the reserve. A distinct feature of land use of this are is the use of small lots and repeated change of a type of use of each lot (use

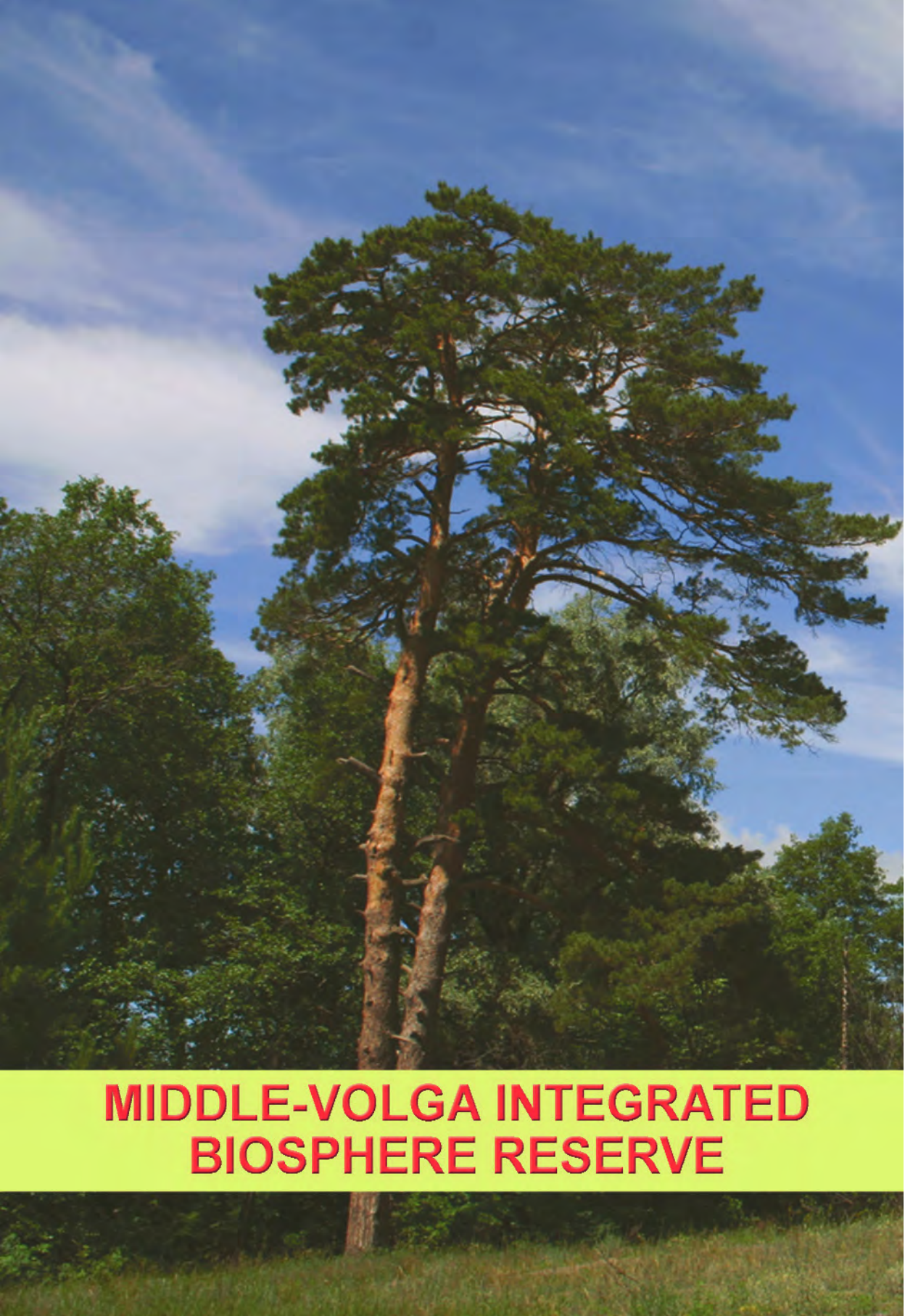
as forest, pasture, farm) over the course of several recent centuries. Hence, today fauna of the reserve is characterized by a mosaic pattern. Mixed forests with few dominant tree types (usually, 3-4 types) are common. Simultaneous presence of birch, aspen, and pine is the evidence of mixed use of this land in the past.

