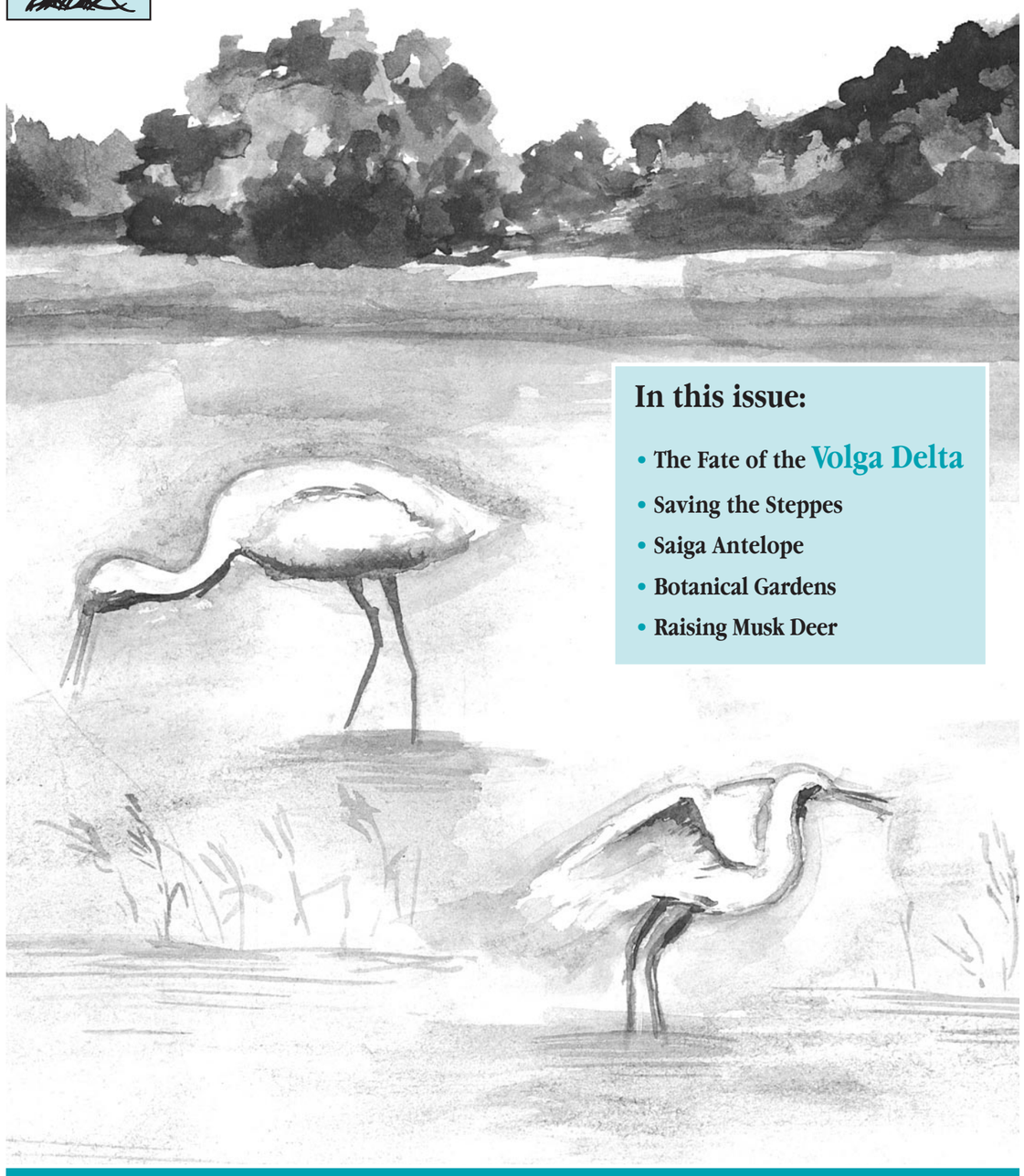
No. 28 Winter 2002

Russian Conservation News



In this issue:

- The Fate of the Volga Delta
- Saving the Steppes
- Saiga Antelope
- Botanical Gardens
- Raising Musk Deer

PROMOTING BIODIVERSITY CONSERVATION IN RUSSIA AND THROUGHOUT NORTHERN EURASIA

CONTENTS

Voice from the Wild (Letter from the Editor) 1

PROTECTED AREAS

Oases of Nature in Russia's Cities 2

SPECIAL SECTION:
THE FATE OF THE VOLGA DELTA

A New Strategy for the Volga Delta 5

A History of Nature and Nature Use in the Lower Volga Region 6

The Portrait of a Local District 8

The Decline of Agriculture in the Volga Delta 9

The Current State of the Fishing Industry 10

An Environmental Ethic for the Caspian Oil Industry 12

The Role of Astrakhansky Zapovednik in Preserving the Biological Diversity of the Volga Delta 14

ENDANGERED ECOSYSTEMS

What are Steppes? 16

The Fate of the Steppes of Western Siberia and Kazakhstan 18

Preserving the Steppes of Russia, Ukraine, and Kazakhstan 20

Natural Steppe Regeneration on Old Field 22

Artificial Steppe Restoration in Russia and Ukraine 24

ENDANGERED SPECIES

The Saiga Antelope in Europe 26

CONSERVATION HISTORY

Protected Areas in Ukraine a Decade after Independence 29

A New Hope for the Dnieper River 32

CONSERVATION MANAGEMENT

The Deer with the Deadly Scent 33

BULLETIN BOARD 36

ABSTRACTS IN RUSSIAN 37

CONSERVATION CONTACTS ..... Back cover

CONTENTS

The mission of the Center for Russian Nature Conservation (CRNC) is to promote the conservation of nature in Russia and throughout the former Soviet Union, and to assist conservation groups in that region through information exchange, coordination of professional and education exchanges, and provision of technical assistance to protected areas. CRNC is a project of the Tides Center.

Center for Russian Nature Conservation

Copyright 2002 CRNC/Tides Center.

RCN has many partners and friends in Russia, including the Partnership for Zapovedniks, whose mission is to offer organizational, technical, and financial help to zapovedniks and national parks in Russia.

PARTNERSHIP FOR ZAPOVEDNIKS

Russian Conservation News was produced with support of many individuals and foundation including the Weeden Foundationa, the Ecoregion Strategies Unit of the World Wildlife Fund, Andrew Sabin, Joan Hoblitzell, Juliana T. Williams. We wish to recognize Harriet Crosby, Andrea Williams, and Charles Dewey for their extraordinary generosity, support, and enthusiasm for Russian nature conservation. Finally, a heartfelt thanks to Jack Padalino for his long-time devotion to Russia's parks and nature reserves, and his unwavering support for RCN from its inception.

Other special friends and supporters include: Tom Babcock, Ernest Bauer, Galia & Derk Bodde, Barbara Born, Joan Bridgwood, Evelyn Cochran, Wallace Cole, Mary Cooper, Lucy Craft, Tom De Meulenaer, Andrew Durkin, Brock Evans, Carol Foss, Michael Freed, Louis Friedman, Gertrud Freitag, Robert Hoffmann, Nancy Hopps, George Johnson, Freeborn Jewett, Nadezhda Kavrus-Hoffmann, Jr., Graeme Kelleher, Eliza Klose, Rayda Krell, Rick McGuire, Bernie McHugh, Mary Anne Mekosh, Philip Micklin, Laurel Mittenthal, Lois Morrison, Douglas Murray, Philip Pryde, Nicholas Robinson, Jonathan Sachs, Fred Strebeigh, Gregory & Judy Streveler, Townsend Swayze, Dana Visalli, Richard Warren, Bill Volkert, William Wasch, Jr., Gary Waxmonsky, Don Weeden, Margaret Zokowski, and the Joint Secretariat Inuvik Canada.

ISSN 1026-6380

EDITORIAL BOARD

Executive Editor: *Margaret Williams*

Editor: *Lisa Woodson*

Managing Editor: *Nikolai Maleshin*

Graphics Artist: *Maksim Dubinin*

Design and Layout: *Design Group A4*

Editors' Assistant: *Ludmila Perepelkina*

Environmental Education Advisor: *Natalia Danilina*

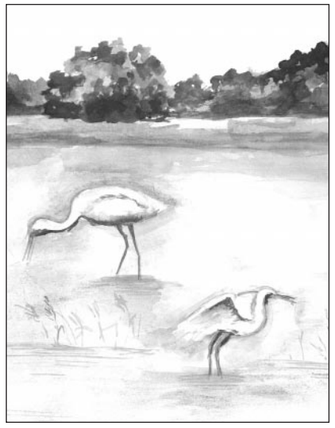
Translators: *Lisa Woodson*

Subscriptions Manager: *Sarah Buckbee*

Contributing Authors: *Y. Chuikov, T. Filatova V. Galkin, U. Gräbener, A. Grachev, G. Harper, A. Kurapov, O. Listopad, N. Litvinova, S. Monakhov, Y. Mazurov, V. Nikolaev, A. Pakina, V. Prikhodko, P. Rytov, S. Shcherbak, V. Sobakinskikh, N. Zolotukhin, I. Zolotukhina.*

Contributing Artists and Photographers: *T. Bakinova, M. Dubinin, A. Goburnov, U. Gräbener, G. Harper, A. Kurapov, O. Listopad, Y. Molchanova, V. Nikolaev, A. Pakina, V. Prikhodko, R. Reading, G. Rusanov, T. Sorokina, A. Vlasov, L. Woodson.*

ON THE COVER



Kulan (Equus hemionus)
Cover drawing by V. Gorbatov

Voice from the Wild (A letter from the Editor)

Throughout his life, the 19th-century Russian-Ukrainian writer Nikolai Gogol never lost his wonder at the expansive steppes that covered his native land. At every hour and season they were different, a perpetually changing canvas of colors and sounds carried on the wind. Nearly two centuries later, few of us have seen the steppes as he did: the spread of agriculture and industry across central Eurasia has eliminated much of the wide band of grassland that once stretched from Eastern Europe through Kazakhstan and even beyond Lake Baikal. But in this issue of Russian Conservation News, we invite you to explore these unique ecosystems in all their vastness, examining both the history of their destruction and scientists' hopes for their restoration. Then travel to the steppes of Kalmykia on the northwestern shore of the Caspian Sea, the last remaining habitat in Europe of the saiga antelope. For centuries, the fortunes of this resilient mammal have risen and fallen like the waves of grass that cover the steppe, ever following the currents of Russian history in the fate of its habitat and the people who share it.

We also turn our attention to the tiny musk deer, whose valuable musk glands have made it the prize of many a poacher in the Far Eastern region of Russia and brought one subspecies near the brink of extinction. Though musk deer are difficult to raise in captivity, years of careful observation and experimentation may have finally proposed solutions that could offer impoverished Siberian villages the opportunity to earn a living by raising the deer instead of hunting it.

Indeed, the complicated relationships between people and nature take center stage in this issue of RCN as we study the future of the Volga delta region. Just kilometers away from the steppes of Kalmykia, Europe's longest river spreads into a fan of rivers and streams at the edge of the Caspian Sea. A wetland with great importance for conservation of many fish and birds, the delta is also home to a small but significant human population and several industries with competing demands on natural resources. Astrakhansky Zapovednik, one of the oldest nature reserves in Russia and also a UNESCO biosphere reserve, has recently taken the lead in creating a forum for these multiple stakeholders to practice cooperative management of natural resources. Russian Conservation News offers an in-depth look at some of the challenges and opportunities the region faces on the road to sustainable development.

In many ways, the project in the Volga delta is a sign of a relatively new trend in Russia: even twenty years ago, local determination of environmental management was impossible in the face of central planning and a command economy. But the breakup of the Soviet Union a decade ago brought a completely new palette of problems and tools to nature conservation as each newly independent republic began to forge its own environmental policy. In this issue of RCN, we examine the development of nature conservation in Ukraine since independence in 1991. Bearing in mind Ukraine's unique cultural landscapes, local conservationists are learning to work with government officials and international organizations to expand the network of protected areas and clean up the pollution and poor environmental management of the nation's Soviet inheritance.

We invite you to begin your journey with a tour of what may be the oldest example of conscientious environmental management: the botanical garden. For centuries, gardens and arboretums have brought together the creativity of the human mind and the beauty and abundance of nature. In Russia, a network of botanical gardens that stretches throughout the country provides an oasis of nature to city dwellers, and for many, their first introduction conservation ideals.

Protected Areas

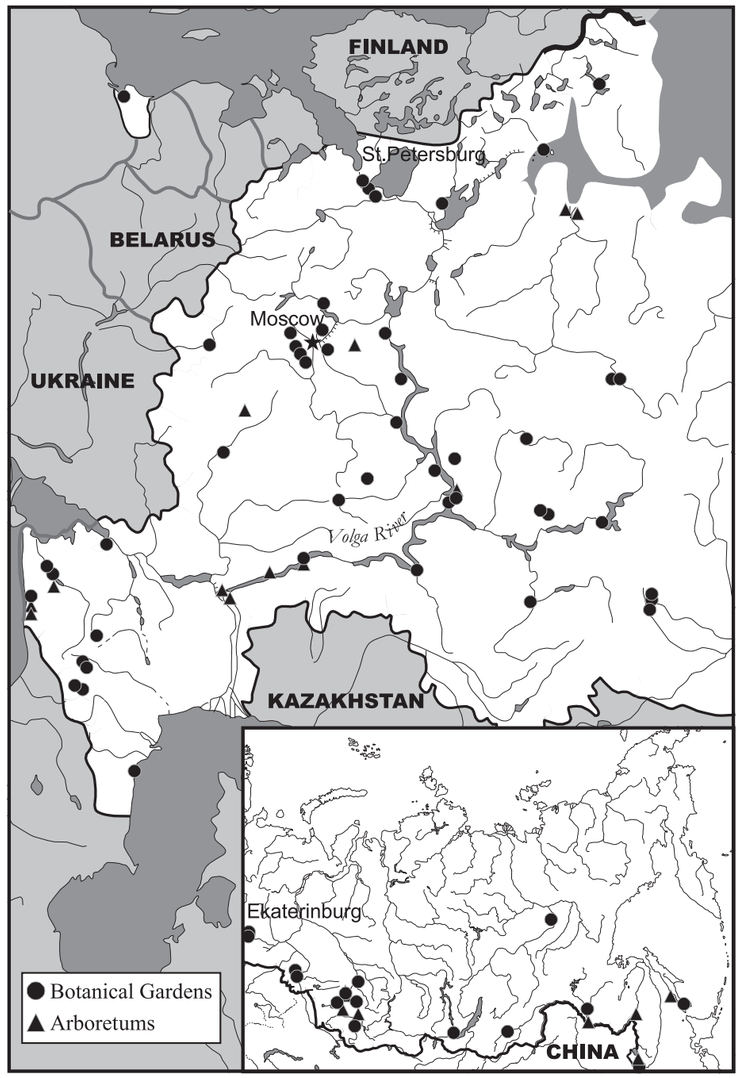
Oases of Nature in Russia's Cities

*By **Yuri Mazurov** and **Anna Pakina***

Botanical gardens uniquely combine the creative powers of people and nature. Diverse collections of plants and mosaics of varied landscapes offer an aesthetic value that makes arboretums and botanical gardens important recreation areas and centers of environmental education throughout the world. In shaping botanical gardens, people have created architectural monuments, unique landscape complexes, museums and herbariums, libraries, greenhouses, and botanical collections, giving flesh to the thoughts of leading scientists in biology, geography, and ecology. For centuries, botanical gardens and arboretums have fed a craving for scientific knowledge and nurtured ecological and aesthetic culture.

Today the 1995 Russian law "On Specially Protected Natural Areas" lists botanical gardens and arboretums in a special category of protected area. This status is a witness of their significance in nature protection. Preserving biological diversity and developing principles for sustainable use of plant resources are among the fundamental goals of botanical gardens. Moreover, fostering ecological culture and educating visitors are important aspects of a botanical garden's work.

The first botanical gardens (in the modern understanding of the word) appeared during the middle ages, when gardens were kept in monasteries throughout Europe. Monasteries in medieval Rus' also had gardens, though they were usually more utilitarian, focused on growing fruits and vegetables for food. But there were also gardens intended simply for decoration, which were required to include "heavenly trees" – apples – and also fragrant flowers, as a pleasant aroma was considered an essential attribute of such gardens. Gardens that symbolized heaven were widespread in central Russia, while monastery gardens in northern Russia generally focused primarily on producing food.



Russia's network of botanical gardens and arboretums. *Map by Y. Mazurov and A. Pakina, edited by M. Dubinin.*

The Japanese Garden in the Moscow Botanical Gardens. *Photo by A. Pakina*

Russia's first official botanical garden was founded in 1706. At the order of Peter the Great, a "pharmaceutical garden," as they were then called in Russia, was planted on Moscow's northern edge. This garden's primary function was to grow medicinal plants for military needs and hospitals. From the very beginning, however, the garden included a special place for "strange and wonderful" plants. Later the pharmaceutical garden became the botanical garden of Moscow State University, and the garden's botanical collection grew quickly: in the 1730s, it contained about 200 plants, but by 1808, 3,500 varied species. Several palms from this era remain to this day, preserved in the greenhouses.

The garden's arboretum includes more than a dozen trees that survived the terrible fires of 1812, when Napoleon captured Moscow (in comparison, only three trees from that era remain in the center of Moscow). The oldest tree in the arboretum, a relic of the "pharmaceutical" garden, is a Siberian larch (*Larix sibirica*), which, according to legend, Peter the Great himself planted.

