Each State Party to this Convention recognizes that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated on its territory, belongs primarily to that State. It will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain.

CONVENTION CONCERNING THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE
INTRODUCTION

Among conventions and programs concerning nature conservation the UNESCO Convention concerning the Protection of World Cultural and Natural Heritage is the most effective and representative one. The primary objective of the Convention is to join international efforts for identification, protection, and overall support of cultural and natural sites of outstanding universal value.

The World Heritage List, which was opened in 1976, is representative of earth's regions and contains an impressive number of properties: 174 natural, 679 cultural and 25 mixed (natural and cultural) sites from 165 states. The Convention protects such world known natural sites as the Great Barrier Reef, Hawaiian Islands, Galapagos Islands, Grand Canyon, Mount Kilimanjaro, Iguazu Falls and Victoria Falls. The total area of natural World Heritage sites represents more than 13 percent of the total area of specially protected natural areas throughout the world.

Today the Russian Federation possesses 15 cultural and 8 natural World Heritage sites. 30 Russian Specially Protected Areas (SPA) including 11 State Nature Reserves and 5 National Parks enjoy World Heritage status. Russian existing natural World Heritage sites are the Virgin Komi Forests, Lake Baikal, Volcanoes of Kamchatka, Golden Mountains of Altai, Western Caucasus, Central Sikhote Alin', Uvs Nuur Basin and Wrangel Island. Work is underway now to subscribe to the World Heritage List the following natural properties, which are currently included into the Russia's Tentative List: the Putorana Plateau, Magadansky Reserve, Commander Islands, Daurian Steppes, Lena Pillars, Great Vasyugan Mire, Krasnoyarsk Pillars and Ilmen Mountains.

Also, expert work is being carried out on the extension of the Tentative List with new potential natural WH sites, among which the Volga Delta – natural area within the borders of the Astrakhnsky State Nature Reserve – is rightfully ranked first. The outstanding value of natural complexes of the Astrakhnsky Reserve has already gained international recognition; the territory is a part of the Volga Delta Ramsar site and possesses the status of a biosphere reserve. Besides, according to the results of the IUCN Gap Analysis of the World Natural Heritage, the territory of the Volga Delta has been recognized as positively deserving World Heritage status.

The Volga Delta lies at a crossroads of migratory flyways of numerous waterfowl species, which makes the territory a very important biodiversity conservation area. The Volga Delta is one of the world’s most dynamic river deltas, and as a result of interaction between a large river and a landlocked basin of the Caspian Sea, the delta has a very specific hydrological regime. These features give to the Volga Delta a high chance of being nominated under several natural criteria. The Volga Delta is a unique natural region, which certainly deserves inscription onto the World Heritage List.

The present booklet is based on the materials of the Volga Delta nomination dossier prepared jointly in 2007-2008 by the Natural Heritage Protection Fund, the Astrakhnsky State Nature Biosphere Reserve, Geography Institute of the Russian Academy of Sciences, The Lomonosov Moscow State University and the Russian Research Institute for Cultural and Natural Heritage with the assistance of the EURONATUR (Germany) and the UNDP/GEF project «Conservation of Wetland Biodiversity in the Lower Volga Region».

The analysis and the description of the state of conservation of natural complexes of the Astrakhnsky Reserve are based on published materials, archival data and the results of long-term scientific researches carried out in the Reserve.

NOMINATION

«THE VOLGA DELTA»
(RUSSIAN FEDERATION)

For inscription on the UNESCO WORLD CULTURAL AND NATURAL HERITAGE LIST

Prepared by:
Natural Heritage Protection Fund
Astrakhnsky State Nature Biosphere Reserve
Geography Institute of the Russian Academy of Sciences
The Lomonosov Moscow State University
Russian Research Institute for Cultural and Natural Heritage

With the support of:
EURONATUR
The UNDP/GEF project “Conservation of Wetlands Biodiversity in the Lower Volga Region”
IDENITIFICATION OF THE PROPERTY

1. Country (and State Party if different)
   Russian Federation.

2. State, Province or Region
   Astrakhan Region, Kamzyaksky, Sikryaninsky and Volodarsky Districts.

3. Name of Property
   «The Volga Delta».
   The nominated property is located within boundaries of the Astrakhan State Nature Biosphere Reserve.

4. Maps and plans, showing the boundaries of the nominated property and buffer zone

   A1. Location of the Astrakhan Reserve on the map of Russia.
   A2. Topographic map with precise indication of boundaries of the Reserve and its buffer zone. Scale 1:200 000.
   A3. Specially protected natural areas of the Lower Volga. Scale 1:1 600 000.