Pine is dominant in over 40% of the reserve's forest. Dry and fresh pine forests are the hallmark of the reserve. The age of pines in the reserve varies broadly: most common age is 60-80 years old, some trees are up to 200 years old. Past anthropogenic influence on this forest is obvious. Pine trees were actively planted along the Oka River banks in the 19th century in order to prevent spread of sand caused by felling of forest along the banks - forest naturally protects sandy riverbanks from degradation. As a result of banks degradation and drought the river shallowed. Planting of pine on sandy soils became common from then on everywhere in the Central Russia. Most recently, pine was planted in the 1950s. Pine forest fires, common in the beginning of the 20th century, promoted renewal of pine forest of the reserve.

Large areas of the reserve are used in forestry, and the areas outside of the core zone are used in agriculture. Local community of hunters and fishermen makes use of the entire territory of the reserve. Virtually all areas suitable for construction of summer residences have been used for this purpose already.

Meadows of the reserve are former pasture and felling areas. Photo by A. Kulichenko.

European bison breeding center have been established in 1948 and has successfully operated since. Its main purpose is breeding of bison and restoration of bison natural population. Photo by N. Treboganova.



MIDDLE-VOLGA INTEGRATED BIOSPHERE RESERVE

Middle-Volga Integrated Biosphere Reserve

The reserve is based on Zhigulevsky State Nature Zapovednik and Samarskaya Luka National Park. The core zone gained legal status of zapovednik on August 19, 1927.

Biosphere reserve designation: 2006.

Area: total area – 150,000 ha; core zone area – 12,000 ha; buffer zone area – 46,500 ha; transition (collaboration) zone area – 91,500 ha.

Address: 1, Zhigulevskaya St, Bakhilova Polyana, Zhigulevsk City District, Samara Region, Russia 445362

Phone/fax: +7 84862 37838 / none

E-mail: zhr@mail.ru

Web: http://www. zhreserve. ru/

The reserve features both unique and typical nature complexes of the Samarskaya Luka and neighboring areas: unique Zhiguli Mountains, typical mixed forest-steppe ecosystems of the Samarskaya Luka plateau, and typical ecosystems of the middle Volga River valley. Anthropogenic forces of varying strength have transformed the latter ecosystems: some area have been included into the biosphere reserve and are hence not used at all, while the others are used permanently as agricultural and residential areas.

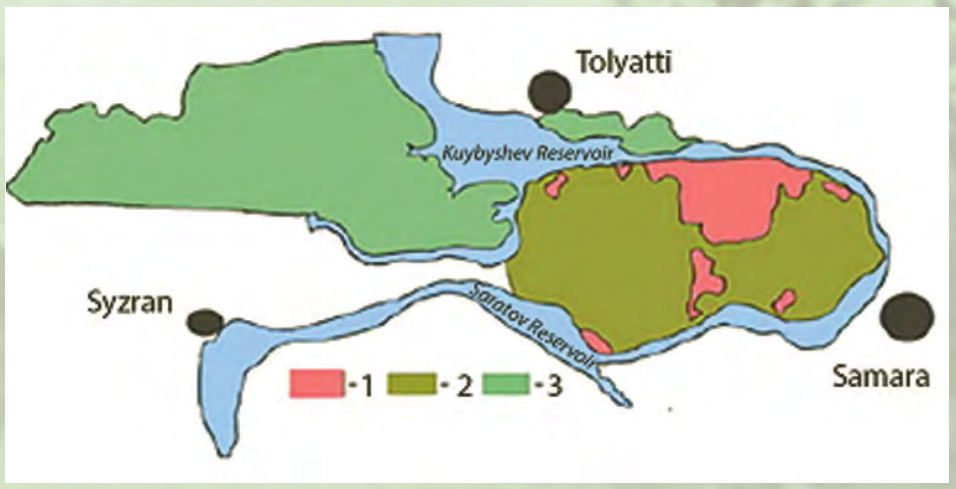
Limestone rocks. Photo by L. Kooss.

The reserve boasts a great biological diversity. Several unique ecosystems of limestone mountains are located in the reserve: stony steppe, virgin steppified pine forest, and mixed coniferous and broad-leaved forest growing on unique brown forest soils. Native lime, oak, and birch forests and derivative forest types, such as aspen, maple, birch, and elm forest, meadow-like steppe areas, mowable meadows, pastures and farmland span the Samarskaya Luka plateau. Original oak forest, and forest with predominant black poplar, common willow, while poplar, and

black alder, as well as willow groves and flood meadows are located in the floodplain of the Volga River and on the river's islands. Former limestone mining areas have their own unique ecosystems: of special interest are adits, which offer overwintering shelter for large groups of bats.