Another of Russia's oldest botanical gardens was opened in St. Petersburg in 1713. Like its sister garden in

The Arctic Garden througth Scottish Eyes

*By **Geoffrey Harper***

The botanists of the Polar-Alpine Botanic Garden & Institute near Kirovsk on the Kola Peninsula have one regret: they cannot claim to have the most northerly botanic garden in Eurasia. The Norwegian garden at Troms bears this honor. Even so, Kirovsk is 150 km north of the Arctic Circle, and the scientists at work in the Polar-Alpine Botanic Garden have accomplished no small feat in growing tropical plants in their hothouses.

As a scientist with the Royal Botanic Garden in Edinburgh, I have visited the Kirovsk garden several times recently with a party of botanists from Britain. I felt right at home in the Khibiny Mountains, where the garden is situated, as the summer weather and landscape bear a strong resemblance to the Scottish Highlands. Both landscapes were molded by the ice-age glaciers. But whereas in Scotland our natural vegetation has mostly disappeared under the influence of centuries of people, sheep, and deer, the vegetation of the Khibiny Mountains is much more natural. A walk up Vudyavchorr Mountain in the botanic garden rapidly leaves behind spruce taiga: one passes through a charming elfin woodland of crooked birches to emerge on the alpine tundra, where tiny flowers hide between miniature shrubs. For me the fascination of the area lies in seeing what Scotland was probably like about 7,000 years ago, soon after the last ice age.

Founded in 1931, the Garden and Institute now fulfill several functions. As to be expected, the staff are experts on the local flora and vegetation, and there is an interesting demonstration of local plants in one part of the garden. Through the woods a short distance away is a bed of introduced plants. Quite apart from making an attractive display, the bed has a serious purpose: the long polar night and deep snow cover can be quite depressing for some of the local Russians, and considerable efforts have been made – with notable success – to discover which plants from further south can be grown here. Plants can do wonders in brightening up a drab environment

Visitors, even in summer, may find something else depressing about the area. Kirovsk and the neighbouring town of Apatity are industrial. The main activity is quarrying and processing the mineral apatite (used, ground up, as a phosphate fertiliser), so that in places the landscape is scarred where whole hillsides have been dug away. One of the Institute's tasks is to monitor the effects of pollution on local vegetation.

But there are many places around Apatity and Kirovsk where visitors can easily escape the quarries and industrial buildings. There I can almost imagine myself back in prehistoric Scotland, except for one awkward fact: after the last ice age we never received the spruce. Even in the Kola Peninsula, nature seems much richer in Russia than back home.

***Geoffrey Harper** is a translator for Russian Nature Press and a botanist attached to the Royal Botanic Garden in Edinburgh.*

Moscow, in the first years of its existence, this garden specialized in cultivating medicinal plants to supply pharmacies. But with each year, the planners and gardeners who tended the garden gave more and more attention to decorative plants. The collection grew most of all thanks to expeditions to remote regions of Russia, as well as to Central Asia, China, and Mongolia. Just 20 years after its founding, the garden's plant collection totaled more than 1,200 different species. Peter the Great himself took great interest in how the garden was arranged, personally placing orders for saplings and flower seeds to be brought from Holland and Germany, as well as new cities in Russia and Ukraine, and oversaw their planting.

Along with these and other large gardens, there were quite a few private gardens and parks that belonged to wealthy merchants in the 18th century, bringing rise to widespread development of botanical gardens across Russia. This network of gardens continues to grow and develop to this day. The Council of Botanical Gardens of Russia, a branch of the International Council of Botanical Gardens (BGCI), includes more than 80 sites. These sites include both young gardens (Sakhalin, Zabaikal, Udmurtsky and others), and the very oldest, as well as many founded in the 19th century, such as the botanical gardens of Kazan, St. Petersburg, and Tomsk Universities, the Perkalsky Arboretum in Pyatigorsk, the Sochi Arboretum, and many others.

The Sochi Arboretum. *Photo by A. Pakina*

Botanical gardens vary considerably in size, ranging from the one-hectare garden of the Bryansk Technological Institute in western Russia to the more than 1000-hectare garden of the Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences. The internal structure and plant collections of various gardens and arboretums are dependent on many different factors. Young gardens often have large wild regions with natural plant cover; older gardens usually have strictly planned formal gardens with greenhouses, arboretums, and special nurseries.

In recent years botanical gardens and arboretums in Russia have faced many problems. The effects of local environmental pollution have been observed in 80 percent of Russia's arboretums and botanical gardens. In contrast to other categories of protected areas, such as zapovedniks, national parks, and zakazniks, most botanical gardens are located in large cities. For this reason, they are subject to the effects of proximity to the industrialized world, in particular, to air pollution. Pollution from cars is an especially serious concern for gardens situated near major roads. Higher local temperatures also assert a negative impact on many botanical gardens. In most cases, construction

The Moscow Botanical Gardens. *Photo by A. Pakina*

SPECIAL SECTION: THE FATE OF THE VOLGA DELTA

A new Strategy for the Volga Delta

*By **Uli Gräbener***

One of the major projects of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) is to support the world's biosphere reserves, a network of sites intended to facilitate conservation and development. In Russia, many of these sites are based in zapovedniks, large areas with strict protection that offer an infrastructure for implementing scientific research, sustainable development programs, and other projects. For much of their history, Russian biosphere zapovedniks focused on nature conservation, scientific research, and environmental monitoring. But as the UNESCO biosphere reserve concept turned increasingly towards sustainable development, partly as a result of the 1992 summit in Rio de Janeiro, some Russian biosphere zapovedniks began seeking ways to include nearby communities in their activities. In particular, a relatively new concept in Russian nature conservation legislation called biosphere polygons, special areas attached to biosphere zapovedniks that are used for sustainable development initiatives, and coordinating councils, which coordinate cooperation between various groups in the vicinity of the zapovedniks, offer promise for testing cooperative methods of management and sustainable natural resources use.

Following a training seminar last summer in Krasnoyarsk for Russian biosphere reserve directors, the UNESCO Moscow Office has begun organizing special initiatives for individual biosphere zapovedniks to help address their specific problems and opportunities. The first of these was Astrakhansky Zapovednik, a key player in nature conservation in the lower Volga region.

Stakeholders gathered at a seminar in Astrakhan in April 2002 to discuss plans for creating biosphere polygons and a coordination council to manage it. *Photo courtesy of U. Gräbener*

A meeting in early April 2002 organized in cooperation with Astrakhansky Zapovednik, the Astrakhan regional Committee for Natural Resources, and the Russian branch of the World Wide Fund for Nature (WWF) was dedicated to bringing together the varied stakeholders of the Volga delta. The goal of this meeting was to foster interaction and expand collaboration between the zapovednik and its socio-economic environment. Representatives of nature conservation organizations, scientific institutes, agricultural and fishing enterprises, as well as tourism and oil companies at the meeting learned the theory behind biosphere reserves and discussed the potential for implementing it.

One of the key ideas was the creation of a coordination council comprised of various stakeholders to coordinate the use of natural resources and promote sustainable development around Astrakhansky Zapovednik. This instrument could also be used to manage three biosphere polygons to be attached to the zapovednik. Maximizing the council's success relies upon ensuring that all of the important stakeholders of the region (local and regional officials, relevant private business, scientific and educational organizations and NGOs) find an active role in it and realize the mutual benefit of their cooperation.

Granted, this process cannot be completed in a day, but presenting the biosphere reserve concept to all of the important stakeholders in the region was a key factor in its commencement. Though no binding decisions were made, the seminar participants all had a chance to speak their mind about the information presented. One scientist from the zapovednik commented on all of his many years of work in the Volga

A History of Nature and Nature Use in the Lower Volga Region

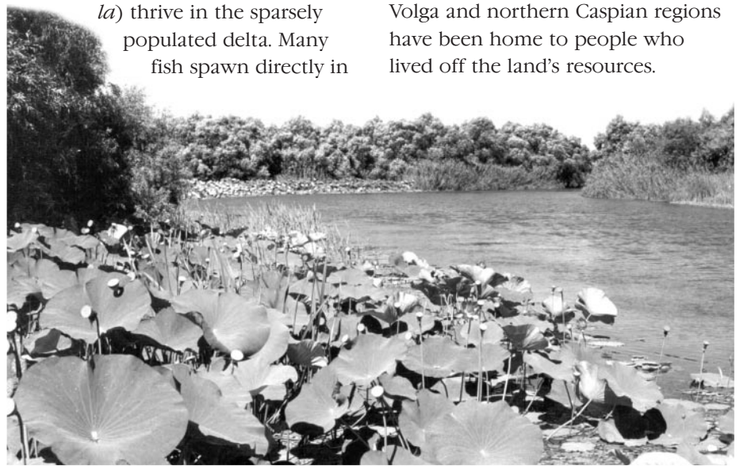
By ***Yuri Chuikov***

After twisting its way through northern Russia gaining speed and volume, the Volga River splits into a fan of more than 250 channels that flow slowly through the arid desert of southern Russia before spilling into the Caspian Sea. Spanning nearly two million hectares, the Volga delta is one of the largest in the world, an intricate maze of streams and rivers that provide homes for many species of birds and fish. Thin stripes of forests arch over narrow canals that widen to stretch nearly from horizon to horizon. The delicate pink and white blossoms of the sacred lotus (*Nelumbo nucifera*) and white water lily (*Nymphaea alba*) float lazily upon fields of lily pads. The lower delta in particular is notable for its concentrations of eagles, cormorants, ducks, swans, gulls, and other water birds, many of which nest in the reed colonies and riparian forests of the delta. A number of endangered species, including Dalmatian pelican (Pelicanus crispus), mute swan (*Cygnus olor*), and white-tailed eagle (*Haliaeetus albicilla*) thrive in the sparsely populated delta. Many fish spawn directly in the delta, while others – most notably several species of sturgeon (*Huso huso*, *Acipensar spp.*) migrate from the sea through the delta's deepest canals on their way to spawning grounds higher in the Volga. Away from the river floodplain, arid steppes and semi-desert stretch into the Republic of Kalmykia on the west and Kazakhstan on the east.

The lower Volga and northern Caspian region. *Map by M. Dubinin*

For thousands of years, the lower Volga and northern Caspian regions have been home to people who lived off the land's resources. Nomadic peoples began living in the area during the Iron Age and held to their way of life even as regional politics saw the reign of the Khazar Kingdom and the Tatar-Mongol Empire. The Scythians, perhaps the most famous of the region's historical inhabitants, won renown for their metal artwork, which is still prized today. With Russian expansion in the middle of the 16th century, industries developed in salt and niter mining, as well as fish curing. Astrakhan never became a major industrial center, however, because of the region's relatively small population. Raw materials were instead shipped to other areas in central Russia. Trade and water transport became the main supports of the local economy, which in turn helped the development of local shipbuilding and ship repair industries.

The 20th century brought serious changes to the region's specialized economy. Soviet collectivization put an end to nomadic herding, ruining

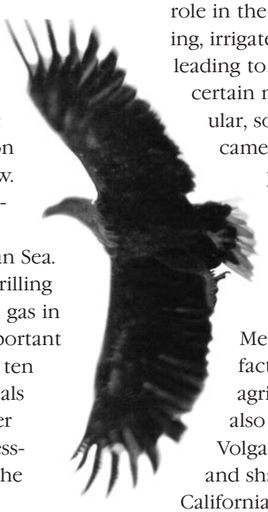


Lotus fields. *Photo by A. Gorbunov*

the time-tested balance between the size of herds and the condition of the fields in which they pastured. The shift from herding varied animals – oxen, horses, and camels – to large and sedentary flocks of sheep deepened this problem, leading to the degradation of plant and soil cover, and ultimately, to desertification. Meanwhile, the use of fish resources also intensified, as more species were shipped to other parts of Russia and neighboring countries.

Agriculture developed quickly in the second half of the twentieth century as centralized planning envisaged expansive irrigated fields bringing bountiful crops to the Soviet Union. Huge areas of wild steppe were plowed and large irrigation systems constructed. This change in land use led quickly to soil degradation as salt and chemical fertilizers built up in the soil and spread into the water systems of the Volga delta. This method of land use was not sustainable, and after being farmed for all of three or four years, a tract of formerly virgin steppe would be exhausted, unable to support crops. These plots were subsequently abandoned and new areas plowed. Agricultural lands stretched ever outward from the floodplains of the Volga until they reached the arid steppes of Kalmykia. Giant canals constructed to irrigate these semi-desert lands reduced the flow of the Volga River.

The development of industry (especially in the second half of the 20th century) in the Volga basin released industrial and sewage waste into the river. Ten hydroelectric power plants built upon the river altered its flow. Together these two factors brought intense pollution to the Caspian Sea. At the same time, oil drilling and mining for natural gas in the region became important industries. For the first ten years, these raw materials were processed in other locations, until a processing plant was built in the city of Aksaraisk.



This path of development is common in Russia. The unique feature of nature use in the Astrakhan region is that by and large most of the region's natural resources are used directly, without intensive processing. On the one hand, this form of nature use places a heavy burden on raw resources, but on the other, frees the region from the heavy pollution that is unavoidable in the processing of raw materials. For example, the single processing plant in Aksaraisk accounts for a full 60 percent of atmospheric pollution in the region. The major problem is that for many years, a relatively small number of industries have played the principal role in the region's economy (herding, irrigated agriculture, fishing), leading to the gradual exhaustion of certain natural resources, in particular, soil and fish. This process came to a halt during and after perestroika, when economic problems caused a stall in agricultural production, in essence giving nature a 10-year rest.

Meanwhile, dynamic natural factors – often aggravated by agriculture or industry – have also left their mark on the Volga delta. Roughly the size and shape of the state of California, the Caspian sea is the world's largest inland sea, and an extremely dynamic body of water. For many years the delta gradually moved southward, causing the lines that once separated various ecosystems (forests, meadows, and reeds) to blur. The mysterious fluctuations in the level of the Caspian Sea in the last century created large regions of shallow water and islands. As a result, special canals were built to aid fish in their migrations to the major branch of the Volga, but these canals impaired natural processes in the

Geese and swans. *Photo by G. Rusanov*

The Portrait of a Local District

A note from the editors: *The success of nature conservation initiatives as a whole often rests on their effects at the local level. The following article offers a detailed look at one of the districts in which Astrakhansky Zapovednik is located, a typical example of a rural district in the Volga River delta. Until measures are taken to improve the quality of life of these towns and villages, several major issues that threaten the environmental health of the Volga delta will likely remain unresolved.*

By ***Peter Rytov*** *and* ***Vladimir Galkin***

Photo by L. Woodson.

The Volodarsky District is located in the southeastern corner of the Astrakhanskaya Oblast, touching borders on the northeast with Kazakhstan. A total of 51,000 people live in the district, which covers 388,000 hectares (3,800 square kilometers). Many of these residents live in the central town of Volodarsky or in one of its 74 other towns and villages. At the present time, employment in the district revolves around its 19 fishing collectives, 7 agricultural cooperatives, 87 farming enterprises, and several fish processing and other agricultural companies. Future plans include building plants for processing crops such as tomatoes and rice.

Though protected areas cover 11.9 percent of the total area of the district, including the Obzhorovsky section of Astrakhansky Zapovednik, at the present time, land, water, and fish resources show signs heavy anthropogenic stress. After rising with the development of the region in the 1970s and 1980s, the average catch of fish is falling with each year, especially fish in the sturgeon family (*Acipenser spp.*), Caspian shad (*Alosa caspica*), European carp (*Cyprinus carpio*), and European pike-perch (*Stizostedion lucioperca*). The problem seems to be based in poaching, which is made more problematic by a lack of cooperation between the many organizations responsible for curtailing poaching.

Most of the district once harbored significant fish spawning habitats. In the 20th century, many of these lands were adapted for farming, but then became polluted or poorly managed, and in many cases, unusable. A visual sweep of the countryside shows barren, abandoned fields littered with trash. These lands require various measures to be turned back into spawning grounds, but a lack of both central and local financing has so far prevented this action.

The question of treating industrial and residential wastes plagues the district: a regional program has been passed on the local level, but due to a lack of funding, is hardly being carried out. The region has two water treatment plants, which, due to poor quality, work only at 10 to 15 percent of their projected power and bring the district a loss of 700,000–800,000 rubles per year. The problem of ensuring clean drinking water for the local population is no less important, but for the time being is meeting with greater success.

Fires are another factor that adversely affects the district's environment. Each year local residents set these fires and allow them to burn out of control: in early spring of 2002, such fires burned much of the Obzhorovsky section of Astrakhansky Zapovednik. The problem has the unwavering attention of both nature protection organizations and the Administration of the Volodarsky District. Environmental protection is a high priority in the district government, a responsibility shared by a number of organizations including the Land Committee, Sanitation Service, Forest Inspection Service, and Fish Inspection Service. Nonetheless, these organizations lack the power and resources to complete all of their functions. For example, the catastrophic environmental pollution of 2001 went unrecorded.

Peter Rytov *is the Head of the Administration of the Volodarsky District.* ***Vladimir Galkin*** *is the district's Director of Environmental Inspection and Regulation.*

The Decline of Agriculture in the Volga Delta

By ***Anna Pavlukevich***

At the present time 154 collective farms and 1732 family farms – not to mention 125,000 personal vegetable gardens – represent the agricultural capacity of the Astrakhanskaya Oblast. Most of this production comes in the form of early grains, potatoes and other vegetables, and melons, as well as non-traditional products like tobacco, cotton, and safflower. In 2001, agricultural production brought around $133,000,000 into the region, 10.9 percent more than the year before. But despite these recent gains, agriculture has experienced a marked drop since the collapse of the Soviet economy: in 1990, crops covered 325,000 hectares, while in 2002, a mere 87,400 hectares.

The major reasons for this drop were the high labor and energy costs of agriculture: despite lying at the mouth of an enormous delta, the Astrakhanskaya Oblast is essentially a desert region that can produce crops only with significant irrigation. Over 80 percent of the plowed land in the region is centered around irrigation systems. Yet half of the irrigated land goes unused because better irrigation technology is needed to make agriculture efficient: the equipment is either too old, or else unable to cope with the rising level of the Caspian Sea.