5. Area of nominated property (ha.) and proposed buffer zone (ha.)
   Area of the Reserve is 67 917 ha. Area of the buffer zone makes 31 000 ha. Area spreading between clusters is shown in table 1.

   Table 1
<table>
<thead>
<tr>
<th>Clusters</th>
<th>Area (ha)</th>
<th>Sea aquatory</th>
<th>Buffer zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damchiksky cluster</td>
<td>30 050</td>
<td>9 430</td>
<td>9 000</td>
</tr>
<tr>
<td>Trekhizbinsky cluster</td>
<td>9 460</td>
<td>232</td>
<td>3 000</td>
</tr>
<tr>
<td>Obzhorovsky cluster</td>
<td>28 407</td>
<td>2 550</td>
<td>19 000</td>
</tr>
<tr>
<td>Total</td>
<td>67 917</td>
<td>12 212</td>
<td>31 000</td>
</tr>
</tbody>
</table>
The Astrakhansky State Nature Biosphere Reserve
DESCRIPTION

2a. Description of the property

The area of the Astrakhansky State Nature Biosphere Reserve consists of three clusters located in the western (Damchiksky cluster), central (Tekhizbinsky cluster) and eastern (Obzhorovsky cluster) parts of the Volga delta.

The Astrakhansky Biosphere Reserve lies in the Volga Delta Intrazonal region of the Caspian biogeographical province, in the desert zone. According to Udvardy’s classification of biogeographical provinces (extended by A. Voronov and V. Kucheruk) the reserve’s area belongs to the desert Prikaspiysko-Bekpak-dalinsky Province of the Palearctic Realm and immediately neighbors the Caspian Province. The region possesses natural features belonging to various biomes as the result of its location at the meeting point of two biogeographical provinces combined with the intrazonality and complex geological history of the region.

Geology

The Volga Delta sits within two structural-tectonic zones; the interzonal boundary lies approximately at the latitude of the Astrakhan’ city. The northern portion of the delta is located within the limits of the Caspian syncline, which is the East European Platform’s largest depression. The southern portion of the delta lies within the borders of two platforms: the Epihercynian Scythian Platform and the Turan Platform. Geostructural features of the delta and of the adjacent water area of the northern Caspian Sea were the key factors determined the development of an extensive, flat subaqueous part of the delta (avandelta) and an extremely shallow sea area adjacent to the avandelta. Both subaerial and subaqueous parts of the delta have very gentle slopes (about 0.0002°) that, in its turn, determined the development of the world’s most complicated and ramified network of distributary channels and the active sediment accumulation at the marine edge of the delta.

Landforms

The Volga Delta is situated in the Pre-Caspian Lowland, which is a dried seabed exposed as a result of the Hvalynian Sea recession in the Late Quaternary Period. The distinctive feature of the lowland is that the major part of it is located below the sea level. The relief is low and flat; its monotonous relief is relieved only by salt domes with outcrops of more ancient Paleozoic and Mesozoic rock formations (Ullagan and Bol-
It is characterized by prevalent development of large disconnection of above – 23, 5 meters BS (Baltic mean sea level). The waterway network is a complicated system of water reservoirs and watercourses, the two culminating points of the Volga River and on its large tributaries. This especially refers to the Volga Hydroelectric Power Station and the Volgograd Water Reservoir (the two culminating points of the Volga Power Plant Cascade).

Annual inflow to the Volga Delta varies significantly, mainly for climatic reasons. Mean annual inflow is about 250 km³; during the 20-th century, the swing was from 200 to 270 km³. The hydrological regime of the Volga Delta has been seriously altered after the construction of a cascade of water reservoirs and power stations on the Volga River and on its large tributaries. This especially refers to the Volga Hydroelectric Power Station and the Volgograd Water Reservoir (the two culminating points of the Volga Power Plant Cascade).

The distinctive feature of the Volga Delta’s Lower Zone is an extensive avendelta (a subaqueous part of the delta), which is basically a wide platform gently inclined towards the sea. It juts out 35–50 kilometers into the sea and averages about 2 meters in depth (while the Caspian Sea level is ~27 m BC). Flat relief of the zone becomes more complicated here because of numerous sandbanks and islands, natural furrows and artificial shipping channels, fish bypass channels and spoil banks along the channels. River waters slowly flow down over a shallow avandelta off to the sea and thus the zone of river and sea water mixing is located several tens of kilometers away from the marine edge of the delta.

All three clusters of the Astrakhan’s Reserve lie within the Lower Zone of the Volga Delta and shallow coastal waters of the Volga.

Hydrological conditions

The Volga River (also called Ra in ancient times and Itil’ in the Middle Ages) belongs to the rivers with so-called East European type of hydrological regime and is characterized by well-defined periods of annual spring floods, autumn overflows, summer and winter low-water periods. The river is fed primarily by snowmelts.