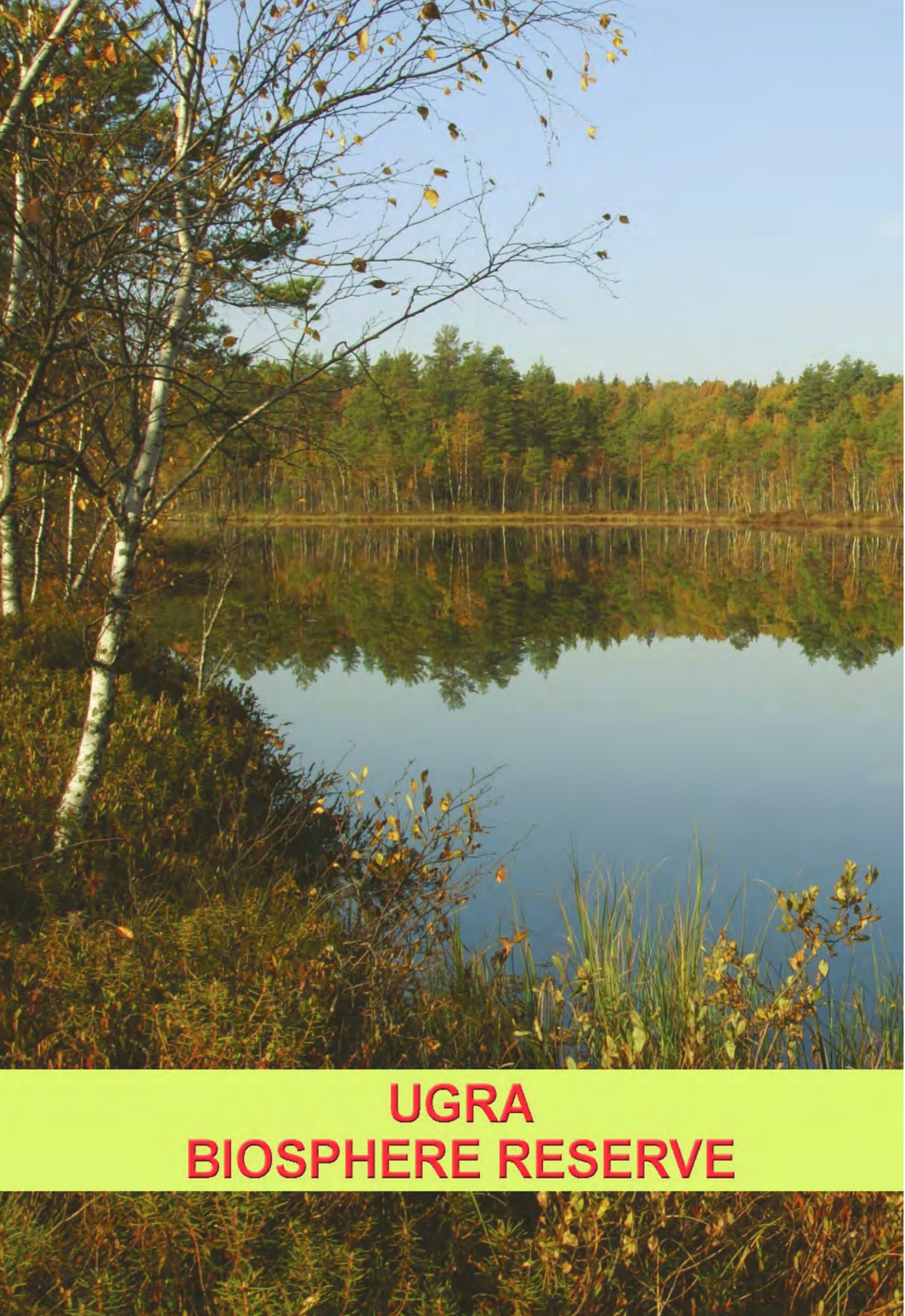
Environmental expo. Photo by F. Akimov.

Ecosystem diversity directly translates into the diversity of flora and fauna species. A number of species have been studied very well: 150 species of flowering plants, 400 hundred of which are used in agriculture, roughly 170 species of mosses, 200 species of lichens, and 800 species of fungi. Vertebrate animals are represented by 300 species, which include 62 species of mammals, over 200 species of birds (including species that live permanently in the reserve, visit it occasionally, or stop here during their seasonal migration), 8 amphibian species, 9 reptile species, and 68 species of fish. Invertebrate animals are numerous: 7 thousand species, 5 thousand of which are insects. Of special interest are endemic species (5 plant species and 11 invertebrate species), relic species (over 60 plant species and 80 invertebrate species), as well as endangered species listed in the Red Data Book of the Russian Federation.