An analysis of rice, vegetable, and melon industries in the region over the past decade shows that production fell sharply in the mid 1990s, but has risen steadily since 1997. Current goals for agriculture emphasize early production of vegetables and shipping greater volumes of vegetables to be processed. In the case of Astrakhan melons – famous throughout Russia for their flavor and succulence – plans must find a way to enable these melons to compete with Central Asia's melons, which ripen far earlier. One potential use for a biosphere polygon attached to Astrakhansky Zapovednik would be developing cooperation strategies with factories and other vegetable processing companies: raw products grown on the polygon would be offered at optimal prices that would ensure the profitability of producing and processing vegetables.

The situation is slightly different in the potato industry, which has received special investment from the regional administration. Personal vegetable gardens account for 95 percent of potato production. When provided with high quality seeds, gasoline, informational and consulting services, and specialized agricultural technologies, these small farms and gardens annually increased potato production. Even collective farms and family farms have used this support to increase their production. Moreover, a special regional government program focused on the potato industry from 2002 to 2006 hopes to significantly increase potato production in family farms.

The potato industry is an example of a new trend in regional agricultural policy. In recent years, the Astrakhan Regional Administration has been working to increase agricultural production in general by supporting promising and profitable enterprises. Funds earmarked in the regional budget subsidize farms ready to buy seeds and fertilizer on a credit system. Special programs focus on introducing new production technologies that save energy resources while significantly increasing the harvest. In the past two years, 253 hectares of land have been outfitted with state-of-the-art irrigation equipment that helped raise harvest levels two or more times as well as save water and electricity. Energy conservation projects such as this one will continue to grow in the region.

One of the fundamental factors hindering the recovery of the economy of agricultural enterprises is the widening gap between the speed of inflation in industry resources and that of agricultural produce: the profits gained from selling fruits, vegetables, and grains simply do not cover the increasing costs of production. But the real problem is that fundamental economic changes in the national have torn apart the old agricultural system of collective farms, while the smaller farms that have grown up in the past decade lack the resources to stabilize and restore agricultural lands to their former levels of production, even if some growth has been observed in the past two years. It is no longer party plans but increasingly market demand that dictates the organization of agricultural lands, and the region must learn to adapt to these conditions by looking to the future instead of the past.

For this reason the creation of biosphere polygons around Astrakhansky Zapovednik is a timely and expedient idea. A model territory for sustainable development is the ideal place for testing various methods of agriculture. But choosing the location for these territories should be the joint decision of both the regional administration and other interested parties, including those from the agricultural arena.

Anna Pavlukevich *is the Head of the Bureau of Plant Management in the Department of Agriculture of the Astrakhanskaya Oblast.*

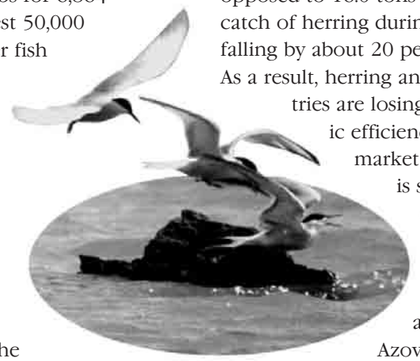
The Current State of the Fishing Industry in the Northern Caspian and Volga Delta

A note from the editors: *Fishing is the single most important industry in the Volga delta region today. The following article assesses recent trends in the industry, including environmental management.*

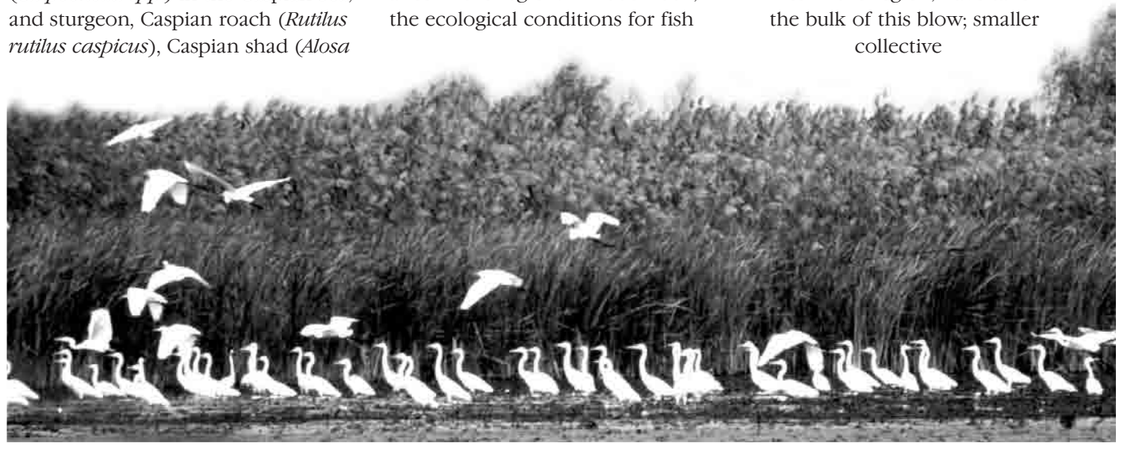
By ***Alexander A. Grachev***

Of the 60 major species of fish that live in the Caspian Sea and Volga River, around 30 have economic significance for the Astrakhanskaya Oblast. First and foremost these fish include the prized but threatened sturgeons, such as beluga (*Huso huso*), Russian sturgeon (*Acipenser gueldenstaedti*), stellate sturgeon (*A. stellatus*), and sterlet (*A. ruthenus*), the trade of which is regulated by the International Convention on Trade of Endangered Species (CITES). Freshwater fish (*European pike-perch*, *European carp*, *Eastern bream*, *European catfish*) as well as saltwater species (anchovy sprat, Caspian shad), and pond fish (various carps) comprise the region's fundamental riches. Raw materials for the regional fish processing industry come from two basic sources: kilka (*Clupeonella spp.*) in the Caspian Sea, and sturgeon, Caspian roach (*Rutilus rutilus caspicus*), Caspian shad (*Alosa caspica*), and various freshwater fish in the delta.

The Fishing Management Service of the Astrakhanskaya Oblast is responsible for both maintaining accurate data on fish stocks as well as issuing permits to using these resources. Fishing companies receive licenses that allow them to fish in specific areas: last year, 225 licenses were given out among 578 small enterprises currently at work in the delta, which provide jobs for 6,864 people and harvest 50,000 tons of freshwater fish per year.



Cardinal changes have come to the Caspian Sea basin in recent years that make managing fisheries in a sustainable way all the more difficult. Agriculture, oil and gas, shipping, and other aspects of local industry in Russia and neighboring countries have all disturbed the ecological balance in the region. In 2000-2001, the ecological conditions for fish development grew worse as a result of the introduction of Leidy's comb jelly (*Mnemiopsis leidyi*) from the Black Sea into the Caspian. The jelly's disruption of Caspian ecosystem's affected many species along the food chain. Fish stocks have fallen sharply, especially herring, which in turn has affected the fishing industry. Just two years ago, the annual kilka harvest was nearly three times greater than today: in 2001 the average ship caught 5.6 tons, as opposed to 16.0 tons in 1999). The catch of herring during migration is falling by about 20 percent annually. As a result, herring and kilka industries are losing their economic efficiency, and the market for these fish is shifting in favor of boats in the Atlantic Ocean, the Black Sea, and the Sea of Azov. Local fish processing has fallen by more than 30 percent since 2000. Large and middle-sized fish processing companies, which comprise 60 percent of all fish processing companies in the region, have taken the bulk of this blow; smaller collective farms and other enterprises have managed to keep production levels steady by intensifying fishing activity and varying their catch methods.



In comparison, the sturgeon industry looks somewhat brighter. Despite the fact that several species of sturgeon are under international watch as rare species, in the Caspian their numbers have stabilized at around 9,400,000 beluga, 24,400 Russian sturgeons, and 14,800,000 stellate sturgeons. The most current information shows that catches have risen, and may continue to rise: six fish hatcheries in the region have increased their fish stocks by more than 25 percent, raising 58,500,000 young fish annually. But even though the numbers of these fish have not decreased in recent years, data show that their quality (as indicated by weight) has declined.

Meanwhile, in recent years freshwater fish in the delta have benefited from an increased flow of water from dams regulating the Volga River. Ecological conditions have encouraged spawning and development of these fish in the delta, increasing their numbers significantly. Roach – and the industry it supports – in particular has prospered, becoming more numerous and extending its range farther out into the Caspian Sea. Annual catches have already risen, and will likely continue to rise in the next few years as the young fish that hatched in the abundant Volga flow grow to maturity.

Aside from hatcheries that raise fish to be sent out to sea, the Astrakhanskaya Oblast has 136 companies that raise fish in artificial pools set up throughout the delta. But because of the economic recession, these companies are unable to feed the fish mixed fodder, an important part of keeping fish stocks healthy and productive. Fish production levels between 1996 and 1998 were 30 to 40 percent lower than standard norms for organizations of this type. Although the harvest rose closer to normal levels between 1999 and 2000, most experts believe this rise was an anomaly, and that the future will bring a further decline in the industry due to the continuing decline in conditions for raising the fish. Ironically, investment in the fishing sector has not fallen, remaining around $5,700,000 annually, about 70 percent of total investment in the food industry. One of the most promising investments for developing the region's fishing industry is the Ikryaninsky Fish Factory, which is set to begin work in 2002.

The Fishing Management Service has developed a project to guide the development of the Astrakhan fish industry from 2002–2006. This project gives particular attention to the fate of towns and villages whose life revolves around a single fishing enterprise, such as a factory or fishing company. The Astrakhanskaya Oblast has 35 of this kind of single-industry town, plus another five towns whose livelihood is significantly tied to a local fishing collective.

In 2001, the Administration of the Astrkhanskaya Oblast conducted an appraisal of unused agricultural land with the goal of returning some of these lands to their natural state, spawning grounds. In order to farm these spawning grounds, barriers were built up along the edges of canals to prevent the rivers from spilling over onto the ground during flood season. In total this kind of agricultural land covers 114,800 hectares, but 52,000 hectares of this sum have been abandoned in recent years due to lack of funds for agri-

Abandoned agricultural lands may soon be reverted to their natural state.
Photo by G. Rusanov

An Environmental Ethic for the Caspian Oil Industry

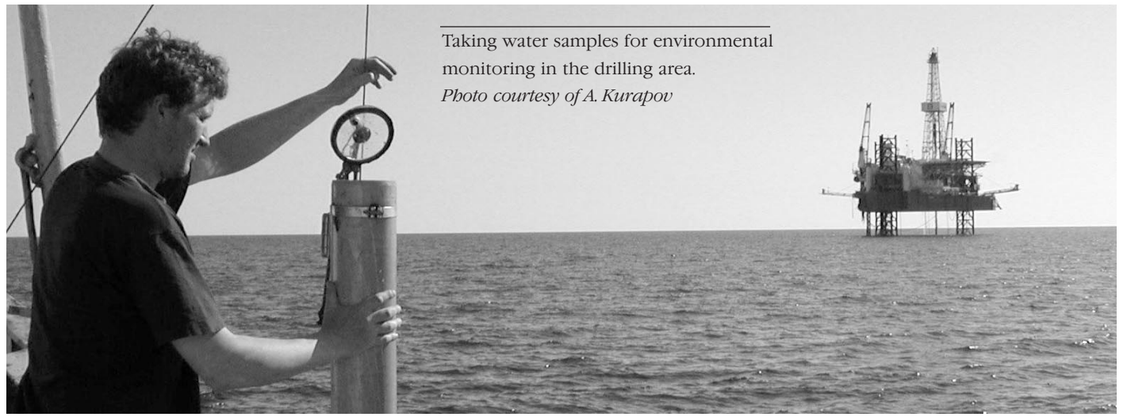
Note from the editors: *The Caspian Sea holds vast oil and gas resources that are only beginning to be fully developed. Experts estimate that somewhere between 18 and 35 billion barrels of oil lie in the Caspian, as compared to about 22 billion barrels in the United States or 17 billion in the North Sea. Considering the history of oil exploitation in other parts of the world, environmentalists are wise to be concerned about the threats the growing industry presents to Caspian ecosystems in pollution and potential oil spills. Nonetheless, oil resources offer great economic promise for the lower Volga region: though there is currently no commercial drilling in the northern Caspian, oil and gas giant LUKOIL estimates that its upcoming plans for drilling will create 100,000 to 130,000 new jobs between 2005 and 2007. For this reason, it is all the more important that measures be taken today to make the oil industry a safer partner in developing the northern Capsian. As the following article shows, LUKOIL, a major stakeholder in the region, has already taken significant steps in this direction.*

Boring platform.
Photo courtesy of A. Kurapov

By ***Aleksei Kurapov*** *and* ***Sergei Monakhov***

From the moment LUKOIL began its activity in the northern Caspian, which to date has included exploratory drilling at four offshore sites, the company has set a standard for environmental responsibility. LUKOIL's environmental ethic in the northern Caspian is based in a systematic approach to resolving current ecological problems and developing a long-term strategy for nature conservation. The company's priorities also include keeping abreast of scientific developments and using modern technology to implement environmental protection measures, as well as developing new technologies that will diminish environmental damage.

LUKOIL has taken a firm stance on controlling the ecological impacts of its own activities. In accordance with environmental legislation regulations, the company first received



Taking water samples for environmental monitoring in the drilling area.
Photo courtesy of A. Kurapov

permission from Russia's federal environmental assessment service before beginning exploratory drilling in 1999. Preventative measures form the backbone of LUKOIL's strategy of guarding against environmental damage and minimizing the unavoidable effects of oil drilling on the ecosystems of the northern Caspian. Policies, protocols, and equipment are regularly reviewed and updated.

In particular, the company has tried to follow the "zero waste" principle. "Zero waste" means that all industrial outputs formed on drilling platforms, with the exception of water from the outer energy cooling system, are gathered and sent to onshore sites where they are cleaned and processed. From the start of drilling in June 1999, 2,800 cubic meters of sludge, 20,000 cubic meters of mortar and polluted water, and 3,000 cubic meters of other waste was sent to be reprocessed. Proper rigging of the drilling platforms, transport systems, diesel fuel storage containers, cementing, and chemical reagents plays an important role in keeping the sea free from pollution.

Environmental monitoring is another key point in LUKOIL's environmental policy. Possessing the material resources to conduct state-of-the-art monitoring activities, LUKOIL teamed with the region's scientists to study Caspian ecosystems and the effect of drilling activities on them. In 1997, LUKOIL began conducting complex ecological research on an area of the sea considerably larger than the area on which LUKOIL had license to drill for oil. Today this research includes monitoring over 300 parameters, including hydrological, microbiological, chemical, ichthyologic, and ornithological indicators. A database on storms over the past fifty years has been compiled, as has a computerized map of atmospheric pressure during storms.

In an effort to increase the sensitivity of the observation system in districts where geological exploration (boring) was conducted, a dense network of monitoring stations covering an area of 400 hectares was set up around each drilling site. This monitoring involved checking around 60 indices, including observing atmospheric pollution, which had never before been studied above the Caspian Sea. Studying other fundamental elements of hydrometeorology, such as sea level, water currents, and winds offered project planners a better understanding of natural conditions and the potential dangers they presented to the stability of the boring platform. In 2001 work began on satellite monitoring of the Caspian region.

Boats from the State Fishing and Hydrometeorology Committee have been outfitted with the necessary equipment and are used for carrying out monitoring and various scientific expeditions. Specialists from scientific institutions in the Caspian region (the Caspian Fishery Scientific Research Institute, Astrakhan State Technical University, the Caspian Sea Scientific Research Center, Astrakhansky Zapovednik) and beyond (the regional center "Monitoring the Arctic" and the public scientific organization "Southern Sea Geology," among others) take part in this research. In this way, both the company and the public have access to additional resources for appraising the effects of oil and gas drilling on the ecosystems of the Caspian Sea, as well as measuring the effectiveness of LUKOIL's countermeasures for protecting these ecosystems.

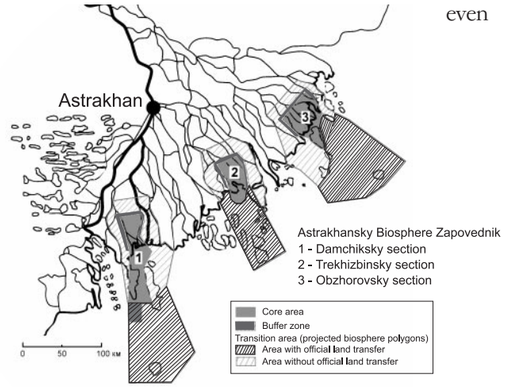
In addition to monitoring environmental conditions in general, LUKOIL has taken a lead in developing emergency rescue plans to guard against the harmful effects of oil spills and other industrial accidents. Using data gathered from monitoring sea conditions, the company has created mathematical models to predict the effects of emergency situations and develop and appraise counter-strategies. Technical systems are constantly monitored, and staff and personnel receive continuing training. Concrete plans for counteracting the effects of an oil spill include localizing the spill to collect

Shipment of waste.
Photo courtesy of A. Kurapov

The Role of Astrakhansky Zapovednik in Preserving the Biological Diversity of the Volga Delta

*By **Nina A. Litvinova***

The Volga delta and the northern Caspian are extremely rich in biological resources, making the region one of extreme value for people. Indeed, it is this wealth of resources that has often supported communities in the region. There were times when these resources were overused and wasted. But due to work in nature conservation – not to mention and nature's own potential for renewing itself – many of the region's biological resources have been preserved to this day, and continue to play an important role in the life of local communities.