The hydrographic network of the Volga Delta is a complicated system of water reservoirs and watercourses that includes large distributary channels, smaller waterways, eriks (narrow channels less than 30 meters in width), ilmens (small lakes), bokans (large natural reservoirs at the delta mouth where the runoff from the delta channels and smaller waterways accumulates before going further to the avendelta). The distinctive feature of the Volga Delta’s Lower Zone is an extensive avendelta (a subaqueous part of the delta), which is basically a wide platform gently inclined towards the sea. It juts out 35–50 kilometers into the sea and averages about 2 meters in depth (while the Caspian Sea level is ~27 m BC). Flat relief of the zone becomes more complicated here because of numerous sandbanks and islands, natural furrows and artificial shipping channels, fish bypass channels and spoil banks along the channels. River waters slowly flow down over a shallow avandelta off to the sea and thus the zone of river and sea water mixing is located several tens of kilometers away from the marine edge of the delta.

Water Reservoir (the two culminating points of the Volga The Middle Zone (stretching along 40– 60 km) is situated at a height of -24...-25 meters BS. It is the most ancient section of the delta with mean elevations occupied with lakes, mounds in the Upper Zone, only a few of them are located in the Lower Zone, but there are over 400 Baer mounds in the Middle Zone. The modern marine edge of the delta is the youngest and most rapidly evolving section of the delta. Modern relief formation processes take place here as a result of the accumulation of river alluvia and marine sediments. Thanks to extensive shallows covered with sand and underwater vegetation and numerous open and isolated bays (kul’tuk) this piece of the delta looks very peculiar.

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Such regulation of the river flow has resulted in reduction of the volume and time of annual floods. Before the cascade construction, about 50% of the annual inflow occurred during the high-water period (April - June), while today it's only 40% for the same period of time. The flooding period now starts later and finishes earlier and in general it has become about 45 days shorter than in previous years.

Climate

Climate of the Reserve's area is formed under influence of Asian anticyclone. Solar radiation duration is up to 2400 h/year, total solar radiation reaches 118 ccal/sq.cm. Sum of air temperatures above +10°С makes 3500-3600°, 2400 h/year, total solar radiation reaches 118 ccal/sq.cm. Within the upper zone, the most widespread soils are alluvial marsh soils. They are forming in conditions of shallow groundwater occurrence (up to 1.5 m) and close overwetting of the profile. Due to this, the frost-free period is 15-30 days longer.

Soils

The Reserve's soils are presented by alluvial sediments in their initial stages of the soil forming process. Alluvial sediments of different texture are transforming into marsh-meadow-silt (meadow-ilmen), peat marsh-marsh-meadow-silt (marsh-ilmen), and meadow-silt soils. At the islands of the Reserve, especially at its northern boundary, are found salinized soils of mosaic spreading.

In respect of the soil zonation, the northern boundary of the Reserve can be divided into upper, lower and kultuk zones.

The upper zone of the Reserve is relatively old: it has been already formed by the 1920s. The upper zone is located between absolute heights of -24.7 and -25.7 m. In its relief rise above elevated parts with sharply defined levee 1-2 m above the waterline, insular lower parts with ridges and dead channels and also the vast depression occupied by the drying Danchik ilmen.

Within the upper zone, the most widespread soils are alluvial marsh meadow soils. They are forming in conditions of shallow groundwater occurrence (up to 1.5 m) and rather prolonged surface floods. The alluvial marsh-meadow-silt soils (meadow-ilmen soils, by M.A. Gorbunova) are developed under bluejoint and wheat grass meadows. Alluvial marsh-marsh-pitted peat soils (marsh-ilmen soils, by M.A. Gorbunova) are developed under reed, cereal-reed and herb-reed meadows. Under halophytic meadows are developed alluvial marsh-silt saline soils and meadow and marsh solonchaks. At levees in the upper zone of the Reserve are formed alluvial meadow-silted saturated soils. In the drying ilmens under beds of reed, reed mace and spire form alluvial marsh-limos-peat-soil soils.

The lower zone of the Reserve has dried up at the stage of rapid sea level drop in 1930-1940-s. Occupying absolute heights between -25.7 and -26.5 m, this zone includes low delta islands with poorly developed levees with height about 0.5 m above the water level. Soil of the lower zone are developed in conditions of prolonged flooding (3-4 months and more) and close groundwater occurrence (less than 0.5 m), which determines their strong overwetting. Large amount of organic remains coming onto the soils surface, in conditions of overwetting are poorly humified and are accumulated as peat-humus mass. The upper horizons, as a rule, are slit because of suspended solids accumulated by the river in the flood periods.