Zonal structure of Middle-Volga Integrated Biosphere Reserve.
1 – core zone; 2 –buffer zone; 3 – transition (cooperation) zone

The reserve is located on the peninsula of Samarskaya Luka, in the center of Samara-Tolyatti metro area. A large share of the biosphere reserve is minimally altered and is included in Zhigulevsky State Nature Zapovednik and Samarskaya Luka National Park. Nearby industrial enterprises (limestone mines and chemical and oil manufacturing plants) are the greatest threats for the reserve. Another source of anthropogenic influence is unorganized tourism: the number of tourists who visit the reserve on their own as opposed to those who sign up for tours offered by the reserve, is continuously growing.



UGRA
BIOSPHERE RESERVE

Ugra Biosphere Reserve

The reserve is based on Ugra National Park. The core zone gained legal status of zapovednik on February 10, 1997.

Biosphere reserve designation: 2002.

Area: total area – 153,832 ha; core zone area – 9,806 ha; buffer zone area – 22,826 ha; transition (collaboration) zone area – 121,200 ha.

Address: Prirodnoe Lesnichestvo, Kaluga, Russia 248007

Phone/fax: + 7 484 2 725791/ none

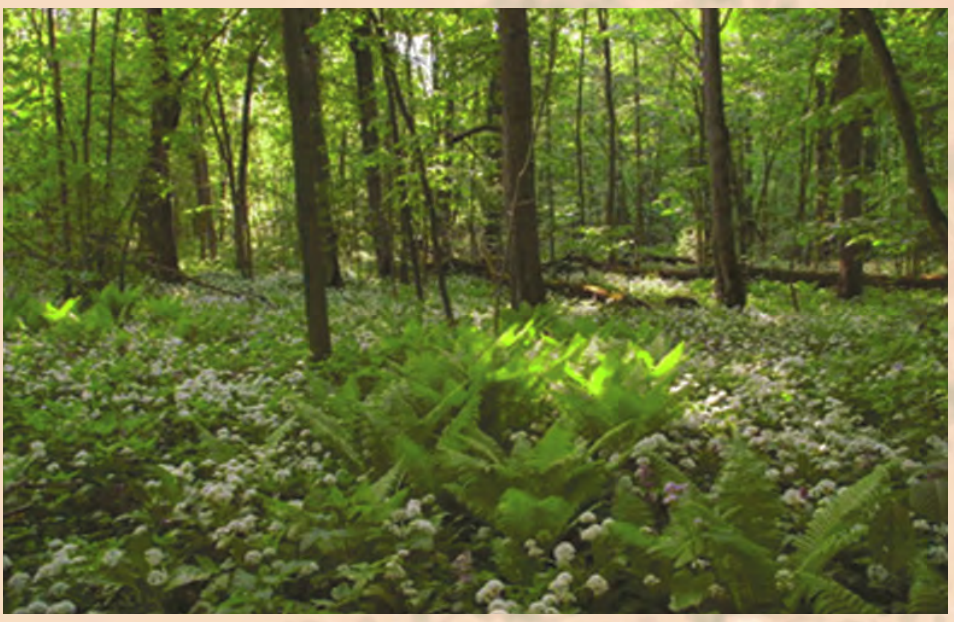
E-mail: parkugra@kaluga. ru

Web: http://parkugra. forest. ru/

The reserve comprises 3 clusters, which span picturesque valleys of the rivers Ugra and Zhizdra and the left bank of the Oka River. The reserves territory has a variety of landscapes typical of the south of the forest zone. The Ugra cluster is the typical moraine valley with hilly relief, numerous swamps and springs, some of which are mineral. Moraine and erosion plains are common landscapes of Zhizdrinsky and Vorotynsky clusters. The Zhizdra River valley has multiple lakes that originated as a part of the old riverbed.ройки муниципальных образований.

The middle Ugra River. Photo by V. Novikov.

The reserve serves a habitat for over 90% of Kaluga Region species. Close proximity of several nature zones that exist within the reserve results in mixed nature of flora and fauna of the reserve, which include boreal, middle-European and steppe species. This area has a unique combination of botanical and geographical characteristics. First, its flora comprises an impressive 1145 species of higher plants. Some of these are forest species, since forest covers 63% of the reserve's territory;



Oak forest. Photo by B. Teleganova.