Projected zoning for Astrakhansky Biosphere Reserve.
Map courtesy of N. Litvinova, edited by M. Dubinin

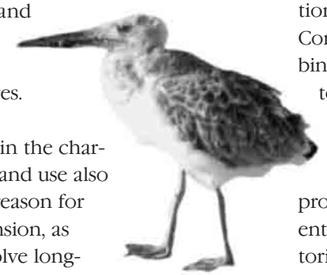
Nonetheless, in recent decades, a number of economic and political changes in the northern Caspian region have brought sharply increased anthropogenic stresses to the ecosystems of the lower reaches of the delta. Use of natural resources must be reevaluated and ultimately changed.

Among the most serious problems is the rise in the scale of hydrocarbon ore exploration and local processing. Projects are already in place for improving and creating new channels for transporting this ore. Areas slated for potential drilling in the future are located right next to the underwater delta: for example, a tract of sea leased by the Caspian Oil Company runs even with the southern edge of the Volga Delta Ramsar site, in places even crossing into the area, in defiance of the Ramsar charter. At the same time the company conducts its mandatory environmental assessment research only on the area slated for ore exploration, even though it is obvious that the area of influence of these prospecting sites (and all the more so mining/drilling sites) is much greater.

The role of fish as a source of income and food is growing. In turn this trend is leading to an intensification of fish in trade, including an increase in poaching. The increase in fishing in the mouth of the delta directly affects the conditions in which fish put on weight and spend the winter; it often leads to the devastation of their autumn and winter concentrations. These tendencies are particularly clear in current economic conditions, when the number of fishing organizations and companies has risen sharply while regulation of their activity has weakened. Even in years with favorable flood seasons, fewer and fewer fish are spawning, a fact which creates a threat to the future of fish reproduction. An official decision to move the commercial fishing zone's northern borders closer to the mainland means that fishermen now practically work in the jagged inlets that are important habitats for water birds, first and foremost, for the gray lag goose (*Anser anser*). Contending with illegal fishing is another important aspect of regulating the use of fish resources. An increase in unemployment, decline in agriculture, and comparatively easy means of earning much needed money through illegal fishing lead many people to commit this crime.

The number of tourists who come to the delta annually has grown significantly. Having lost the ability to travel to traditional resorts in the southern Caucasus and Crimea (which now belong to independent nations instead of the Soviet Union), these tourists now travel to the Volga delta. If unregulated, these tourists could cause significant harm to the nesting sites of many bird species, disturbing both the habitats and the birds themselves.

Willow trees hang over a stream in Astrakhansky Zapovednik.
Photo by A. Gorbunov



Changes in the character of land use also provide reason for apprehension, as they involve long-term rental agreements, particularly in the lower reaches of the delta. Thousands of hectares burn in unsanctioned spring and autumn fires, depriving birds of the nesting places and lowering the quality of feeding grounds for many animals. Now more than ever, responsible management of natural resources is needed to ensure that these resources will remain for generations to come.

Astrakhansky Zapovednik possesses many years' worth of information on the condition of ecosystems throughout the lower Volga delta. The science department of the zapovednik can and should provide the scientific and methodological resources needed to resolve a number of problems regarding the conservation of biological diversity.

At the same time, the basis for preserving biological diversity is preserving characteristic ecosystems in their natural condition. This conservation requires expanding the size of protected areas as well as using of natural resources in a sustainable way.

In following the requirements of the Seville Strategy for Biosphere Reserves, Astrakhansky Zapovednik can and should support the realization of the Sustainable Development Concept for the Volga delta by combining preservation of natural ecosystems with sharing of its scientific expertise. The creation of one or more biosphere polygons would not only increase the size of the protected area, but also support scientific research, environmental monitoring, and the testing and implementation of methods of sustainable nature use. The zapovednik should play a key role in providing the scientific foundation for the development of resource-conserving uses of the delta's wetlands.

Astrakhansky Zapovednik has already begun this work, planning the expansion of its southern borders farther into the Caspian Sea. The southern edge of these biosphere polygons would coincide with the borders of the Ramsar Important Wetlands site. A government meeting in April 2001 instructed Ministry of Natural Resources and *Glavrybvod* to work together with the executive branches of government in Russia's provinces to expand zapovedniks located in the lower Volga and northern Caspian regions. Russia's law on protected areas is also a foundation for this work, though the legal process for creating a biosphere polygon remains unclear. Nonetheless, the staff of Astrakhansky Zapovednik is confident in its work to expand the reserve's territory and change its zoning.

The first steps have already been taken. The Volodarskaya District Administration, where the Obzhorovsky section of the zapovednik is located, has already approved the turnover of part of the sea to the zapovednik for the creation of a biosphere polygon. The borders of the polygon in the Kamyzyaksky and Ikryaninsky Districts have received verbal approval at official meetings in these respective districts.

Biosphere polygons should thus be structural subdivisions of the zapovednik, financed by the zapovednik and protected by its staff of rangers in cooperation with the Fish and Wildlife Service and Federal Border Guard. Regions that become biosphere polygons can be used for commercial fishing, sport hunting and fishing, and tourism; clearly defined measures for controlling the level of environmental disturbance will strictly regulate these activities. Zapovednik staff as well as scientists in the Caspian Science Institute of Fishery and other scientific organizations will be responsible for developing recommendations for sustainable use of natural resources. Managing the biosphere polygons, including developing appropriate and specific regulations and measures for these areas as well as enforcing them,

One of Astrakhansky Zapovednik's projects involved sending young Siberian cranes (Grus leucogeranus) born in captivity into the wild. *Photo courtesy of Astrakhansky Zapovednik*

Protected Areas

What are Steppes?

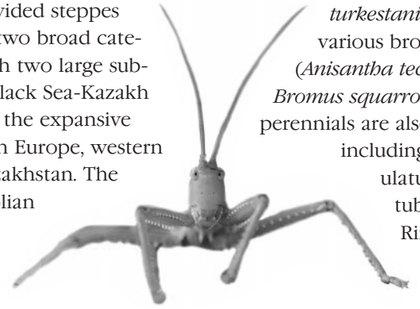
> How beautiful you are, my steppe, in April,
> With air as clean as crystal, open space,
> And little bells that ring with skylarks' trilling!
> You are a melody, which once a genius,
> Who since has passed from mem'ry, set anew
> Upon a living canvas filled with tulips.
>
> – D. Kugultinov

Allen's Encyclopedia tells us that scientific literature records at least 54 different meanings for the word "steppe." Generally speaking, the term refers to an expanse of grassland – called "steppe" in Eurasia, "prairie" in North America, "pampas" in South America, and "highveld" in southern Africa, to name a few. These grasslands include reedy swamps, forest and alpine meadows, grassy fields, and many other ecosystems. The largest zone of grassland is found in Eurasia, where a wide belt of steppe stretches 7,500 kilometers all the way from Hungary (where they are called "pushta") to the expanses east of Lake Baikal. After crossing through Eastern Europe, steppes dip through Central Asia, covering vast regions of Kazakhstan, China, and Mongolia, and rise upward through Siberia. There are monsoon-steppes in the Amur plain of the Russian Far East, black earth steppes in Ukraine and western Russia, and high mountain steppes in the Altai and Sayan Mountain Ranges. Steppes are even found in frozen Yakutia, where the remnants of the Daurian steppe ecosystems (which 15,000 years ago reached beyond the Arctic Circle) still remain on dry, southern-facing hillsides kept warm by the sun. Grassland ecosystems on other continents add further dimensions to this diversity.

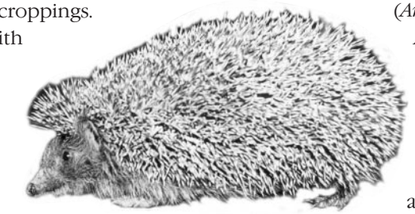
Nonetheless, there are invariable features present in all steppe ecosystems, including specific climate, vegetation, animal population, microflora, and soil. Steppes thrive in arid regions, decline in the face of too much humidity. Grasses and other thin-leafed plants that are able to survive periodic droughts dominate. These plants are deceptive, as most of their volume lies below the surface of the ground, creating a deep tangle of water-seeking root systems that led biologist I. Pachosky to name steppes "upside-down forests." Steppe plants are also notable for their ability both to store up minerals and decompose rapidly. Animal life in steppe ecosystems survives mostly on plants, such that even the most violent predators can eat plants when need arises, especially in times of drought. Almost all steppe animals also have a close relationship with the underground world of the steppe. Steppe microflora is important for helping to transform decaying plants into humus, a key component of steppe soil. Humus is a complex mixture of organic compounds formed when plants decompose. When combined with calcium, a common feature of sedimentary strata spread over areas of steppe, this humus forms

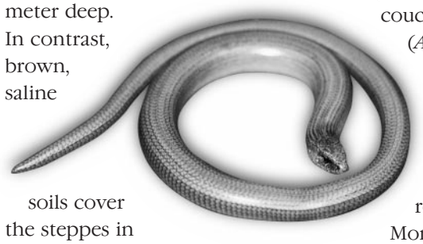
A Catalogue for Eurasia's Steppes

In the 20th century, Soviet geobotanists divided steppes of Eurasia into two broad categories, each with two large subdivisions. The Black Sea-Kazakh steppes include the expansive plains of Eastern Europe, western Siberia, and Kazakhstan. The Daurian-Mongolian steppes cover the mountains and plateaus that stretch from the Altai almost as far as the Pacific Ocean, through Mongolia and deep into China.

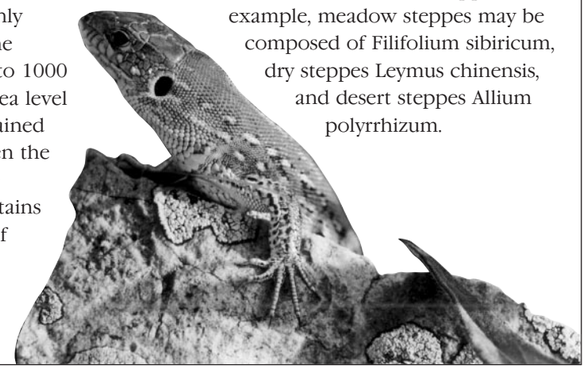


Thick belts of varied steppe zones (forest-steppe, steppe, dry steppe) pan across the flat plains of the Black Sea-Kazakh steppes in distinct layers from north to south. Much of these regions are covered in rich, black soil with a layer of humus more than a meter deep. In contrast, brown, saline soils cover the steppes in the southern reaches of Ukraine (on the shores of the Black Sea and Sea of Azov), the highlands east of the Volga River, and almost all of Kazakhstan. The Ural River marks a further separation between the two subdivisions of the Black Sea-Kazakh steppes: to the west, the climate is continental but temperate, with 450-800 mm of annual precipitation, while the east is far dryer and harsher, with annual precipitation of 250-600 mm. On both sides of the river, spring is comparatively gentle, warm, and humid, supporting an abundance of annual flowers, such as common whitlow grass (*Erophila verna*), dwarf alyssum (*Alyssum turkestanicum*), and various bromes (*Anisantha tectorum*, *Bromus squarrosus*). Spring perennials are also common, including Crocus reticulatus, Geranium tuberosum, Rindera tetraspis, and multiple tulips (*Tulipa spp.*). Throughout the summer various feathergrasses (*Stipa spp.*) dominate. Small root systems allow Stipa orientalis to flourish on bare, rocky outcroppings. Other plants with small root systems that survive well on these steppes include fescues (*Festuca spp.*), couches (*Agropyron spp.*), meadowgrasses (*Poa spp.*), and Mediterranean hairgrass (*Koeleria cristata*).





In contrast, mountainous relief dominates the Daurian-Mongolian steppes, bringing divisions between flora communities not by latitude, but altitude. The only flat plains in the region lie 500 to 1000 meters above sea level on the well-drained plateau between the foothills of the Khangai Mountains and outskirts of the Great Khingan Mountains.



Black earth covers only small regions, while loamy, rocky brown soils are widespread. The climate is harshly continental, with regular droughts. Spring is cold, windy, and dry. As in the Black Sea-Kazakh steppes, feathergrasses dominate here as well, but in different species: *Stipa krylovii*, *S. baicalensis*, *S. grandis*. In desert steppes the feathergrasses *S. gobica*, *S. Glareosa*, and *S. klemenzii* are specially adapted to grow low to the ground, while festucas grow only in the mountains.

Mugwort bushes (*Artemisia frigida*, *A. zerophytica*, *A. caespitose*) are common, but there are no spring annuals, and among perennials that bloom in spring, only the tulip Tupila uniflora. In particularly wet years, annual mugworts (*A. scoparia*, *A. pectinata*, *A. palustris*, *A. adamsii*) and plants in the Dontostemon genus grow abundantly. A specific feature of the Daurian-Mongolian steppes is the dispersion of unique steppe communities not found at all in the Black Sea-Kazakh steppes. For example, meadow steppes may be composed of Filifolium sibiricum, dry steppes Leymus chinensis, and desert steppes Allium polyrrhizum.

The Fate of the Steppes of Western Siberia and Kazakhstan

*By **Vladimir Nikolaev***

Throughout much of history, the vast steppes of Kazakhstan and Western Siberia were the home of nomadic herders. In the first half of the 20th century, Russian and Soviet expansion and development clamped down on this traditional way of life, forcing local residents to settle and raise domesticated animals. Then in the 1950s, central party planners in Moscow made a decision to turn the steppes into vast fields of crops. The decision was perceived not only as a way to ensure an adequate grain supply for the Soviet Union, but also as a method for creating jobs, modernizing sparsely populated regions, and building a bright communist future.

In making these plans, party leaders took into account the success of farming in the most productive agricultural region of Russia and Ukraine, where thick layers or rich black earth and brown earth soils provided for bountiful harvests. But in contrast to these eastern European steppes, Asian steppes were less often used for growing crops. The climate in these regions was harsher and more continental, and more than half of the steppes were marred with large rock outcroppings or had sandy or saline soils. The average harvest from these regions was comparatively low and farming unsustainable in the long run. The peasant farmers who moved east of the Ural Mountains in the 1800s recorded that harvests grew progressively smaller year after year. Even in the most productive lands of western Siberia, settlers in pre-Revolutionary Russia noted that they had bountiful harvest only two or three times per decade, leading to the local proverb "one year will feed four years."

Perhaps looking for a scientific basis for expanding agricultural development in Central Asia and western Siberia, in the 1950s communist party planners sent teams of scientists to map these virgin steppes and determine what lands were suitable for growing grain. The geographers noted large regions of mixed sandy loam and black earth, as well as dark brown soils. But in many cases the scientists recommended these lands not be used for agricultural purposes because of the devastating wind erosion bound to occur if the areas were plowed. In other cases, they recommended selective plowing with special methods for protecting the soil. But this advice was ignored, and the steppes were plowed nearly from horizon to horizon. In the end 40 percent of the steppes of western Siberia and Kazakhstan became farmland, even though these regions were so arid that growing crops was a risky endeavor. Much of the remaining 60 percent of steppe lands continued to be used to pasture domestic livestock.

Farming the Asian steppes proved far more difficult than expected. In the first years after plowing a region of virgin steppe, workers on collective farms used farming methods traditional for European Russia. But these methods were unsuitable for Asian steppes. Beyond the droughts that were common in Asian steppes, wind erosion and subsequent dust storms quickly became a scourge to farming efforts. Comparatively light breezes swept away loam, and stronger winds pulled away even heavier clayey soils that had been loosened by plowing. Within five to seven years after first being plowed, the rich black and brown soils of the Asian steppes had almost completely floated away. Dust storms were common in spring, when the surface of the dry soil was not protected with crops or other vegetation. By the mid-1960s, many fields had become human-made sandy deserts; harvest fell to low levels on fields that remained cropland. In many cases, fields were simply abandoned after they lost their agricultural value. Even the general climate of the region began to change: historical records show that nearly half of the past hundred years have been drought years, and that these drought years have come with ever increasing frequency since the 1930s.

Gathering the harvest produced its own complications. Asian steppes must be sown in late May, comparatively later than European steppes, meaning that harvest also comes later in the season, often lasting late into September. But in many years, bad weather begins well before the harvest is complete. In such conditions, gathering and threshing grain is nearly impossible, and losses heavy.

Recollections from a Geographer's Notebook

The Kustanaiskaya Expedition of the Geography Department of Moscow State University was one of the teams sent from Moscow to map and evaluate the Kazakh steppes for their value as potential farmland. Between 1955 and 1959 the geographers on the expedition conducted large-scale soil surveys and agricultural assessments on a number of regions of virgin steppe.

Valentina Maksimova, then a laboratory assistant at Moscow State University, recalls the beauty of the expansive steppes the first year she went to what was then the Kazakh Soviet Socialist Republic. Brightly colored tulips would burst into bloom on a single day, covering the landscape as far as the eye could see, and already be withered the next. Knowing that in all likelihood the steppe she was mapping would soon disappear forever, she was both filled with a sense of sadness and keenly aware of the importance of preserving what she could of the steppes on paper in her description of plant communities and landscapes.

When she returned to Kazakhstan the next year, she was surprised to find grain already growing on the entire territory she and her colleagues had mapped, apparently without the slightest regard to their recommendations. In the regions with rich, dark soil, the wheat was more than two meters tall; right next to it in saline fields the same wheat was only knee-high.

She and her colleagues nonetheless continued their observation, recording the steppes and making recommendations for agricultural use of the land. In one region, even before they had finished taking an inventory of soil and plant communities, a tractor came rolling in, ready to plow the steppes. The scientists waved for him to wait while they finished cataloguing the tract of steppe, and the tractor driver benignly obliged. After scribbling down their notes, the scientists left, and the tractor plowed under the field of waving grasses.

It had become clear that their expedition was but a pretense for a scientific basis for expanding agriculture in Kazakhstan. In fact the decision to plow under Kazakhstan's steppes had been made long ago.