At the levees under willow forests form alluvial marsh-humus-grey soils. Inside islands under reed meadows form alluvial marsh-limos humus-grey soils.

Kultuk zone is the youngest one. The land has been dried up during the prolonged water level drop period in 1950-1970-s. At present time, it is located between heights of -26.5 and -27.0 m. Soils of the kultuk zone occupy intermediate position between underwater organic and mineral formations and alluvial marsh soils typical for the lower zone. The upper horizons of these soils are slit and contain large amount of humus and peated vegetable remains. At the depth of 5-10 cm they convert into strongly overmoistened mineral mass represented by sand and siltstone sediments with inclusion of shell detritus. Quite often at the surface is noted reddish oxidated warp. We have classified these soils as alluvial marsh silt-grey soils, poorly formed in most cases.

Thus, the soils of the Reserve are generally presented by different varieties of alluvial marsh-meadow and alluvial marsh soils. Peculiarities of soils are firstly connected with hydrologic conditions (length and height of floods, groundwater occurrence). In the soil cover of the reserve the water level is sharply defined three zones. In the upper zone, hydromorphism is developed poorly than in the others, here is developed humus accumulation process, halogenesis is noted. In the lower zone, hydromorphism intensifies, decomposition of large amount of organic remains periodically takes place in anaerobe conditions, which leads to generation of peat-humus horizons. The kultuk zone soils are characterized by accumulation of poorly peated vegetable remains, silting of surface horizons and strong overwetting of the profile.

Monthly average temperatures

<table>
<thead>
<tr>
<th>Month</th>
<th>Annual precipitation level (mm)</th>
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<tbody>
<tr>
<td>Январь</td>
<td>-2,0°</td>
</tr>
<tr>
<td>Июль</td>
<td>+24,3°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>North</th>
<th>East</th>
<th>South</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North-east</td>
<td>2,1</td>
<td>2,1</td>
<td>1,7</td>
<td>8,3</td>
</tr>
<tr>
<td>South-west</td>
<td>7,9</td>
<td>8,8</td>
<td>3,0</td>
<td>6,6</td>
</tr>
</tbody>
</table>

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flora and vegetation

The flora of the Astrakhan Reserves includes a total of 314 vascular plant species belonging to 64 families. All species depending from their habitat and water regime are divided into several ecological groups: hydrophytes, hygrophilous, mesophytes, xerophytes and halophytes. Six hygrophilous species can also be regarded as hydrophytes (amphilants). There are also a number of true water plants, which appear within communities of terrestrial plants when those communities get flooded in low water periods, and disappear when the water gets high.

The flora of the Reserve is a part of the vegetable gene pool of Russia, and a variety of plants growing here have economically valuable features, such as forage plants (118 species), medicinal herbs (59 species), bee plants (41 species), ornamental plants (40 species), food plants (26), industrial plants (20), essential oil plants (10), dye plants (9), oil plants (6 species). Weeds number 77 species and noxious plants include 7 species.

Wide-spread economically significant plant include Salix alba, Salix triandra, Rubus caesius, Phragmites australis, Typha angustifolia, Calamagrostis epigeios, Agropyron repens, Phalaris commutata, Agrostis stolonifera, Trachymium sarmatiense, Sparganium erectum, Nelumbo caspica, Butomus umbellatus, Trapo nana lys, Nympheas peltata, Salvinia natans, Spironela polyrhiza, Lemna minor, Potamogeton perfoliatus, Potamogeton pectinatus, Vallisneria spiralis and Ceratophyllum demersum.

The vegetation of the Reserve can be divided into 4 types: shrubs, forest vegetation, meadow vegetation and water vegetation.

Summertime shrubs dominated by Salix triandra, Tamarix ramosissima and Amorpha fruticosa represent shrub vegetation of the Reserve. Broadly spread Salix triandra-dominated communities grow on small islands and spits at the mouth of the delta channels and eriks.

Communities of Tamarix ramosissima are confined to salt marshes developed as a result of the influence of either natural or anthropogenic factors. The communities of Tamarix ramosissima and meadow halophytes are commonly found building a complex biocenosis. The formation of Amorpha fruticosa is scarce and appears as solitary bushes or small-sized thinned thickets 2-3 meters in height. It is situated mainly on high banks of islands inundated only in years abounding in water, and in burnt woods. It is also found replacing overmatured Salix alba in its communities.

Forest vegetation is of inundated deciduous forest vegetation type and is composed of different plant communities (lowland herb-grass-sedge, herb and herb-blackberry) generally dominated by Salix alba. Initially occurred on spits and islands at the mouth of the delta channels, they gradually develop into dense gallery forests growing along watercourses. The development of one or another forest type is connected to vertical growth of banks of islands. On slightly growing channel banks there are S. alba–motley-grass and S. alba–motley grass-bramble communities can be found.