140 species are listed in the regional Red Data Book, and six are listed in the Red Data Book of the Russian Federation (sedge, feather grass, lady's-slipper orchid, sword-leaved helleborine, and military orchid). Lady's-slipper orchid is also listed in the IUCN list of Threatened Species. The reserve spans 100 km north to south; hence nature complexes change considerably within its borders. Ugra cluster features coniferous and mixed coniferous and broad-leaved forests. Sub-arctic complexes of oligotrophic swamps are well developed. Zhizdrinsly cluster located further south features old forests of the defensive intersection line of Moscow state of the 16th-18th centuries. The cluster also has relic broad-leaved forests, pine forests spread across sandy dunes with plants rare in Middle Russia, and unique phytocenoses of lakes of the floodplain. The Ugra and Zhizdra rivers' valleys have expansive grassy floodplain meadows and south-facing slopes. Steppe flora of these areas is traditionally known as the Oka flora.

Fauna of the reserve comprises over 300 species of vertebrate animals, and 20% of these species live along the margins of their natural habitats. To date, 33 species of fish, 10 species of amphibians, 6 species of reptiles, 215 species of birds, 25% of which are migratory, and 53 species of mammals have been registered in the reserve. Forty percent of the animals breed in the reserve. The majority of species common in the reserve are associated with the mixed forest zone; in terms of number of species, the second largest category is species associated with aquatic and bog environments.

Naturally, the reserve provides refuge for endangered species. Listed in the Red Data Book of the Kaluga Region are 6 species of fish, 1 species of reptilian, 54 species of birds, 12 species of mammals, and 76 species of invertebrate animals, 67

of which are butterflies; 21 species of vertebrate and 8 species of invertebrate animals are listed in the Red Data Book of the Russian Federation. Twenty species of mammals are listed in the IUCN list of Threatened Species. Five key bird habitat territories, i. e. territories participating in the Important Bird Areas International Program, are located within the boundaries of the reserve, two of which, Dolina Zhizdri and Tishskaya Dal, are of international impotence.

Unique natural features of the reserve are intimately linked to its 300 historic and cultural landmarks: 137 archeology landmarks built in the period of time from Paleolithic era to the Middle ages, 29 churches, convents, and monasteries, including the Saint Vvedenskaya Optina Monastery, 23 former aristocrat estates, and 47 military burial sites and monuments. Traditional residential buildings and other historic sites, such as old roads, hydrotechnical and industrial buildings, and old mines, are of interest as well.

The Vorotynsky Convent of the Savior is a remarkable example of cultural heritage of the reserve. Photo by V. Novikov.

Diversity of cultural landscapes is a distinctive feature of the reserve area. These landscapes have emerged as a result of the interaction between the nature and the man. Several types of these landscapes are worth mentioning: peasant village, an aristocrat estate park, monasteries, historic factories, patriarchal landscapes of small towns, archeological, and historic military landscapes. Examples of the latter are memorial fields where large battles took place in the past, such as the Great Ugra Opposition of 1480 between the Russians and the Golden Horde and battles of the World War II of 1941-1943, remnants of ancient defense lines, both natural and artificial, such as Kozelsky Zaseki of Moscow state, which date back to the 16th-17th centuries. Sev-

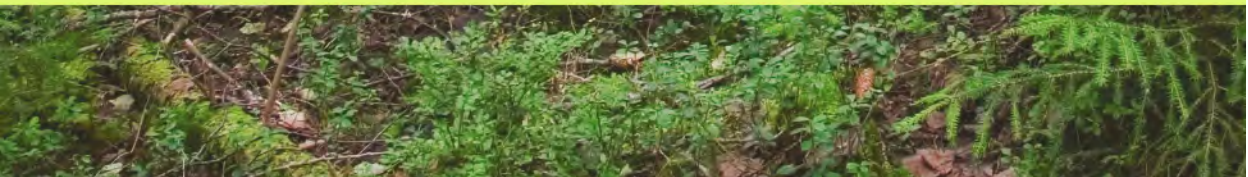
eral historically significant landmarks are featured in the specialized museums and expos of the visit center of the reserve, for example, Kozelsky Zaseki Defense Line Museum, Museum of Gzhatsky Tract Road, and General Efremov Museum.

Zonal structure of Ugra Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – transition (cooperation) zone

Population of the reserve is approximately 13 thousand people, who live in 138 village settlements. Residents' main occupation is farming. Agricultural activity within the reserve is mainly focused on animal farming. During summer, the population grows to 140-160 thousand people due to influx of summer home residents and the reserve visitors. The key anthropogenic threats are garbage left in the reserve by the visitors, illegal fishing, hunting, and use of forest resources. Due to the lack of traditional farming activity, traditional cultural village landscapes deteriorate. Also, unorganized construction within residential areas leads to the loss of their traditional architectural image.