*Based on an interview with **Valentina F. Maksimova**, retired Senior Lecturer of Geography at Moscow State University.*

Preserving the Steppes of Russia, Ukraine, and Kazakhstan

The steppe zone of Eurasia stretches 13,000 kilometers from west to east and from 500-900 north to south, covering areas as varied in landscape as in history and culture. Farming in present-day Russia and Ukraine destroyed many of these steppes long ago, and large stretches of steppe farther east fell to plows as a part of agricultural development in the second half of the 20th century. Despite this history, however, pockets of intact steppe have remained. Some have been saved by chance, lying in areas long used for military training or along railroads, or in other places where for various reasons they escaped being plowed. In other cases, scientists actively campaigned for the creation of protected areas when they realized the value of these pockets of disappearing steppe. Even so, throughout the vast steppe zone or Eurasia, only a small number of protected areas preserve the remaining wild steppe ecosystems.

The greatest number of zapovedniks and national parks with regions or fragments of wild steppes are located in Russia. But only a few of them, however, have areas with more than 200 hectares of steppe: Altaisky, Bogdinsko-Baskunchaksy, Galichya Gora, Daursky, Dzherginsky, Belogorye, Orenburgsky, Privolzhskaya Lesostep, Rostovsky, Sayano-Shushensky, Ubsunurskaya Kotlovina, Tsentralno-Chernozemny, Khankaisky, Khakasky, and Chernye Zemli Zapovedniks, as well as Tunkinsky and Khvalynsky National Parks. Others have only small fragments of steppe ecosystems of various sorts, including "true" steppes, meadow steppes, desert steppes, rocky steppes, and high mountain steppes.

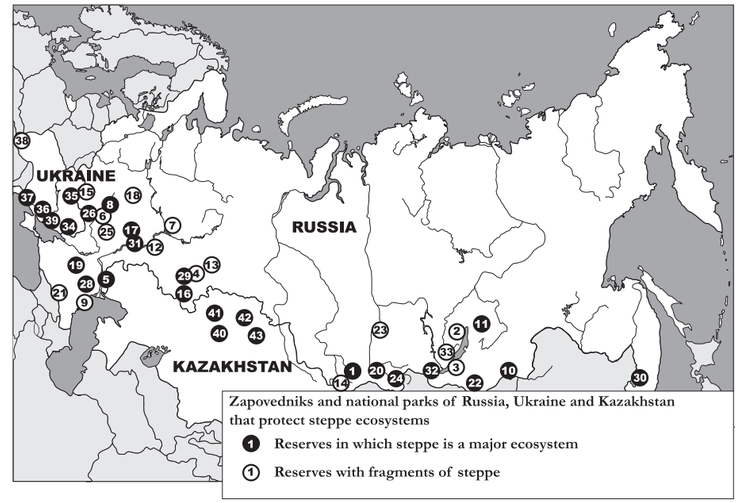
Even though the total area of steppe communities in Russia's zapovedniks covers less than 150,000 hectares – less than 0.3 percent of the area of the nation's steppe zone – the species diversity of flora in these small regions is great. Nonetheless, preliminary tallies show that protected areas contain around 50 percent of the flora species and communities represented in all of Russia's steppes. In other words, another 50 percent of steppe plant species in Russia have no guarantee of conservation. Scientists have shown that founding another five or six zapovedniks in the steppe zone would raise the representative coverage of steppe flora in protected areas to 85-90 percent.

Nearly 40 percent of the nation of Ukraine is located in the steppe zone. The most interesting areas of virgin steppe, which preserve unique complexes of southern European steppes, are concentrated in this area. Five zapovedniks – Askania-Nova, Ukrainian Steppe, Lugansky, Chernomorsky, and Rostochye – as well as one national park (Azovo-Sivashky) protect these natural treasures. The most famous tract of steppe, the 11,054-hectare Askania-Nova, is a biosphere reserve founded in a region that has been protected since 1898. The protected areas along the Black Sea and Sea of Azov have only fragments of steppe ecosystems, but nonetheless these small tracts of grassland preserve a multitude of plants and varieties of steppe that were once widely spread along the coasts of these seas. Altogether, Ukrainian protected areas cover 0.2 percent of the area of the steppe zone.

Two zapovedniks, Korgalzhynsky and Nauryzumsky, protect steppe in the vast expanses of Kazakhstan. Here regions of grassland with large rock outcroppings have biological diversity that is rivaled only by steppe regions of the Crimea. Covering 2,600,000 hectares, the Tengiz-Korgalzhynsky Lakes that are protected by these two preserves are the largest system of lakes in the steppe zone. These wetlands house a great diversity of birds (112 species) and serve as an important resting place along major migration routes through Kazakhstan. Lake Tengiz alone is able to feed 15 to 16 million birds per year. The lakes represent the northernmost nesting grounds of the great flamingo (Phoenicopterus ruber), and provide nesting grounds for 350,000 birds annually. Beyond these two zapovedniks, fragments of steppe exist in Kokshetav and Bayanaul National Parks and in 24 zakazniks (special purpose preserves). Nonetheless, only 0.3 percent of the land area of Kazakhstan's steppes have federal protection. In Kazakhstan, the small size of this figure is a particular problem because vast regions have still not been fully scientifically analyzed, meaning that entire ecosystems – especially unique and rare ones – may not be represented in these protected areas. Vast regions of unplowed land still exist in Kazakhstan and western Siberia that could become the backbone of a stronger network of protected areas.

Steppe in southern Russia.
Photo by A. Vlasov

Taken as a total, the acreage of steppe ecosystems in protected areas is startling low in comparison to other ecosystems. Why, if protected areas cover a full four percent of the territory of Ukraine, do steppe reserves cover a mere 0.2 percent of the area of steppe in country? Statistics for Russia and Kazakhstan are similarly disproportionate. These figures reflect the fact that by the time nature conservation received attention in the Soviet Union, very little virgin steppe was left in Russia, Ukraine, and Kazakhstan. In comparison, other ecosystems, such as taiga, broadleaf forests, and tundra, are better and more broadly protected. Forest zapovedniks, for example, protect 95 percent of the varieties of plants and plant communities represented in Russia's European and Siberian taiga forests.



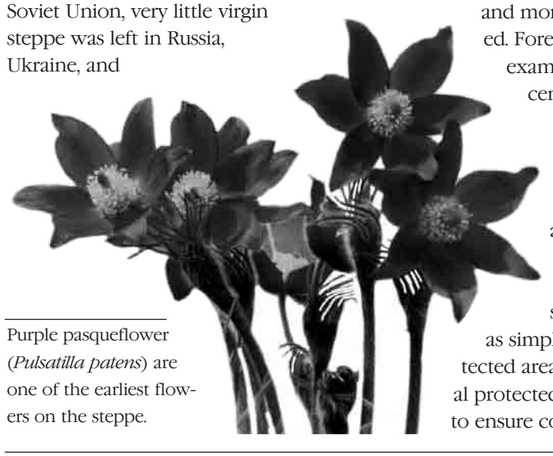
Zapovedniks and national parks of Russia, Ukraine and Kazakhstan that protect steppe ecosystems
1 Reserves in which steppe is a major ecosystem
1 Reserves with fragments of steppe

RUSSIA
Zapovedniks
1. Altaisky
2. Baikalo-Lensky
3. Baikalsky
4. Bashkirsky
5. Bogdinsko-Baskunchaksky
6. Voronezhsky
7. Volzhsko-Kamsky
8. Galichya Gora
9. Dagestansky
10. Daursky
11. Dzherginsky
12. Zhigulevsky
13. Ilmensky
14. Katunsky
15. Belogorye
16. Orenburgsky
17. Privolzhskaya Lesostep
18. Prioksko-Terrasny
19. Rostovsky
20. Sayano-Shushensky
21. Severno-Osetinsky
22. Sokhondinsky
23. Stolby
24. Ubsunurskaya Kotlovina
25. Khopersky
26. Tsentralno-Chernozemny
27. Khakassky
28. Chernye Zemli
29. Shulgan Tash
30. Khankaisky
National Parks
31. Khvalynsky
32. Tunkinsky
33. Pribaikalsky

UKRAINE
Zapovedniks
34. Ukrainian Steppe
35. Lugansky
36. Askaniya Nova
37. Black Sea
38. Rostochye
National Parks
39. Azovo-Syvashky

KAZAKHSTAN
Zapovedniks
40. Korgalzhynsky
41. Nauryzumsky
National Parks
42. Kokshetav
43. Bayanaul

Map by M. Dubinin



Purple pasqueflower (*Pulsatilla patens*) are one of the earliest flowers on the steppe.

Preserving the steppes is no longer as simple as creating protected areas, though additional protected areas are required to ensure conservation of more species of steppe flora. But today's challenge is truly to reconstruct areas of steppe using the remaining islands of virgin steppe as a guide. This process requires a complex and thorough approach, making full use of existing scientific and practical knowledge, all the while continuing to study the dynamics of these grasslands.

References:

The Steppes of Eurasia (in Russian). Leningrad: Nauka, 1991.

Zolotukhin, N.I. "Zapovedniks of Russia and Protection of Steppe Flora" (In Russian). *Problems of Preserving and Restoring Steppe Ecosystems*. Orenburg, 1999.

Natural Steppe Regeneration on Old Fields

Note from the editors: *Fields that have been plowed and later abandoned may, given time and proper conditions, revert naturally to wild steppes. The problem is that few old, abandoned fields in Russia lie near or adjacent to virgin steppes. Nonetheless, scientists have found ample opportunity to study this method of steppe regeneration on the old field now protected in Tsentralno-Chernozemy Zapovednik.*

By ***Tatiana Filatova***,
Nikolai Zolotukhin,
Irina Zolotukhina,
and ***Vasily Sobakinskikh***

Tsentralno-Chernozemny Zapovednik was founded in 1935 to preserve three rare and isolated regions of unplowed steppe in southern Russia. But over its long history, the zapovednik grew, attaining several new tracts of land, including old fields that had once been used in farming. These old field have offered the zapovednik's scientific staff a unique opportunity to watch the natural succession processes unfold on fallow lands.

Five of the six sections that comprise the reserve today contain fields once used for farming, all of which vary in size, configuration, length of time they have lain fallow, and speed and direction of natural regeneration. Altogether, old fields make up about ten percent of the zapovednik's area. The largest (290 ha) and oldest (60 years) of these old fields, called Dalneye Polye ('distant field' in Russian), is located on the Kazatsky section of the zapovednik. A 1.5-hectare field in the Streletsky Steppe section was used as a garden until the beginning of the 1970s. The Bukreeva Barma section has a 20-hectare old field that was plowed until the beginning of the 1970s and then mowed bare annually until 1986, when the region became part of the zapovednik. The Barkalovka section has several old fields that have lain fallow for 30 years, with a total area of about 18 hectares. The Zorinsky section, which became part of the zapovednik just four years ago, has more than 200 hectares of fallow lands, which range in age from one to eight years.

Careful observation is crucial to understanding natural steppe succession. *Photo by A. Vlasov*

The natural steppe succession process of old fields is one that takes place where plant communities have been ruined but where soil structure is intact and still contains many small animals and microorganisms. Most scientists consider this kind of succession "fast" succession, meaning that it can reach near completion within a single human generation (in comparison, natural regeneration of tundra takes more than a hundred years, and forests may reach an old-growth stage only after several centuries). Nonetheless, if the fallow land has a large area and is isolated from any sites with natural vegetation, the process of natural regeneration may take several decades, and many scientists doubt that they can ever be restored to a virgin state.

In Russia, the classic observation site for studying fallow lands is the Kamennaya Steppe near the city of Voronezh, where various fields have lain fallow since 1882, 1885, 1890, 1895, 1900, and 1908, and have been studied by some of Russia's most famous steppe scientists. Tsentralno-Chernozemny Zapovednik lacks fallows so old, but possesses one very important advantage that the Kamennaya Steppe fallows lack: tracts of flat virgin steppe, which can serve both as sources for seeds and also as models for comparison.

Observations in Tsentralno-Chernozemny Zapovednik have shown that time is not necessarily the most important factor in steppe regeneration. The 60-year-old fallow in the Kazatsky section is far less developed than the 30-year-old fallow of the Streletsky Steppe section. Conditions for natural steppe regeneration in the Streletsky section were simply superior: the tract of fallow land was small (1.5 hectares) and was bordered on much of its perimeter by the Streletsky Steppe, an area of virgin steppe that had never been plowed. In comparison, the 290-hectare Dalneye Polye was a large field that had no contact with virgin steppe.

Similarly, the 10-hectare fallow in the Barkalovka section of the zapovednik has lain fallow for 30 years, but has not shown positive signs of developing into healthy steppe. Forest and thickets encase the region, separating it from the steppe plant communities nearby. After the field was abandoned, it was never mown to the ground, nor was it sown with perennial plants. To this day, wild boars (*Sus scrofa*) regularly tear up the sod in their search for food, so that a basic ground cover has never had a chance to develop. All of these factors exert a negative effect on steppe regeneration on the field, making for a very slow and generally unsuccessful regeneration process. In particular, the invasion of trees and shrubs from the surrounding forest offers little hope that the tract will ever become a region with healthy wild steppes.

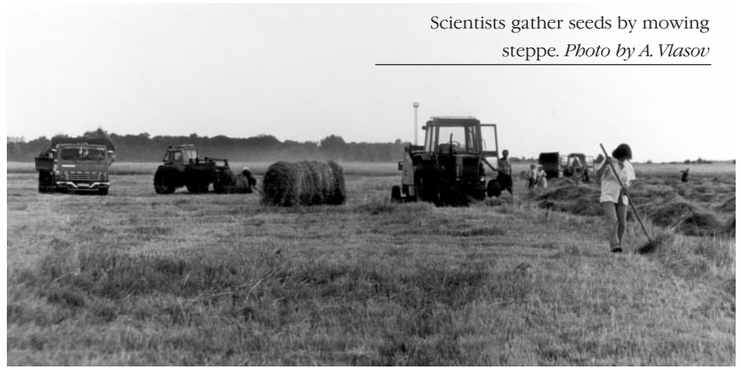
Mowing is an important part of maintaining the steppes of Tsetnralno-Chernozemny Zapovednik, and also provides hay for local residents.
Photo by A. Vlasov

steppes are characterized by a rich collection of flora in which multiple species dominate, rapid – almost weekly or biweekly – changes in the physical appearance of the steppe, and a complex vertical and horizontal grass structure. Observations have also shown that natural regeneration often results (at least in the first years of regeneration) in steppe that lacks rare and endangered plant species that may be less hardy or less successful at self-propagation. For example, the fallow test sites in Tsentralno-Chernozemny Zapovednik are poor in locally endangered species such as pheasant's eye (*Adonis vernalis*), dwarf sedge (*Carex humilis*), Centaurea sumensis, Delphinium cuneatum, Hyacinthella leucophaea, and bearded iris (*Iris aphylla*), all of which are rather common in regions of virgin steppe within the zapovednik. Some species, such as purple milk-vetch (*Astragalus danicus*) and

Virgin meadow

Artificial Steppe Restoration in Russia and Ukraine

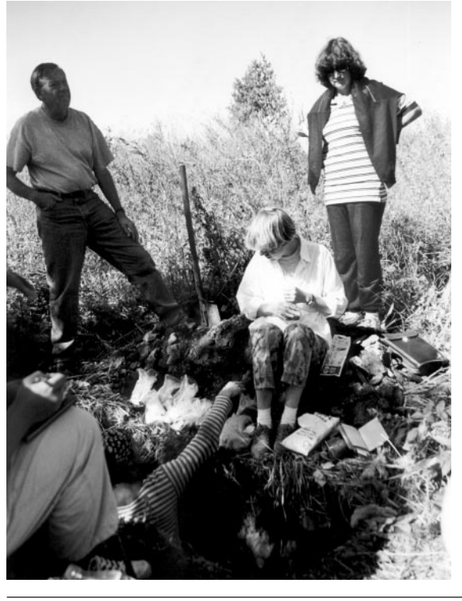
*By **Tatiana Filatova** and **Nikolai Zolotukhin***



Scientists gather seeds by mowing steppe. *Photo by A. Vlasov*

As agricultural development swept across Russia in the 19th and 20th centuries, little thought was given to the fact that once plowed under, a tract of wild steppe would be gone forever. But today as collective farms have fallen into ruin and many lands once used for growing crops lie fallow, conservationists have directed increased attention to using artificial means to restore natural steppe vegetation on these lands. The problem is still poorly studied, and the methods developed complicated and laborious, but scientists working throughout Russia have built a foundation for further work in artificial steppe restoration.

In Russia, Stavropolsky Botanical Garden has the most experience in restoring steppes on abandoned farmland. Since 1961, scientists in this botanical garden have experimented with various methods for restoring meadow steppes on tracts of land around one hectare in area. These experiments have focused on two basic methods: transplanting sod and sowing seeds. The first method involves attaining pieces of sod from virgin steppe and transplanting them in a prepared field. With shovels or a special plow, scientists cut pieces of sod 10x20 or 20x20 centimeters in area and 30 centimeters deep out of a tract of virgin steppe, then transplant these pieces in a checkerboard fashion 60 centimeters to one meter apart. The new tract of land is prepared ahead of time by plowing it deeply in the fall, then shallowly in the spring before transplanting. Within five to seven years, the plant communities that grow up in this area are almost identical to their parent communities. Experiments using even small plugs of sod have also offered positive results. This method of steppe regeneration does, however, cause trauma to the original site of virgin steppe, so whenever possible scientists harvest sod from areas already slated for plowing or construction, such as future road construction sites.