Along with dense gallery forests there is shrub wood (typical for the upper zone of the Reserve) developing as willow trees die off. The woodland species include S. alba, Fraxinus excelsior, Amorpha fruticosa, Ulmus nucifera, Sparganium erectum, Butomus umbellatus, Triumfetum sarmatiense, Sparganium erectum, Nelumbo caspica, Alisma gramineum, Hydropiper and Marsilea quadrifolia.

Regular meadow consists of the following plant formations: high grasses (Calamagrostis epigeios and Agropyron repens), small grasses (Alnus petraea, Hierochloe odorata and Agrostis stolonifera L.), low grasses (Cypsela), tall herbs (Trachymium sarmatiense, Lepidium angulare–aquaticus, Polygomerum hydrocarpus and Marsilea quadrifolia), and meacered (Typha angustifolia), Waterlogged meadows occupy about 40.24 ha mainly covered by reedbeds and meacered.

Aquatic vegetation includes true aquatic plants and amphibious plants. True aquatic plants cover a total area of 6.77 hectares; they can be divided into 4 general types:

1) rooted plants with floating leaves (Trapa nana, Nympheas peltata, Potamogeton nodosus); 2) totally submerged, rooted plants (Myriophyllum spicatum, Myriophyllum verticillatum, Vallisneria spiralis, Elodea canadensis, Potamogeton perfoliatus, Potamogeton lucens, Potamogeton pectinatus, Potamogeton berchtoldii and Potamogeton crispus, Batrachium ericksonii, Trapa natans, Nymphaea candida, Nuphar luteum, Caltha palustris, Sagittaria sagittifolia, Nuphar luteum, Nymphaea candida, Nuphar luteum – are best represented in the Reserve. The communities of Vallisneria spiralis, Potamogeton pectinatus, Potamogeton lucens and Potamogeton nodosus, Ceratophyllum demersum L., Utricularia vulgaris,

2) rootless plants, floating on water surface (Hydrocharis morsus-ranae, Salvinia natans, Lemna minor, Spironela polyrhiza); 4) rootless submerged plants (Ceratophyllum demersum L., Utricularia vulgaris).

Aquatic plant communities dominated by floating leaf species - Trapa nana, Nympheas peltata, Nympheas candida, Nuphar luteum - are best represented in the Reserve. The communities of Vallisneria spiralis, Potamogeton pectinatus, Potamogeton lucens and Potamogeton nodosus, Ceratophyllum demersum L. are the most common among the submerged species.

Amphibious vegetation includes tall grasses (formations dominated respectively by Phragmites australis, growing as willow trees die off. The woodland species include S. alba, Fraxinus excelsior, Amorpha fruticosa, Ulmus nucifera, Sparganium erectum, Butomus umbellatus, Triumfetum sarmatiense, Sparganium erectum, Nelumbo caspica, Alisma gramineum, Hydropiper and Marsilea quadrifolia). About 50 % of regular meadows occur at firebreaks along the northern borders of the Reserve’s clusters, where their development is driven by annual mowing. Other 50% are bush grass and hendoey meadows developed as a result of the vertical growth of islands and natural change of vegetation.

Steppe meadows, formed as a result of mowing and grazing management, consist of several plant formations respectively dominated by Poa angustifolia, Gyneriaceae, Salix triandra, golden dock, Glyceria flava and Limonium gmelitin. Within this meadow type bluegrass meadows, couch grass meadows and licorice meadows replace bush grass meadows.

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brunched burr and others, often grow in complex associa-
tions located at sporadically flooded low sites. The
fact that M. aegyptiaca mainly reproduces vegetatively
provides the necessity to preserve its habitats, which is
possible only within specially protected areas.

A. verticillatum, Vallisneria spiralis, Caulinia minor, Potamo-
geton lucens are majorly confined to running areas of reser-
voirs and in tangle fauna. Nonsymbiotic aquatic invertebrates
to the European fauna type, with the presence of elements
belong to 828 taxonomic units, including 403 Rotifera
(142 taxons), Copepoda (136 taxons), Cladocerae (124), Copepodo (70)
and other animal groups (77). 225 invertebrate species
relating to 8 classes have been registered at the bottom of
reservoirs and in tangle fauna.

High diversity of microclimate conditions gave rise to the
coeexistence of various ecological groups of insects,
from aquatic to mesophilous and desert ones.