Zonal structure of the reserve is in alignment with that of Ugra National Park. The core zone of the reserve comprises 5 clusters of protected national park territories. The buffer zone of the reserve either surrounds the core zone of the reserve or is located away from it; the buffer zone includes the specially protected territory of the national park. The cooperation zone of the reserve comprises all functional zones of the national park, such as historic and cultural landmarks, protected landscapes, recreation, tourist housing areas, and housekeeping areas, as well as outer protected zone of the national park. The total share of the cooperation zone is 79% of the territory of the reserve.

TSENTRALNO-LESNOY BIOSPHERE RESERVE



Tsentralno-Lesnoy Biosphere Reserve

The reserve is based on Tsentralno-Lesnoy State Nature Zapovednik. The core zone gained legal status of zapovednik on December 31, 1931.

Biosphere reserve designation: 1985.

Area: total area – 125,067 ha; core zone area – 25,900 ha; buffer zone area – 46,061 ha; transition (collaboration) zone area – 53,106 ha.

Address: Zapovedny, Nelodiv District, Tver Region, Russia 172513

Phone/fax: + 7 482 66 22433/ none

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Sphagnum and blueberry spruce forest. Photo by D.Ivanov.

The reserve is located in the southwest part of the Valday Hills, in the watershed of the Volga and Zapadnaya Dvina rivers. The reserve's forest is a unique example of south taiga forest that has remained anthropogenically unaltered to date. Landscapes of the reserve are diverse: spruce forest with trees of various age and large areas of pristine bogs of the core zone; secondary forests in various stages of restoration and farmland of the buffer zone; and sustainably used areas of the cooperation zone. The main types of geomorphological structures of the reserve are moraine ridges, lake hollows, and flat plains, which are typical of both lakes and ridge shoulders. Clay-based soils are very common, hence water is retained in the soil leading to surface bog formation.

Storoselsky Mokh swamp. Photo by I.Shironya.

Soils of the core zone are typical of south taiga; soil layer is highly diverse and resembles a mosaic. Soddy podzolic soils cover soddy, steep slopes of moraine ridges. Scarcely sodded areas feature peated podzolic soils. Peated gley soils are typical of depressed areas and their surroundings.

The reserve is a habitat for 546 species of the upper plants: 16 species of trees, 22 species of bushes, 12 species of dwarf shrubs, and 494 species of herbaceous plants. Subarctic species, such as dwarf birch, knotberry, wild cranberry, play the special role in the reserve. Several Siberian species, specifically, ancient taiga species of ferns of have been registered in the reserve. Several species are listed in the Red Data Book of the Russian Federation, for example, lady's-slipper orchid. Flora of the reserve is typical of south taiga and may be rightfully considered a standard of original biogeocenoses of the center of the Russian Plain. Native spur forests are dominant, occupying 47% of the reserve's area; pine forests occupy 10% of the territory, which is primarily bogged-up. Small-leaved forests, black alder forests, and meadows cover roughly 40%, 2%, and less than 1% of the territory. Sphagnum bogs take up roughly 6% of the area.