Research continues in Tsentralno-Chernozemny Zapovednik.
Photo by A. Vlasov

The second basic method involves mowing areas of virgin steppe to gather natural mixtures of seeds. A mechanical mower cuts down a tract of steppe, thereby gathering a mix of seeds, stems, leaves, and flowers. By choosing several similar tracts of steppe and mowing each once at several different times of year, scientists are able to harvest a wide variety of seeds. Scientists then spread this mix of seeds and cut plants – which may first be dried or else used immediately after each subsequent mowing – over a tract of plowed land in a proportion of about 25 to 30 kilograms of plant material per hectare. In Russia, the artificial grass communities that grow up from this seeding have been given the name *agrosteppe*.

These two methods have been tested and applied in several areas in Eurasia's steppe zone. In 1981 scientists in the Ukrainian Steppe Zapovednik used seeds gathered from mowing parts of the zapovednik to foster agrosteppe in a plot of fallow land 100x100 meters square. Within five years, scientists observed that the structure and productivity of the test square nearly mirrored that of the natural communities.

A mixture of methods was applied to a quarter-hectare test site on the historic steppes of the Field of Kulikovo in western Russia in 1986-1987. Scientists and young student helpers transplanted plugs of feathergrass (*Stipa pennata*) and also sowed a mixture of seeds on the site. On a second test site of similar size nearby, they spread dried plants from three tracts of virgin steppe that had been mowed in three different seasons. Within three to four years, the first test site showed the seasonal changes in flora typical of virgin steppes, while the second showed an entirely different sequence of seasonal changes. Nonetheless, some factors showed that the second test site was also beginning to form natural steppe ecosystems.

In the steppes of Bashkiria, scientists from the Ural Mountains Branch of the Russian Academy of Sciences began a study in 1989 to test several methods of seeding lands that were farmed in the 1950s, but had lain fallow for several years. Scientists would attain seed mixtures by mowing 0.1-hectare tracts of virgin feathergrass steppes that incorporated a wide variety of grasses, then spread these seeds onto tracts of recently plowed and raked fields 0.5 to one hectare in area. After the seeds had been sown, a heavy roller would press them into the soil. Five years later, succession indicators showed that more than 50 percent of the plant communities of the original virgin steppe were now present in the agrosteppe. The scientists involved considered this a positive result, noting that it was nearly impossible to create identical steppe communities using a seeding method.

One of the most recent experiments in steppe restoration was undertaken in Tsentralno-Chernozemny Zapovednik under the aegis of the Global Environment Facility (GEF) project "Conservation of Biodiversity in Russia" from 1999-2001. In 1998 the zapovednik, which was founded in 1935, acquired a new 225-hectare tract of farmland and fallows, called the Zorinsky section. The tract showed some signs of natural steppe regeneration, but scientists at the reserve decided to conduct an experiment in artificial restoration on a 6-hectare plot in the Zorinsky section. Another of the zapovednik's six sections, the Streletskaya Steppe, became the source of seeds for the test plot. Sod transfer was not even considered both because of the harm it might cause the virgin steppes of the Streletskaya Steppe, and also because the size of the region to be restored would demand intensive labor and equipment.

Instead, scientists chose 12 hectares of the Streletskaya Steppe and mowed two hectares at a time six times between July and October. After each mowing, the seeds and cut plant material were spread over the test plot. Not enough time has passed to be able to analyze the full results of this experiment, but significant differences in soil composition between the parent and daughter sites probably preclude the possibility of a near reproduction of the flora communities of the Streletskaya Steppe. Nonetheless, scientists believe they have a firm basis for their hope that the Zorinsky section will become richer in steppe flora, including endangered species.

Research in restoring meadow steppes in Russia has been limited both by time and scale of experiments. Transplanting sod from virgin steppes for restoring agricultural lands to their natural wild state is costly, laborious, and disturbs the steppes from which sod is taken. To date, no experiments have attempted to restore a large (more than a few hectares) tract of steppe.

Research continues in Tsentralno-Chernozemny Zapovednik. Photo by A. Vlasov

Endangered Species

The Saiga Antelope in Europe

A note from the editors: *With population numbers still in the hundreds of thousands in Kazakhstan, the European subspecies of saiga antelope* (Saiga tatarica tatarica) *has not received official status as an endangered species. Nonetheless, a catastrophic decline in population over the past 20 years has awakened significant concern in the conservation community, leading to inclusion in Appendix II of the Convention on International Trade in Endangered Species (CITES) in 1995. Meanwhile the Mongolian subspecies of saiga* (S. t. mongolica)*, considered endangered, survives in two small populations in Mongolia.*

A small antelope with a large, bulbous nose that filters dust, the saiga antelope (Saiga tatarica) is perfectly adapted to life on the arid steppes of Central Eurasia. The twisted fortunes of the European population of saiga antelope, however, reflect changes in human settlement patterns, the path of Russian history and transformations in land and agricultural policy. Though as recently as the 17th and 18th centuries the saiga's range stretched through present-day Ukraine, by the mid-19th century the antelope had already disappeared from everywhere in Europe except for a small region of dry plains on the northwestern shores of the Caspian Sea. These lands were occupied by the Kalmyks, a nomadic people that Russian poet Alexander Pushkin called "friends of the steppes." By adopting a pattern of seasonal migrations and rearing mixed herds of horses, cattle, sheep, goats and camels, the Kalmyks made the best of this driest corner of Europe and managed to live a peaceful coexistence with the saiga. But this relationship between the Kalmyks and the saiga changed drastically in the mid-19th century with the arrival of a flood of settlers from central Russia.

Unfamiliar with the harsh environment in which they had settled, the settlers readily plowed the steppes to plant crops. With traditional wild pastures used for farming and herds of livestock pressured onto smaller and smaller areas, by 1915 much of the steppes had lost its plant cover and was becoming sandy desert. Not only were the settlers seriously affected by the deterioration of the steppes, but so also were the saiga: by the early 20th century, just a few hundred individuals lingered on the innermost parts of the Kalmyk land.

The Bolshevik Revolution of 1917 propelled a flurry of changes in the Kalmykian steppes. Civil war, drought, famine and disease took a heavy toll on the human population as well as on their flocks and herds. On the eve of the Revolution, there were about 1.4 million head of livestock in Kalmykia; by the early 1920s, numbers had declined to less than 300,000. Policy changes in 1929 forced Kalmyk herders to abandon their nomadic ways of life and settle in villages. By 1936, 25 million peasant homesteads had been collectivized into 240,000 large-scale collective farms. "Collectivized" animals were increasingly split into single-species units

The Republic of Kalmykia is the last remaining habitat of the saiga antelope in Europe. *Photo by T. Bakinova*

and concentrated on the most productive pastureland. At the same time, extensive tracts of leaner land too unsuitable for livestock farming were largely retired from use, in some cases for several decades. The saiga thrived on these semi-desert lands, aided by a ban on hunting in Kalmykia from 1919 to 1951. The chaos of the Second World War and its aftermath, which included the deportation of over 90,000 Kalmyks to Siberia, left Kalmykia in even further desolation. With extensive uninhabited areas to live in, the saiga population increased to more than 800,000 individuals by 1958.

By 1965, however, the saiga population in Kalmykia plummeted to just over 100,000 animals, a 65 percent drop in just seven years. Presumably massive hunting pressure – both legal and illegal – was the primary cause of this decline. Officials eventually responded to the fall in saiga numbers by keeping commercial hunting at low levels or even prohibiting it in certain areas. These restrictions lasted from 1965 to 1975, but it was only in 1973 that numbers began to rise again.

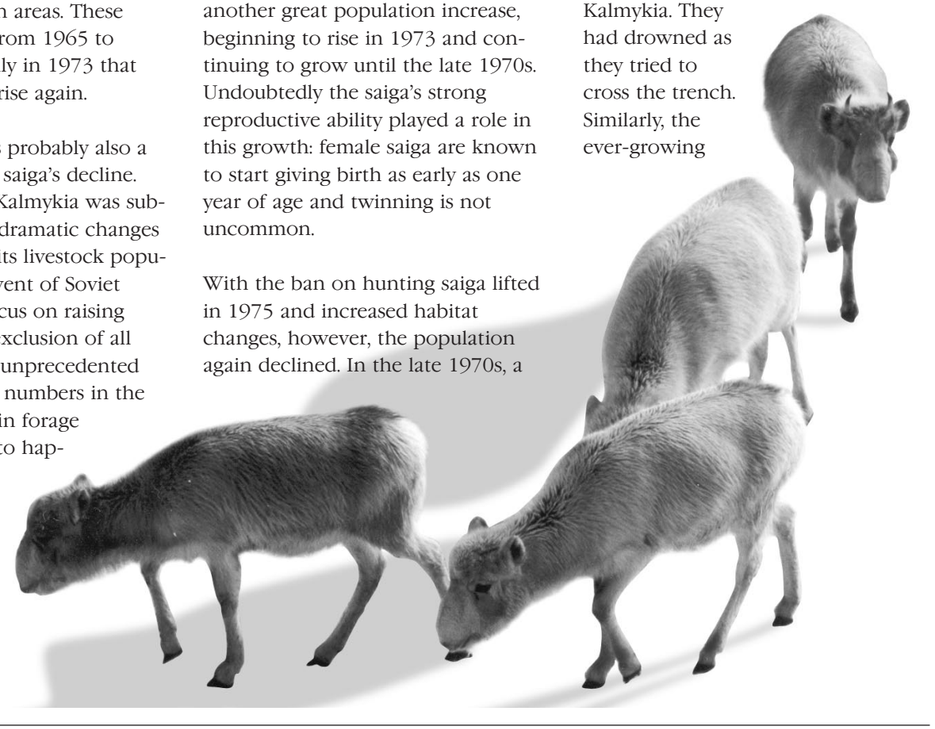
Loss of pasture was probably also a major factor in the saiga's decline. During the 1960s, Kalmykia was subjected to the most dramatic changes in the structure of its livestock population since the advent of Soviet power, a central focus on raising sheep to the near exclusion of all other animals. The unprecedented explosion of sheep numbers in the area soon resulted in forage deficits, which led to haphazard attempts to "improve" natural pastures by turning them into agricultural fields that would produce more fodder. During the 1960s, Kalmykia saw over 150,000 hectares of its pastureland plowed under in pursuit of this goal. By the early 1970s, wind erosion had made a desert out of nearly every hectare of these newly created agricultural fields.

Moreover, the mid-1960s witnessed the beginnings of large-scale irrigation in the north of Kalmykia, a lake region that had once been the saiga's principal calving areas. The area had large tracts of undeveloped flat terrain with abundant seasonal forage (*Alyssum, Bromus, Euphorbia*, and *Poa species*), making it ideal for female saiga to deliver their young. With the construction of irrigation facilities, however, the saiga population was forced to spend the birthing season in central areas of Kalmykia where foraging conditions were notably worse.

Viewed against this background, it is surprising that the saiga showed another great population increase, beginning to rise in 1973 and continuing to grow until the late 1970s. Undoubtedly the saiga's strong reproductive ability played a role in this growth: female saiga are known to start giving birth as early as one year of age and twinning is not uncommon.

With the ban on hunting saiga lifted in 1975 and increased habitat changes, however, the population again declined. In the late 1970s, a large new irrigation facility transformed what was left of the saiga's favorite spring pastures into a rice plantation. Meanwhile, the remaining steppe tracts in the western parts of Kalmykia and adjacent provinces were turned into a uniform mass of plowed fields, interrupted only by newly built canals and roads. As a result, many of the saiga's usual summer retreats were eliminated.

These canals – a network which eventually reached over 1,300 kilometers – reduced the saiga's mobility considerably. Large herds of saiga placed a heavy burden on pastures, which became increasingly overgrazed. Furthermore, the canals obstructed seasonal migrations, taking a particularly heavy toll on newborns accompanying their mothers on their way from calving grounds. In May 1977, for example, over 14,000 saiga, mostly infants three to ten days old, were found dead along a five-kilometer stretch of an irrigation trench in central Kalmykia. They had drowned as they tried to cross the trench. Similarly, the ever-growing



Saiga antelope (*Saiga tatarica*). *Photo by T. Sorokina*

Male saiga are hunted for their horns. *Photo by T. Sorokina*

network of roads and transportation routes also hampered the animal's migrations.

But the chief player in keeping the saiga in a state of continuous decline until 1995 was probably its principal domestic competitor, the sheep. The cornerstone of Soviet agricultural policy for Kalmykia, the sheep industry grew increasingly massive. In 1980, estimates hold that over five million sheep grazed in Kalmykia. Amassed in huge collective farms, sheep were reared with little, if any, seasonal change in the use of pastures. As a result, the levels of livestock grazing throughout Kalmykia typically came to exceed the limits of sustainability by two or three times.

The overused natural pastures turned into a land of shifting sand dunes, while irrigated forage fields became saltpans. The combined effect of overgrazing, wind erosion and evaporation was most pronounced in the core pastoral region of Kalmykia, the Black Lands, which in the 1980s was deteriorating into desert at a rate of 30,000 to 50,000 hectares per year. Eventually the land could no longer support domestic livestock, which began to die off in huge numbers. In the winter of 1986-1987, over 800,000 sheep in Kalmykia died from starvation. In response, government officials ordered that 700,000 sheep be moved away from the Black Lands, freeing more than 800,000 hectares of natural pastures from livestock use by 1990. With the mass exodus of its domestic grazing competitors and their human attendants, saiga found a haven in the Black Lands.

This trend continued after 1991, when the dissolution of the Soviet Union put a sharp end to the command system of economic planning. From this point on, the population of domestic livestock in Kalmykia fell steeply and steadily. Flocks of sheep decreased by 80 percent between 1992 and 2000, from over 3,000,000 to just over 600,000. The price of Kalmykian crude wool is now so low that the industry simply cannot turn a profit. The construction of new irrigation facilities has also virtually ceased, because water transportation has become prohibitively expensive. The combined effects of this social and economic upheaval brought ruin to the people of Kalmykia, but gave the saiga another chance for a comeback. A hunting ban reintroduced in 1987 seems to have further helped the saiga, whose numbers stabilized at around 150,000 animals that same year and began to rise in 1995.

But not even a half-decade could pass before the saiga once again found themselves in peril. Just as scientists and conservationists began to believe the saiga were on a path toward recovery, the Kalmykian population plunged to a level lower than it had ever been. In 1999, the population fell to 50,000 animals, and then to 25,000 in 2000, and to an estimated 17,800 in 2001.

What could have caused this drastic decline? While these years witnessed some harsh winters and dry summers, these have not been nearly so bad as to account for such heavy losses. Nor is the saiga population in Kalmykia known to have recently suffered from any epidemic. The alleged link between the species' decimation and the current growth in the wolf population has not been verified. The most likely remaining option – really there is little doubt – is that poaching is responsible for the saiga's catastrophic decline.

Even in the final days of the Soviet

Saiga antelope (*Saiga tatarica*). *Photo by T. Sorokina*

Conservation History

Protected Areas in Ukraine a Decade after Independence

By ***Oleg Listopad***

The collapse of the Soviet Union ten years ago brought many new opportunities and challenges to nature protection in Ukraine. Almost overnight, the nation won the freedom to determine its own guidelines for using its natural resources, and also faced the complications of entering the international environmental community as its own sovereign nation. The development and successes of the network of protected areas in Ukraine over the past ten years has been largely a function of three factors: legislation, financing and management, and science. Building local and international public support has also played an important role.

Protected areas in Ukraine today have a well-developed legislative base. The foundation of this base is the 1992 law "On Protected Areas." A successor to Soviet legislation on nature protection, the Ukrainian law has a number of important features that have helped develop the position and understanding of protected areas. For example, the description of a biosphere reserve is clearly defined, as are opportunities for placing natural areas under protection. The law also releases zapovedniks, national parks, zoos, botanical gardens, and most kinds of zakazniks (special purpose preserves) from having to pay taxes. Just six months after the law was passed, however the Cabinet of Ministers nullified parts of it.

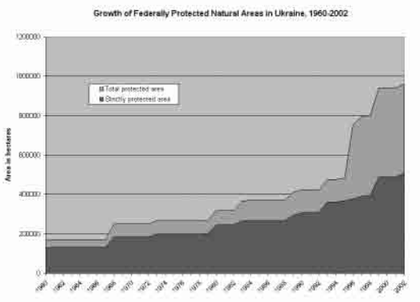
The law was approved together with a package of fundamental legislative bills, an important means of avoiding confusing contradictions between various laws. In the 1991 law "On Environmental Protection," a special section is devoted to natural areas and the special protection they require. All of the codes on use of natural resources (land, water, forest, minerals) include articles regarding the use – or prohibition thereof – of these resources in protected areas. Moreover, the Forest Code confirms that forests in protected areas belong to Group I Forests, that is, strictly protected forests; the Mineral Resources Code designates founding of geological zapovedniks, zakazniks, and natural monuments as one of the uses of mineral resources, and goes so far as to free such protected areas from the normal fees for "using" mineral resources. The 1994 decree "On Reserving Valuable Natural Areas for Later Inclusion into the Network of Protected Areas" is particularly inter-

Biosphere reserves:
1 Askaniya-Nova
2 Black Sea
3 Carpathian
4 Danube

Zapovedniks:
5 Crimea
6 Kanevsky
7 Ukrainian Steppe
8 Lugansky
9 Polessky
10 Yalta Mountain Forest
11 Cape Martyan
12 Karadagsky
13 Rastochye
14 Medobory
15 Dnieprovsko-Orelsky
16 Yelanetskaya Steppe
17 Horgany
18 Kazantipsky
19 Opuksky
20 Rivnensky
21 Cheremsky

National parks:
1 Carpathian
2 Shatsky
3 Synevir
4 Azovo-Sivashky
5 Vyzhnitsky
6 Podolskie Tovtry
7 Svyatye Gory
8 Yavorovsky
9 Desniano-Starogutsky
10 Skolivskie Beskidy
11 Uzhansky
12 Nizhnednestrovsky

Ukraine's network of protected areas. *Map by M. Dubinin*



Note: graph depicts biosphere reserves, zapovedniks, and national park

esting: nearly one million hectares of land were set aside to be preserved until they could be officially protected.