Pisces

The diversity of environmental conditions (water
depth, lowage and weediness of waters) found in water
reservoirs of the Reserve allow the occurrence of
many species (a total of 56 species belonging to 12 families).
The most abundant are Cyprinidae (24 taxons) and Agoni-
dae (11 taxons).

Volga-Caspian region is a global scale center known
for the diversity and wealth of its fish fauna, with special
emphasis on the diversity and richness of sturgeon spe-
cies (Acipenseridae). Huso huso, Acipenser gueldenstaedtii,
A.rutheus are common here, A.ruthenus can also be found
in the Reserve.
Among the fish fauna of the Reserve the most common species are freshwater species, mainly Cyprinidae and Percidae: carp, bream, Caspian roach, tench, rudd, silver bream, zander, lookup, and also pike, cat fish, river perch, pike perch, crucian carp and several species of Cottidae, while nase, sabre fish and Volga zander are found rarer. Diadromous and semi-anadromous fish which migrate to the Reserve’s area during the spawning season represent quite a considerable portion of the Reserve’s fish fauna another considerable part of which are marine fish. Anadromous fish species – Acipenseridae and Clupeidae – can be found in the Reserve’s waters only when they migrate from the sea to their spawning grounds in the Volga River and back. Many of the Reserve’s reservoirs and waterways are migration paths or spawning grounds of fish. The main spawning grounds are inundated meadows (also called pologs) of the subaerial Delta. The water gets warm very early here giving rise to the rapid development of hydrobionts. Vegetation grown up before the beginning of the spawning season serves perfectly as a substrate for fish roe appearance have been registered only after several low flood level years, and Coccidura suaveolens and Coccidura leucodon, both are quite abundant. Russian desman (Desmana moschata) is listed in the Red Data Book of the Russian Federation (status 2), Ast- trakhan Region, and the IUCN Red Data Book (status VU). The information about this species is very scarce. It is a decreasing, rare relic species of Russia. The Logomorpho is represented by the only species – European (brown) hare (Lepus europaeus). It is a typical representative of the steppe-desert faunal complex. The Chipotara, or undomesticated domestic cat, is the Reserve’s mammals, is represented by Pipistrellus kuhli, Pipistrellus nathusi, Eptesicus serotinus, Vespertilio murinus and Nycte- lius noctula. Some of the abovementioned species visit the Reserve only during the migration periods.

Two out of total of 9 species of Rodendra found in the Reserve are naturalized species (European beaver and musquash), the other 7 species are native ones. European beaver (Castor fiber) was imported from the Volograd State Reserve. The beaver population has been decreasing since 1975, currently there is no beavers in the Reserve. The main cause of its extinction is the increase in water level in the Delta in winter season as a result of the evacuation of water from the Volograd Water Power Plant that causes the inundation of lodges and animal loss. Ondatra (Ondatra zibethicus) was introduced to the Volga Delta in 1953-1954. By now, independently or by means of several target-in-regional introductions, the species has occupied the entire Delta area and has become an integral component of the Reserve’s biocoenosis. Arvicolia terrastis was commonly till the late 60s; now its number reduced. Micro- tis arvalis is commonly found in meadows, willow-motley grasses, reed and grass reed-sedge grass stations, though in the last 2 it is found more often, respectively of the distribution of Muskrat. The Caspian seal is spotted in the Obzhorovsky and Damchiksky sector. Today large colonies of Eriones tamariscivorous is the most abundant species. It is natural- ized in the Delta in 1936 and in 1939. The Nyctereutes procyonoides’ best habitats are located in the lower zone of the subaerial Delta – exactly where it is the Reserve’s area, which is well protected and has plenty of food. Camis lupus is a permanent resident of all the three sectors of the Reserve. Vulpes vulpes rather belongs to the biocoenosis of the Upper and Middle subaerial Delta, though is quite common in the Reserve, too. Camis aureus was for the first time registered in the Reserve in 1969 in the Damchiksky sector. Today 1-2 fami- lies permanently live in this sector. Encounters with this animal in the Obzhorovsky sector have also been reported. Mustella eurasis, Mustella nivalis, Mustella visor and Lutra lutra were registered in the Reserve. The most com- mon is Mustella erminea. It is found in every land bio- topes. In contrast, Mustella nivalis is scarce in the Reserve. Mustella visor is an introduced species, which appeared in the Delta in the early 70s as a result of the site-specific adaptation of animals escaped from fur farms. River ot- ter is an Indigenous species of the Delta, which is found throughout the Reserve but is the most abundant in the Damchiksky sector.

The Reserve’s Records contain very limited records of Felis chaus. According to them, jungle cat was common in the Reserve until the middle 50s. Later it occurred more rarely and now special research is required to find out any information about the destiny of this species in the Reserve. The Caspian seal is spotted in the Obzhorovsky and Damchiksky sectors of the Reserve in autumn and in springtime migrating in path of fish shoals, which come to their wintering or spawning grounds to the branches of the Volga River. During this period Caspian seal is found not only in the avandelta water area but also in the Delta channels.