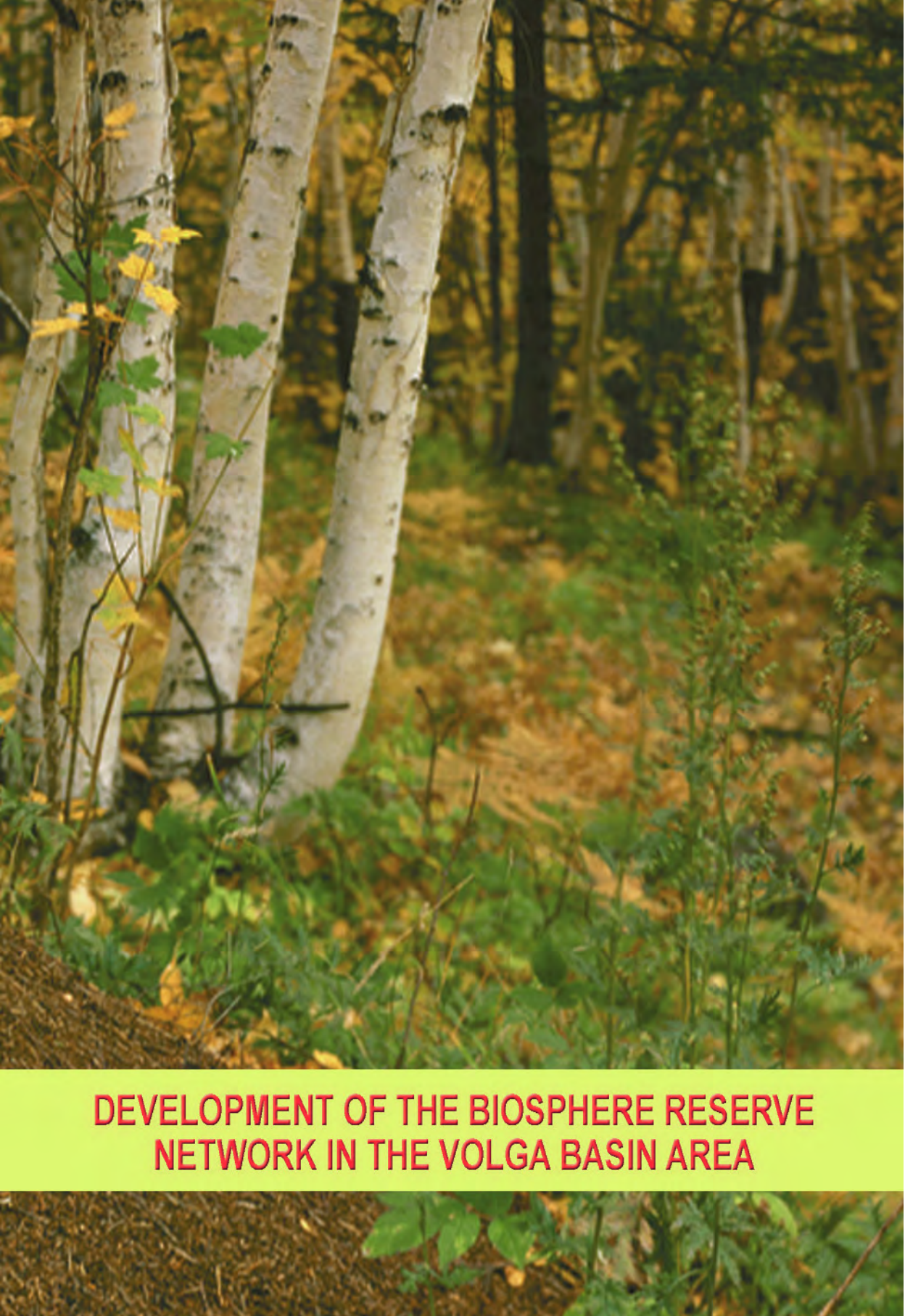
Zonal structure of Tsentralno-Lesnoy Biosphere Reserve.
1 – core zone;
2 – buffer zone;
3 – transition (cooperation) zone

Although fauna of the reserve is mostly of European origin, some species, especially, birds, are typical of Siberia due to boreal landscapes common in this area. Vertebrate animal species comprise 18 species of fish, 6 species of amphibians (common frog and grey toad are widespread), 5 species of reptiles, such as viviparous lizard, 212 species of birds. Birds of forest and its edge are much more common than waterfowl and birds of fields and meadows. Most birds belong to European and Transpaleoarctic fauna types, which comprise 38. 5% and 31. 8% of bird species, respectively, while Siberian fauna type comprises 18% of bird species. Arctic, Mediterranean, Chinese, and Mongolian fauna types are each represented by up to 9% of bird species. Four species of birds listed in the IUCN list of Threatened Species live in the reserve: golden eagle, black stork, white-tailed eagle, and peregrine falcon, lesser white-fronted goose is listed in the European Red List, and 10

species are listed in the Red Data Book of the Russian Federation. Mammals are represented by 56 species. The most strictly protected species are brown bear, lynx, elk, European mink, and European otter. Several other rare species are also worth mentioning: lemming, hazel dormouse, Laxmann's shrew, and Eurasian least shrew.

Staroselsky Mokh ecological tourism route. Photo by D.Ivanov.

Population density within the reserve does not exceed 0. 6 people per km2; there are no residential areas in the core zone. Transition zone, also known as the zone of sustainable nature use, agriculture is underdeveloped, herds of large cattle, horses and sheep are small in size. The volume of forest felling is insignificant. Poaching is extremely rare, as well as illegal fishing. Two industrial objects have been proposed: cascade of reservoirs on the Toodovka River and cement factory, a potential source of lime dust, 30 km northwest of the reserve border. These objects might become the biggest threats for the reserve if the proposals get approved and the construction begins.