The practical development of the network of protected areas in Ukraine has largely been based on a plan that the Supreme Soviet of Ukraine ratified on September 2nd, 1994. The program "Zapovedniks" offered a detailed guide for developing the network through 2000, and more general goals through 2005. The program foresaw the creation of large, multifunctional areas, in particular national and regional parks, and a system for environmental monitoring. Other goals included uniting all of Ukraine's zapovedniks and national parks under one management structure, but this goal has not been reached: for better or for worse, Ukraine's protected areas fall under the management of six different agencies and organizations.

The program proposed a spending package of $115 million, most of which was focused on maintaining existing protecting areas and building infrastructure. As throughout the post-Soviet world, many of these plans went unrealized, as only about 40 percent of the promised funding was ultimately invested in the protected areas system. The protected areas did, however, receive some additional financing from international organizations. The most substantial of these included two half-million dollar GEF grants for the Carpathian and Danube Biosphere Reserves, as well as a number of programs funded by the Netherlands.

Following the first stage of Ukraine's major protected areas project, in September 2000, the Ukrainian Supreme Soviet passed a program called "Forming a national ecological network, 2000-2015," a proposal similar in spirit to the 1995 program "Zapovedniks." The goal of the new program is to form a territorially united system of natural landscapes of Ukraine, including restoring fallow fields to native steppes and planting trees in deforested areas. Twenty-nine new national parks and six new biosphere reserves are planned for the year 2015. Other protected areas may be founded with outside financing as well, such as funding from a project to clean

Deer in Rostochye Zapovednik.
Photo courtesy of O. Listopad

Ukraine's 12th National Park

On January 11th, 2002, the Odessa Regional Council of People's Representatives brought positive closure to a 15-year struggle to found a national park in the swampy valleys of the lower Dniester River. Nizhnednestrovsky became Ukraine's 12th national park, a 21,400-hectare area devoted to nature conservation and regional sustainable development through ecotourism.

The area is unique in all of Europe. The floodplains of the Dnestr River are on the main bird migration path through Ukraine and are a place were many rare or endangered species of birds congregate. They are also part of a planned river valley "ecological corridor," a constituent part of a system for conserving Europe's natural heritage. The mouth of the river is both beautiful and rich in biological diversity: fields of Madonna lilies (*Lilium candidum*) and water chestnuts (*Trapa natans*) float on the Beloe ('White') Lake, where sacred ibises (*Threskiornis aethiopica*) come through on the course their annual migrations. This relatively small region houses more than 50 species of fish and 300 speices of birds, including endangered species such as the Dalmatian pelican (*Pelecanus crispus*), black stork (*Ciconia nigra*), and red-breasted goose (*Branta ruficollis*).

Information provided by ***Ivan Rusev****, Fund for Natural Heritage.*

the Dnieper River and purify drinking water. The planned expansion of the network of protected areas would bring the total area under protection from 500,000 to 2,000,000 hectares. The first four national parks were to be founded in 2002, but these plans may simply be too ambitious for reality: recent changes in governmental environmental policy reflect darkly on the chances for significant expansion of protected areas.

Wildflowers in the Crimea.
Photo courtesy of O. Listopad

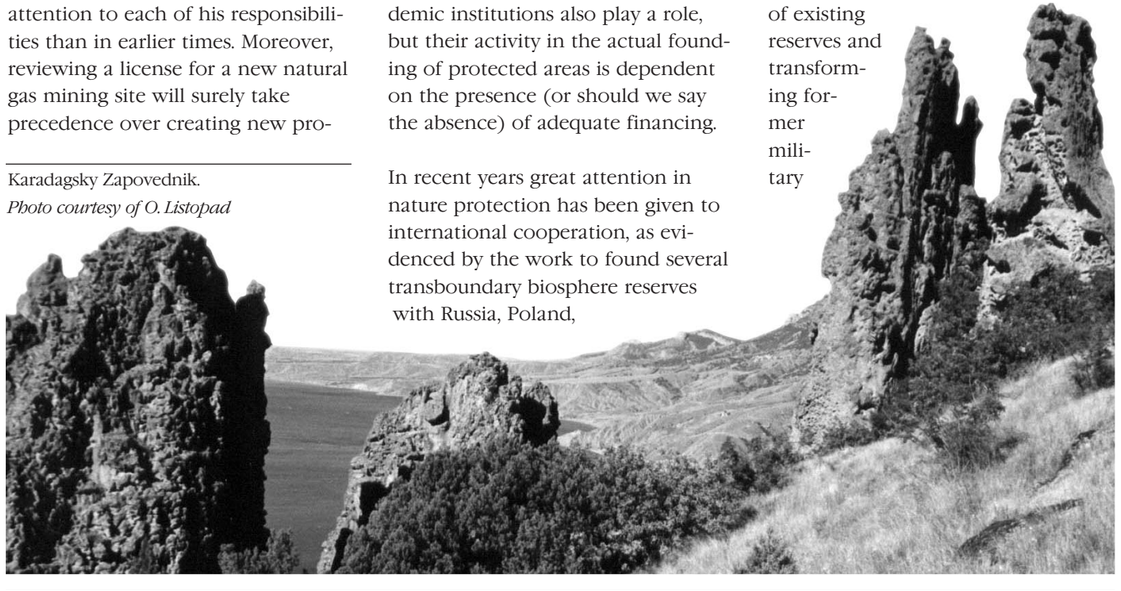
The reconstruction of government structures in Ukraine, aimed at increasing efficiency and lowering expenditures, has reduced the Ministry of Environmental Protection and placed several new structures in direct or indirect subordination to it. These changes have meant that the Minister is able to direct far less attention to each of his responsibilities than in earlier times. Moreover, reviewing a license for a new natural gas mining site will surely take precedence over creating new protected areas.

Despite financial and political difficulties, science – the backbone and source of credibility for the environmental movement – has continued to develop in the past decade. All of the zapovedniks have science departments and a specially assigned advocate in an institute of higher learning or the Academy of Sciences. The program "Zapovedniks" brought the founding of a new institution, the Science Center for Research on Protected Areas. The Ukrainian Academy of Science and the Ministry of the Environment worked together in a joint laboratory in Kiev for establishing scientific foundations for the existence of protected areas. According to many experts, however, other similar laboratories in Kharkov and Odessa are not currently functional. Of course, scientists in academic institutions also play a role, but their activity in the actual founding of protected areas is dependent on the presence (or should we say the absence) of adequate financing.

In recent years great attention in nature protection has been given to international cooperation, as evidenced by the work to found several transboundary biosphere reserves with Russia, Poland, and Romania. International cooperation not only draws global attention to environmental issues in Ukraine, it also brings much need international funding and high-quality environmental protection in border zones.

Nature conservation has had to take into account the specific nature of Ukraine's cultural landscapes. In comparison to Russia, Ukraine has far less land remaining in a more or less untouched natural state. Ukraine has the largest area of agricultural land in Europe, up to 98 percent of land in some districts. Forests cover only 15 percent of the total land area of the country. For these and other reasons, Ukraine does not have the opportunity to create large zapovedniks with strict protection. Instead, there is a tendency to create "cluster" reserves, that is, reserves comprised of several small tracts of land spread out from one another. Of Ukraine's 20 zapovedniks, seven are comprised of more than two of such tracts. And because finding unused lands to create new reserves is so difficult, scientists and government employees alike give much attention to expanding the territory of existing reserves and transforming former military

Karadagsky Zapovednik.
Photo courtesy of O. Listopad



A New Hope for the Dnieper River

The Dnieper River, the third largest in Europe, weaves its course through the land and history of Ukraine more deeply than any other waterway. It was along this river that Vikings traveled their trade route from Scandinavia to Byzantium, and here that the ancient kingdom of Kievan Rus' was founded over a thousand years ago. The Dnieper basin in Ukraine covers 29,140,000 hectares and constitutes approximately 80 percent of the country's water resources. In sum, the waters of the Dnieper River system provide two-thirds of the territory of Ukraine with water, including 30 million people, 50 major cities, and over 10,000 industrial enterprises, 50 large irrigation systems, and four nuclear power plants.

In previous decades, the ultimate economic and environmental consequences of using the river to promote fuel and power industries, metallurgy, and construction were widely ignored. Large industrial cities grew up along the river's banks, causing heavy pollution and disrupting the hydro-ecological balance. Six large hydroelectric dams were built and continue to regulate the river's flow. Records were rarely kept on the use of water, making analysis and management all the more difficult.

Today industrial centers such as Dnipropetrovsk and Zaporizhya are some of the largest individual polluters of the Dnieper River, dumping 196,000,000 and 172,000,000 cubic meters respectively of polluted sewage water into the river. But even these figures represent only a fraction of the total pollution of the river: in many places, river contamination is completely uncontrolled. Very little equipment exists for purifying water at the local level, which means that almost all sewage waste is purified at centralized plants, which are generally unfit to handle this task. As of January 1st, 1994, all of Ukraine's cities had a centralized water supply, as did 89 percent of towns and approximately 20 percent of villages; but only 94 percent of cities had centralized sewage systems, 50 percent of towns, and only about 3 percent of villages.

Moreover, a great deal of pollution comes from rainwater carrying polluted elements from agricultural fields and cattle farms into the river system. Chemical fertilizers and manure flow without any purification into the river, bringing dangerous bacteria and various chemicals and organic elements into the river. Bottom sediments polluted with heavy metals, organic elements, oil products, and other substances play a significant role drinking water quality. The effects of the 1986 Chernobyl disaster also continue to plague the environmental state of the river basin.

In turn, the poor quality of water in the river becomes a human health hazard. Research has shown that water treatment facilities do not remove many of major chemical compounds from the water. This problem is aggravated because the current technologies of preparation of drinking water stipulate use of chlorine, which actually creates carcinogenic chlorine compounds in the unpurified drinking water. Scientists have surmised that the low quality of drinking water in Ukraine is one of the reasons for a recent growth in cases of stomach, gall bladder, and respiratory diseases.

Solving these problems requires an international solution: though the bulk of the river flows through Ukraine, 32 percent of the river's flow is formed in the Russian Federation, and 31 percent in Belarus. While the upper part of the basin can use an average of 219,000 cubic meters of water per square kilometer of river per year as drinking water, in the lower part of the basin this figure is lowered to 36,000 cubic meters per square kilometer.

A new Global Environment Facility (GEF) program budgeted at $7,000,000 is designed to develop sustainable water management on the Dnieper River. The Dnieper falls under the GEF's International Waters Programme, and also its Black Sea Basin Strategic Approach. In partnership with the United Nations Development Program (UNDP) and Canada's International Development Research Centre (IDRC), the Dnieper Programme will focus on Russia, Ukraine, and Belarus. The program purposes to remedy the serious environmental effects of pollution and habitat degradation, to ensure sustainable use of resources, and to protect biodiversity in the Dnieper River Basin. Key objectives focus on improving financial, legal, and operational mechanisms that affect water management, seeking to encourage public awareness and involvement in addressing the problems of the Dnieper Basin, while simultaneously working to ensure safe drinking water for the population.

*Information for this article was provided by **Sergei Shcherbak**, who works in the GEF Dnieper Programme.*

Conservation Management

The Deer with the Deadly Scent

*By **Vladimir Prikhodko***

Photo by R. Reading

Ancient Arab physicians around the 9th century first wrote about the healing properties of a dark brown paste with the texture of curd cheese. This strange substance was musk, a secretion produced by a walnut-sized gland in male musk deer (*Moschus moschiferus L.*). Greeks and Romans had used musk in aromatic ointments, and soon it became a valued ingredient in traditional East Asian medicine, as it remains to this day. Even in Europe, where musk was never used for medicinal purposes, it found widespread use as a key ingredient in many perfumes, as it significantly enhances the endurance of fragrances. By the 1970s, the price of musk had reached $45,000 per kilogram, nearly three times its weight in gold; today the price of musk is highly variable depending on quality and market, but remains a valuable substance in trade. As musk's fame and use grew in Asia and Europe, so did the hunting of male musk deer, which eventually won a place on the IUCN's list of vulnerable species. It is surely no accident that musk deer in Russia have earned the sinister name "deer with a deadly scent," describing both the deer's strong odor and the deadly fate that musk brings the deer.

Four subspecies of musk deer currently live in Russia. The Sakhalin subspecies (*M. m. sachalinensis*) is listed in the Red Data Book of the Russian Federation; the Far Eastern (*M. m. turowi*) and Verkhoyansk (*M. m. arcticus*) subspecies have critically low numbers and require immediate protection. In the past five years the populations in the Sayan Mountains, Republic of Buryatia, and Chita Oblast have been torn apart. Poaching is rampant year-round, even in protected areas such as Altaisky and Dzherginsky Zapovedniks. The only remaining stable population of musk deer lives in the Sakha Republic (Yakutia), where anti-poaching measures are strictly enforced. Outside of Russia, musk deer populations in China have fallen by 50 percent every five years since 1980, and in India, Nepal, and Pakistan the deer survives only in national parks.

Two key factors in saving the musk deer are protecting the deer's natural habitats and raising it in captivity. Breeding musk deer in captivity creates a reserve population for sale or exchange, musk harvesting, and rein-

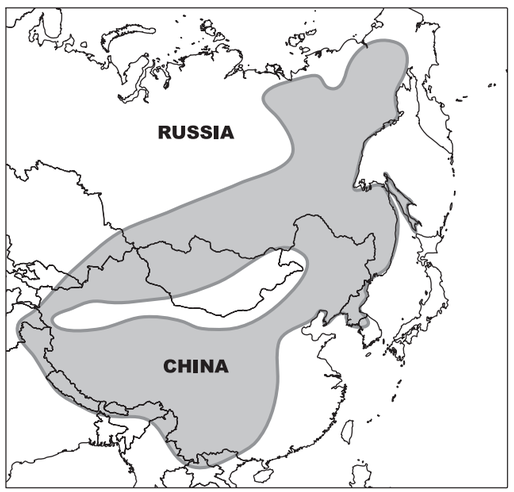
Musk deer (*Moschus moschiferus*) are among the smallest of the world's deer, standing between 60 and 70 centimeters at the shoulder. Shorter front legs and longer, powerful back legs give the deer its characteristic kangaroo-like run. Neither males nor females of the species have antlers, but both have elongated teeth that stretch well beneath the lower lip. While these teeth are used in skirmishes between males, they are of little avail to protect the deer from predators, which include foxes, wolves, yellow-throated martens, as well as tigers, and leopards. Nonetheless, in Russia, hunting and poaching remain the main threat to the survival of musk deer, whose numbers are believed to have fallen to around 40-50,000 in the entire nation.

Table I. Musk deer population in Russia.

Region	Population in 1988	Population in 1996	Population estimate for 2002
Altai-Sayan	80,000-95,000	30,000-34,000	15,000-20,000
Baikal and Chita	48,000-50,000	17,000-18,000	8,000-10,000
Amur, Khabarovsk, and Primoye	24,000-28,000	4,000-5,000	4,000-5,000
Sakha Republic (Yakutia), Magadan	5,000-7,000	2,000-3,000	4,000-5,000
Sakhalin Island	300-400	300	350-400
Total	**160,000-170,000**	**53,000-60,000**	**31,500-40,500**

troduction into the wild. Especially while the demand for musk is high and illegal trade in musk thrives, deer farms can become stable suppliers of musk, as there is no need to kill the animal to extract its musk. In the wild, hunters and poachers find it more efficient to kill the deer rather than capture it and perform the complicated extraction procedure.

The first attempts to breed musk deer in captivity were made in the 18th century, when the deer was first widely hunted in Russia. But despite multiple efforts across Europe and Asia, this small deer has proven difficult to raise in captivity: most of the animals in these experiments died. One notable exception to this rule is the Chernogolovka Deer Farm in the outskirts of Moscow. In 1975, Academician V.E. Sokolov founded a research station in the Soviet Union's Academy of Science's science center in the town of Chernogolovka. The new research station was intended to study the behavior of captive animals in conditions similar to being in the wild. Scientists brought musk deer, roe deer, arctic foxes, hedgehogs, bats, and various rodents to the research station for observation. The station quickly became an important regional science center, attracting many students from Moscow's universities for short-term research projects. In addition to observing the captive animals at the center to learn more of their biology and ecology, the station's scientists have created strategies for protecting various endangered species, including the snow leopard (*Uncia uncia*), Amur leopard (*Panthera pardus orientalis*), and Sakhalin musk deer. Today grants provide most of the funding for the station and its staff of nearly 30 people.



Range of Moschus moschifus according to literary sources. Map reprinted from TRAFFIC report on the Musk Trade.
Edited by M. Dubinin

In 1976, a long-term experiment began to study the behavior of musk deer in captivity. In the past 25 years, around 200 deer have been born in the 20-hectare farm, a brilliant success considering difficulties and high mortality rates incurred at other breeding centers in Eurasia. Indeed, the experiment was so successful that a current ROLL (Rollover of Lessons Learned) project supported by the Institute for Sustainable Communities is intended to promote the development of musk deer farms across Russia by training future specialists in methods of housing, feeding, breeding, and extracting musk from the deer.

One of the fundamental difficulties of raising the deer in captivity came from the lack of knowledge about the animal's ecology, and many enclosures were built in unsuitable habitats. In the wild, musk deer live in mountain taiga. Accordingly, an enclosed artificial habitat should include taiga with fallen trees and areas of open field. Tall coniferous trees offer shade, while shrubs protection and food for the deer. Cliffs are also important part of the musk deer's native habitat, but in absence of natural cliffs, the deer seem content with wooden platforms several meters high. The staff of Chernogolovka has found that the deer take shelter from insect swarms under these platforms; the staff also builds small shelters out of fir branches for each deer.