Three species of hoofed mammals have been registered within the Reserve. The wild boar (Sus scrofa) is the only hoofed animal inhabiting the entire area of the Reserve from the subaerial Delta’s needbeds to the avandelta islands. It is one of the most important components of biocoenosis. Due to well-developed hydrographic network and the presence of natural levees, the Reserve’s area is a maternity home for animals of the adjacent lowland reed grass belt. In recent years from 400 to 800 boars were reg-

21
Mammals are the key component of an ecosystem. In the Astrakhansky Reserve the composition of mammal species is almost equal for each sector. Hydrological regime is the main factor determining the status and dynamic characteristics of mammal populations.

Avifauna

The Volga river delta is one of the most important areas of birds accumulation during their seasonal migrations in Eurasia. At the clusters of Astrakhansky Reserve concentration of migrating waterfowl and near-water birds is especially high: Anseriformes (14 species), Limicoidea (25), Laridae (7) and Ciconiiformes (11). Total migrations duration is 9 months, from March until November. Besides common spring and autumn transitional pass, within the Reserve as well as over the whole delta birds also shift to summer molting areas and back before the beginning of main autumn pass (Anatinae, Haematopodinae). Also are noted early post nesting movements of many species, fore departure transitions of local populations and non-breeding birds, non-periodical migrations of wintering species, etc. Only in June shifts seemingly subside, but do not end.

<table>
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<tr>
<th>Order</th>
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<th>Number of nesting species</th>
<th>Passing through, shifting, wintering, aestivating species</th>
<th>Irregularly visiting species</th>
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<td>99</td>
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Table 2. Bird species of the Astrakhansky Reserve.

During migration period prevail whooper swan (Cygnus cygnus) and mute swan (Cygnus olor), grey goose (Anser anser), mallard (Anas platyrhynchos), pintail (Anas acuta), European teal (Anas crecca), garganey teal (Anas querquedula), duck (Anas strepera), pochard (Netta rufina), diving ducks (Aythya ferina and A. fuligula), magpie diver (Megus albellus). In the nesting period are numerous Ciconiiformes, Pelecaniformes and Charadriiformes, especially great white heron (Egretta alba) and common heron (Ardea cinerea), coromant (Phalacrocorax carbo), black-headed gull (Larus ridibundus), Caspian gull (Larus cachinnans), great black-headed gull (Larus ichthyatus), European teal (Chlidonias hybridus), white-winged black tern (Chlidonias leucopterus) and black tern (Chlidonias niger). Accumulations of migrating birds at Damchiksky cluster are enormous. This area is located at the southwestern part of the lower Volga delta, where ice cover breaks earlier in spring and freezes later in winter. In March and April near Makarkin Island and at the adjacent waters stay up to 8 000 – 9 000 whooper swans, in October-November, up to 12 000. Local and passing mute swans keep together with them. Autumn stops of swans are long. Whooper swans keep at shallow waters of kultuk area until the river totally freezes over, many swans and geese feed with rhizome and drupes of lotus that grows extensively at the Damchiksky cluster of the Reserve.

The Reserve is located at one of the largest migration routes of waterfowl and near water bird species nesting at the West Siberian plain, Northern Kazakhstan and other regions and wintering at the vast area of the south of Western Europe, Africa and Southwestern Asia.

In spring, transitional migrations prevail. Major part of birds stop at the delta for a short time. Birds mostly keep at shallow reed bed areas of the delta. Total number of water birds per season is estimated as 7 million specimens (Krivenko et al., 1998).

Bird fauna of the Reserve counts 279 species, of which 99 nest at the Reserve’s area, 155 are met during migrations and wintering and 23 irregularly visit the area (see table 2). The basis of local bird fauna is made of wetland species nesting on trees or in reed beds, but trophically connected with water reservoirs; over 30 species are forest

istered in the Reserve before the farrowing period. Extensive reed and macerated thickets very much fit the tastes of the wild boar. However, during the flood period, the water rises up, and so it drives the wild boar out from the earth mounds for supplementary feeding during the high flood period. However, during the flood period, the wild boar feed in reed and macereed thickets very much fit the tastes of the wild boar. However, during the flood period, the water rises up, and so it drives the wild boar out from the earth mounds for supplementary feeding during the high flood period.
dwelling birds, only 3 species belong to meadow ecosystems and 3 to synanthropic species. Bird population of the Reserve is distinguished by diversity and large size. Richness of bird fauna is determined by peculiarities of ecological conditions and geographic location.