DEVELOPMENT OF THE BIOSPHERE RESERVE NETWORK IN THE VOLGA BASIN AREA

Development of the biosphere reserve network in the Volga basin area

Substantial natural and socio-economic differences exist between regions of the Volga basin area. Considering these difference and implications of global climate change, it is of the utmost importance to continue to grow biological diversity monitoring efforts in the reserves. Scientific and legal resources, as well as exchange of experience gained while these goals are being accomplished, especially international experience based on the work conducted in basins of the other large rivers, should also be fostered in biosphere reserves.

In order to achieve that, the following tasks will have to be accomplished in the future with support of the Ministry of Natural Resources of Russia and government of regions located in the Volga basin area.

- Facilitate amendment of the Federal Law "On Specially Protected Natural Territories" to include specific definition of the biosphere reserve, the new category of specially protected natural territories of international importance. The amendment should cover conditions of a territory designation as a biosphere reserve and ways to ensure effective operations of a reserve's three zones;

- Strengthen collaboration and experience exchange to enforce green economy principles and implement sustainable socio-economic development strategy in biosphere reserves;

- Establish pilot biodiversity monitoring program in biosphere reserves of the Volga basin area. The program should include recommendations on monitoring of common ecosystems, including their game, endangered and introduced species;

- More proposals on ecological tourism should be developed. These proposals should include information for tour service providers and instructors who plan to teach local craft workshops and classes teaching local traditional knowledge.

Considering decisions made at the Third International Congress on Biosphere Reserves (Madrid, Spain, 2008), Biosphere Reserves of Russia in the 21st Century Russian Fundamental/Applied Conference (Khanty-Mansiysk, 2007), and Sustainable Development of the Volga Basin Area seminars (Nizhny Novgorod, 2010-2014), the immediate tasks for biosphere reserves of the Volga basin area have been formulated:

1. Re-establish collaboration with the Federal Service for Hydrometeorology and Environmental Monitoring of Russia in order to develop the network of complex background monitoring stations in biosphere reserves of the Volga basin area. This will help accomplish biodiversity conservation efforts under the pressure of global climate changes.

2. Strengthen collaboration between UNESCO's the Man and the Biosphere (MAB) Intergovernmental Program and the International Hydrological Program (IHP) in order to avoid conflict of use of water resources. To accomplish this goal, a number of joint solutions for the Volga basin area that utilize modern ecohydrology methods should be developed in collaboration with the Ministry of Natural Resources of Russia.

3. Share experience of sustainable development and use of green technology on websites of biosphere reserves in order to make sustainable development education

efforts more impactful, which is one of the goals of biosphere reserves. Partnering with media to explain a biosphere reserve concept and contribution of reserves to sustainable development of a given area also helps accomplish this goal.

4. Develop a set of measures necessary to protect key endangered species in each reserve, disappearance of which threatens ecosystems themselves as well as ecosystems' ability to provide ecosystem services. By protecting these species, Russia contributes to implementation of the Convention on Biological Diversity. Biosphere reserves protect many endangered animal and plant species included into the international and Russian lists of endangered species.

5. Explore and demonstrate successful use of various renewable energy sources in select biosphere reserves to attain sustainable development education goals and meet sustainable development requirements. Global experience in the use of renewable energy sources should be considered.

6. Request that the Ministry of Natural Resources of Russia and the Ministry of Economic Development of Russia expedite enaction of legislation to ensure optimal function of all three zones of a biosphere reserve (core zone, buffer zone, and transition zone) in order to achieve the goals of the Seville Strategy and Madrid Action Plan. A co-ordinating council should be established in each biosphere reserve, and its rights and responsibilities should be clearly defined by appropriate authorities.

7. Provide legal support to Russian biosphere reserves to fill the gap in existing legislature (the Federal Law "On Specially Protected Natural Territories» enacted in 1995) and its amendments currently under consideration by the State Duma of the Russian Federation. Such legal support is absolutely necessary to meet the requirements of the Seville Strategy and Madrid Action Plan. Model law proposed by UNESCO is a reasonable template for a special law on biosphere reserves and other specially protected natural territories of international importance. The discussion of such special law with the State Duma should continue.

8. Facilitate the establishment of new biosphere reserves, for example, Vishersky, Kologrivsky Les, and Khvalynsky, in the Volga basin area in the near future to represent the full range of nature zones of the Volga basin area in the network of biosphere reserves.

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БИОСФЕРНЫЕ РЕЗЕРВАТЫ ЕВРАЗИИ

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