International Trade in Musk

The single greatest factor leading to the decline of the musk deer in Russia has been the international trade in musk, a lucrative but shady business that easily slips around government controls. As parties to the Convention on Trade in Endangered Species (CITES), the Soviet Union and later an independent Russia became subject to regulations that required monitoring and setting quotas on export and import of musk deer products, an animal that has been listed in the CITES Appendices since 1979. The Soviet Union was always one of the major suppliers of musk for the world market, but following the breakup of the Soviet Union, reported export rose significantly as government controls over hunting quotas and poaching grew slack.

Official statistics show that between 1992 and 1996 Russia exported over 180 kilograms of raw musk, primarily to Hong Kong, Singapore, South Korea, and Japan. But these statistics do not measure the illegal trade in musk, nor does it cover the import of musk to countries that are not party to CITES. Khabarovsk and Vladivostok, large cities in the Russian Far East, have been noted as major centers of both legal and illegal musk trade, and TRAFFIC estimates have suggested that less than 30 percent of trade from the Russian Far East is actually legal.

Photo by R. Reading

Of equal importance is the size of the enclosure. If the shelter is too small, the deer continually run into the fence or shuttle back and forth along the perimeter of the enclosure. But if the enclosure is too large, the animals quickly become wild, and will not allow their human caretakers to approach (fear of humans is essential if the animals are to be released into the wild, but if they are to remain in captivity, the deer will fare better if their fear of people is lessened). Experiments in Chernogolovka have shown that each pair of deer requires from 0.1 to 0.5 hectares of space. Because the animals are extremely territorial, communal groupings inevitably end in conflict, although slightly larger enclosures with plenty of places for shelter are suitable for groupings of one male and two females. In the wild, musk deer tend to form families of this sort over a territory of 250 hectares on average. Indeed, many attempts to raise musk deer in captivity because they failed to take account of this aspect of the species' ecology, assuming that the animals could be raised in herds, as many other deer. Controlling the genetic paring of animals is also important to monitoring and decreasing the effects of inbreeding within a small, artificial population; such experiments also provide interesting data that could be used for managing future breeding programs for certain subspecies whose population levels have fallen below a critical minimum.

Feeding presents other challenges. In the wild, lichens comprise the majority of the musk deer's diet in summer and up to 99 percent in winter. When available, leaves, plants, and mushrooms also play an important role in the animals' food intake, providing ample stocks of protein that lichens lack. Musk deer require food that is low in fiber and high in energy content – not simply abundant amounts of food with low energy content – or else they will not survive the winter months. Many years of observation at Chernogolovka have shown that in captivity the deer thrive on a mixture of lichens, oats, fruits, and leaves, as well as a salt lick for mineral needs. In summer the deer require up to 0.7 liters of water per day, while in the winter they eat snow.

In the past, efforts to remove musk secretions from the musk sac through surgical means often resulted in the animal's death. Another common method of extracting musk without intentionally killing the animal, squeezing the musk from the gland, often rips the membranes of the gland, which inflames the gland and also ultimately leads to the animal's death. The staff of Chernogolovka, however, has developed a method for extracting musk that to date has brought neither death nor trauma to a single deer. In August or September, when the deer finish seasonal musk secretions, male deer are individually caught in box traps and tranquilized. Working in teams of two, one person holds the

Baby musk deer in Chernogolovka farm.
Photo by V. Prihodko

BULLETIN BOARD

Correction

Please note that the photograph printed on page 16 is not of a Pamir argali, as indicated, but Severtsov's Urial (Ovis orientalis severtsovi). There were also inaccuracies in the location of protected areas in the map on page 22.

Please also note that the contact email for the Biodiversity Conservation Center (BCC) printed on the back cover of the previous issue of RCN (Winter 2002) was incorrect. The BCC's official email is biodivers@biodiveristy.ru. Complete contact information appears on the back cover of this issue.

The Editorial Board of RCN apologizes for these inaccuracies.

Now available on CD-ROM:

Zapovedniks and National Parks of Russia

The text of this catalogue of Russia's protected areas, which was prepared in 1998 by the Environmental Education Center "Zapovedniks," is now available with photographs and updated material on CD-ROM. For more information, contact the EcoCenter Zapovedniks at the address below:

Nakhimovsky Pr. 32, 15th floor
Moscow 117218, Russia
Tel/Fax: +7 (095) 129-06-88
E-mail: chipmunk@online.ru

New Publication:

Geobotanical Field Work in Central European Russia

V.V. Neronov's new manual focuses on the fundamental theories of geobotany, methods of organizing field work and training, and techniques for studying flora. The book also covers the ecological properties particular to the major kinds of vegetation in central European Russia. The publication, which is available in Russian only, is intended for teachers, high school and college students, but will also be useful to anyone working in the fields of forestry or nature protection.

The book was published by the Biodiversity Conservation Center Press with support from the John D. and Catherine T. MacArthur Foundation.

Upcoming Conference: Forests of the Northern Lights

Current and Future Boreal Forest Values
Conservation Goals and Market Trends

Winnipeg, Canada, September 20-26 2002

This year the biennial meeting of the Taiga Rescue Network sets its sights on Canada's old-growth forests, bringing together scientists, industry, government, indigenous people, environmental organizations, and the general public to discus the state of the boreal forest from a global perspective.

The conference is designed to explore the diverse values that each sector sees as the principle focus of concern, and primary designated themes include climate change, traditional knowledge, defining and protecting ecological value, and developing a new alternative vision for boreal forests. This year's conference is organized by the Boreal Forest Network, the North American branch of the Taiga Rescue Network.

For more information, contact the conference organizers at conference2002@taigarescue.org. The Taiga Rescue Network is an international network of non-governmental organizations, indigenous peoples and nations working for the protection and sustainable sue of the world's boreal conference.

Аннотации статей, представленных в номере

Раздел I. Особо охраняемые природные территории.

«Оазисы природы в крупных городах России». Юрий Мазуров, Алла Пакина. Ботанические сады и дендрологические парки России – это ООПТ и научные центры одновременно, где ведутся исследования по современным направлениям развития биологической науки в тесном сотрудничестве с ботаническими садами других стран. Расположенные в крупных городах России, ботанические сады дают городским жителям уникальную возможность ознакомиться с естественной флорой как региона, так и всего мира.

Раздел II. Специальный раздел: Судьба дельты Волги.

«Новая стратегия для дельты Волги». Ули Грэбенер. В соответствие с международной концепцией по биосферным территориям ведется работа по созданию координационного совета, который будет объединять разные организации, заинтересованные в устойчивом развитии дельты с целью управления проектируемыми модельными территориями (биосферными полигонами).

«История сосуществования человека и природы в нижнем течении р. Волги». Юрий Чуйков. Нельзя понять современные экологические проблемы дельты Волги без учета истории природопользования региона. Кочевое скотоводство поэтапно замещалось сначала промысловой рыбной ловлей, а затем и сельским хозяйством, основанным на орошении земель. Но всегда характерной чертой природопользования в регионе было (и остается) первичное использование естественных природных ресурсов без их глубокой переработки. Однобокое развитие небольшого количества направлений в природопользовании приводит к истощению интенсивно используемых ресурсов. Дельта Волги – не исключение.

«Портрет одного района». Петр Рытов, Вячеслав Галкин. Володарский район является типичным районом дельты Волги. Основную антропогенную нагрузку несут земельные, водные и рыбные ресурсы, составляющие основу экономики района. Решение природоохранных проблем в рамках одного района – задача очень сложная. «Сельское хозяйство в дельте Волги». Анна Павлюкевич. Фактором, препятствующим оздоровлению экономики Астраханской области, является все увеличивающийся разрыв между темпами роста цен на промышленные ресурсы и продукцию сельского хозяйства. В результате посевная площадь в 2002 году по прогнозам составит лишь 27 % к уровню 1990 года. Настало время искать иные методы использования земли.

«Современное состояние рыбного промысла в Северном Каспии и дельте реки Волги». Александр Грачев. Рыбное хозяйство – наиболее важная отрасль экономики Северного Каспия, развитию которой в Астраханской области уделяется самое пристальное внимание. Сырьевая база рыбной промышленности формируется из двух составляющих: в Каспийском море добывается килька, а в дельте Волги – осетровые, крупные и мелкие пресноводные, вобла и каспийская сельдь. Деятельность сельского хозяйства, судоходства, нефтяной и газовой промышленности, представляют серьезную угрозу для рыбного хозяйства в регионе вследствие нарушения экологического равновесия.

«Экологическая политика «ЛУКОЙЛ» на Каспии». Алексей Курапов, Сергей Монахов. Экологическая политика «ЛУКОЙЛ» на Северном Каспии основывается на системном подходе к решению экологических вопросов. Прежде всего, это применение достижений научно-технического прогресса и современных технологий для реализации природоохранных мероприятий на принципе «нулевых» сбросов. Разработка проектных решений повышающих техническую надежность оборудования и сводящих к минимуму отрицательное воздействие на экосистему, также среди приоритетов компании.

Раздел III. Экосистемы в опасности

«Что такое степь?». В Евразии пространства травянистой растительности тянутся непрерывной полосой от Восточной Европы до Забайкалья. Хотя эти территории и подобные им на других материках очень различны они сходны основными составными элементами: климатом, растительностью, животным населением, микрофлорой и почвой.

«Судьба степей Западной Сибири и Казахстана». Владимир Николаев. В начале 50-х годов в бывшем Советском Союзе на самом высшем уровне было принято решение распахать целинные степи Казахстана. Через 5 лет стало ясно, что азиатские степи (от Урала до Алтая) — зона рискованного сухого земле-делия.

«Сохранение степей России, Украины и Казахстана». Спасение степей требует глубокого и комплексного похода. Хотя существующие степные ООПТ имеют уникальную по богатству флору и фауну, они в среднем составляют не более 0,3 % от всей площади степной зоны Евразии. Поэтому надо найти еще и другие способы сохранения степей кроме ООПТ.

«Восстановление степной растительности на залежах». Татьяна Филатова, Николай и Ирина Золотухины, Василий Собакинских. Спонтанное восстановление степной растительности заключается в том, что степи восстанавливаются на залежах или пашне если они оказываются заброшены в самой непосредственной близости от целинного степного участка или, еще лучше, граничат с ним по одной или более сторонам. Центрально-Черноземный заповедник одно из немногих мест в России, где исследованиям по восстановлению степей уделяют самое пристальное внимание.

«Искусственное восстановление степной растительности: опыт России и Украины». Татьяна Филатова. Первоначально методы искусственного восстановления степной растительности на заброшенных сельскохозяйственных угодьях были разработаны на базе Ставропольского ботанического сада в 1960-х годах. Со временем другие экспериментальные исследования были проведены в России и на Украине, но они остаются достоянием только специалистов. В статье дан краткий обзор разных методов, который не претендует на полную и исчерпывающую сводку.

Раздел IV. Виды животных и растений, находящиеся под угрозой исчезновения.

«Сайгак в Европе». В Европе только в Калмыкии сохранилась популяция сайгака. Судьба этой антилопы тесно связана с историей природопользования в степной и полупустынной зоне. В результате - численность сайгака несколько раз увеличилась или сокращалась в течение двух прошлых веков. Сегодня будущее этого вида под угрозой из-за резкого очередного спада численности. Одна из причин такого явления - массовое браконьерство.

Раздел V. История природоохранной деятельности.

«Заповедное дело на Украине за десять лет независимости». Олег Листопад. После распада Советского союза Украина была вынуждена определить свой собственный природоохранный путь. За последние годы заповедное дело Украины достигло значительных успехов. Достаточно развитая законодательная база облегчает задачу создания новых ООПТ разного ранга, но финансовые трудности продолжают препятствовать развитию этой уникальной сети.

«Новая надежда для реки Днепр». Проект Глобального экологического фонда предлагает комплексное решение по очистке притоков Днепра, который имеет огромное значение для Украины.

Раздел VI. Природоохранные технологии.

«Опыт разведения кабарги в неволе». Владимир Приходько. Кабаргу интенсивно добывают из-за его мускуса, который высоко ценится и в восточной медицине и в парфюмерии в Европы. В некоторых странах были попытки разводить это животное в неволе, чтобы одновременно сохранять его и разработать способ неистощимой добычи мускуса, но эти опыты обычно кончались гибелью животных. Удачное разведение кабарги на научно-экспериментальной базе Института проблем экологии и эволюции им. А.Н. Северцева в Черноголовке является уникальным опытом, применение которого в местах, где сейчас добывается кабарга, может способствовать устойчивому развитию этих районов.

CONSERVATION CONTACTS

Biodiversity Conservation Center.
Aleksey Zimenko, General Director.
Vavilova Street 41, office 1, Moscow, 119312
Russia. Tel/Fax: +7 (095) 124–71–78.
E-mail: forest@ecoline.ru.

Dront Ecological Center.
Askhat Kayumov, Director.
PO Box 631, Nizhny Novgorod, 603000 Russia.
Tel/Fax: +7 (8312) 30–28–81. E-mail: drong@dront.ru.

Ecocenter "Zapovedniks."
Natalia Danilina, Director.
Institute of Economics, Nakhimovsky Prospect 32,
Moscow, 119218 Russia. Tel.: +7 (095) 332–48–28.
Fax: +7 (095) 129–06–88. E-mail: chipmunk@glasnet.ru.

Envirc Ecological Research Center.
Dr. Ekaterina Rachkovskaya, Head of Science.
Kunaeva Street 119-1, Kazakhstan, Almaty, 480100.
Tel.: 8–3272–63–95–33. Fax: 8–3272–91–79–38.
E-mail: evra@astelmail.kz.

Forest Productivity and Ecology Center of the Russian Academy of Sciences.
Aleksandr Isaev, Director.
Profsouznaya Street, 84/32, Moscow 117810, Russia.
Tel. +7 (095) 332–26–17, 332–23–20.
Fax: +7 (095) 332–29–17. E-mail: secretariat@cepl.rssi.ru.

Institute of Zoology of the National Academy of Sciences of Kazakhstan.
Ryspek Baidavletov, Head of laboratory,
Almaty, Kazakhstan. Institute of Zoology,
Academgorodok, 480032 Almaty.
Tel: +7 (3272) 482–632. Fax: +7 (3272) 481–598.
E-mail: ryspek@nursat.kz.

Kazakhstan and Central Asia Zoological Society.
Dr. Anatoly F. Kovshar, President.
Institute of Zoology, Academgorodok, Almaty,
Kazahkstan, 480060.
Tel: +7 (3272) 48–26–32, 48–18–90.
Fax: +7 (3272) 48–19–50.
E-mail: akovshar@nursat.kz.

Valery Kuznetsov.
Independent expert.
P/b 2, Garrygala, 745160, Turkmenistan.
E-mail: margarita@in4com.com.

Victor Lukarevsky.
Researcher at the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences. Contact through WWF-RPO:
Nikoloyamskaya Street 19-3, Moscow,
Russia, 109240.
Tel: +7 (095) 727–09–39. Fax: +7 (095) 727–09–38.
E-mail: lukretsiy@dio.ru, lukretsiy@mail.ru.

Partnership for Zapovedniks.
Nikolai Maleshin, Director.
Box 71, Moscow, 117321, Russia.
Tel/Fax: +7 (095) 332–40–66.
E-mail: mashin@online.ru
nicolai_maleshin@inst-econ.org.ru.

Socio-Ecological Union, Center for Coordination and Information, Moscow.
Olga Berlova, Press Secretary.
PO Box 211, Moscow, 121091 Russia.
Tel/Fax: +7 (095) 124–79–34. E-mail: soeco@ecoline.ru.

Vsevolod B. Stepanitsky.
Director of National Projects for the World Wide Fund for Nature Russian Program Office (WWF-RPO).
Nikolyamskaya Street 19-3, Moscow 109240.
Tel.: +7 (095) 727–09–39. Fax: +7 (095) 727–09–38.
E-mail: Vstepanitskiy@wwf.ru.

United National Development Program (UNDP) in Central Asia.
Mark Anstey, adviser.
United Nations Office in Uzbekistan, 4 Taras Shevchenko Street , Tashkent, 700029, Uzbekistan.
E-mail: mark.anstey@undp.org.

World Conservation Union, Representative Office for the CIS.
Vladimir Moshkalo, Director.
Marshal Vasilevsky Street 17, Moscow, Russia.
Tel: +7 (095) 190–70–77. Fax: +7 (095) 790–58–18.
E-mail: head@iucn-cis.org.

World Wide Fund for Nature, Russian Program Office (WWF-RPO).
Evgeny Shvarts, Director of Nature Conservation;
Olga Pereladova, Manager for Central Asia.
Nikolyamskaya Street 19-3, Moscow 109240.
Tel.: +7 (095) 797–09–39. Fax: +7 (095) 797–09–38.
E-mail: eshvarts@wwf.ru, opereladova@wwf.ru.

Subscribe to *Russian Conservation News!*

We've moved to Washington! Please note our new address.

Sponsor	**$500**
Patron	**$100**
Supporter	**$75**
Organization	**$45**
Individual	**$30**
Student	**$20**

- Foreign subscriptions: add $6 for Canada and $15 for all other countries
- Back issues available for $5 each
- Make check or money order in U.S. currency payable to **CRCN/Tides Center** and send to:

Russian Conservation News
PO BOX 57277
Washington, DC 20037-7277

LETTERS TO THE EDITOR can be mailed to:
Margaret Williams
PO Box 57277, Washington, DC 20037-7277
Tel: (202) 778–9573
E-mail: <rcn@igc.org>
<margaret.williams@wwfus.org>

In Russia our address is:
Institute of Economics, Nakhimovsky Prospect 32, suite 802
117218, Moscow, Russia
Phone/Fax: +7 (095) 332–4066

Mailing address:
Box 71, 117321, Moscow, Russia
E-mail: <rcn@online.ru>