The Reserve’s area is the part of the Wetland of International importance.

Upon the results of zoogeographical analysis, 50% of bird species nesting in the Volga delta belong to transpalearctic group or other even more widespread groups, 24.1% belong to European fauna type, 15.8%, to Mediterranean fauna type, 9.2%, to Mongolian, and 0.9%, to Chinese.

Within the Reserve’s area are met 80% of bird species, which nest over the whole delta of the Volga; during the migrations period was noted 96% of bird species of this category.

The Volga delta is the habitat and temporary dwelling area for a line of rare and disappearing bird species inscribed on the 2006 IUCN Red list (18 species) and into the Russian Federation Red Data Book (42 species). 64 bird species have been inscribed into the Red Data Book of Astrakhsky Region. 27 bird species of the Russian Red Data Book are nesting in the Astrakhansky Reserve, like Dalmatian pelican (Pelecanus crispus) (small colonies at Damchiksky and Obzhorovsky clusters), spoon-billed sandpiper (Platalea leucorodia), glossy ibis (Plegadis falcinellus), buff-backed heron (Bubulcus ibis) (single nest found at Trekhizbinsky cluster), osprey (Pandion haliaetus) (3-4 pairs), white-tailed eagle (Haliaeetus albicilla) (up to 50-70 pairs on three clusters), saker falcon (Falco cherrug) (formerly one pair was nesting at Damchiksky cluster), little bustard (Tetrax tetrax) (2-3 pairs at Damchiksky cluster), black-winged stilt (Himantopus himantopus) (several pairs at the same cluster). Upon confirmed data, galinule (Porphyrio porphyrio) is nesting at areas adjacent to Damchiksky cluster. During shifts and migrations are common: great black-headed gull (Larus ichthyaetus), lesser white-fronted goose (Anser erythropus), black-winged stilt (Himantopus himantopus), peregrine falcon (Falco peregrinus); rare but regularly are met during migrations: red-breasted goose (Branta ruficollis), golden eagle (Aquila chrysaetos), steppe eagle (Aquila nipalensis), white crane (Grus leucogeranus), avocet (Recurvirostra avosetta), Norfolk plover (Charadrius alexandrinus), European white pelican (Pelecanus onocrotalus). Black stork (Ciconia nigra) and flamingo (Phoenicopterus roseus) are visiting species; encounters of Bewick’s swan (Cygnus bewickii), and white-headed duck (Oxyura leucocephala) are possible although they haven’t been met for a long time.

Anseriformes are the most diverse in species and most numerous in the wetland species group. Many mute swans, grey geese, mallard and pochards are nesting. Mute swan demonstrates the positive influence of the Reserve to its population in the Volga delta. Restoration of the mute swan population has first begun at the Reserve’s territory. The first nest was found at Obzhorovsky cluster in 1938. In late 1940-s nesting has become regular, and in 1953 15 pairs have been noted here. At the Trekhizbinsky cluster first swans’ nests have been discovered in 1952, at Damchiksky cluster, in 1953. Mute swans began settling outside the Reserve’s area, especially on lands near Obzhorovsky cluster. In 1961 at Obzhorovsky cluster 215 pairs were nesting, 162 of which were situated in groups by 5-7 nests, and one group even counted 30 nests. The total number of the delta population has reached 755 pairs in 1963. In 1967, the swan population size has reached its maximum of 327 pairs, and then started reducing as birds settled the adjacent areas. In 1981-1984 at Damchiksky clusters nested from 270 to 400 pairs, at Trekhizbinsky, from 4 to 11 pairs, at Obzhorovsky, from 250 to 350 mute swan pairs. The total number of pairs within the whole delta made 4-5 thousand pairs. In early 1990-s, due to the water level rise, the number of nesting pairs sharply decreased. At present time the number of nesting pairs has stabilized.

Of special interest are colonies of Liciniformes and Pelecaniformes. Willow forests serve as their main nesting areas. Here is noted the rare phenomenon: for many years at all clusters exist colonies where nest together grey

### Anseriformes

- **Mute swan** (Cygnus olor)
- **Grey goose** (Anser anser)
- **Mallard** (Anas platyrhynchos)
- **Pochard** (Aythya ferina)
- **Mute swan** (Cygnus olor) - the most diverse and most numerous in the wetland species group. Many mute swans, grey geese, mallard and pochards are nesting. Mute swan demonstrates the positive influence of the Reserve to its population in the Volga delta. Restoration of the mute swan population has first begun at the Reserve’s territory. The first nest was found at Obzhorovsky cluster in 1938. In late 1940-s nesting has become regular, and in 1953 15 pairs have been noted here. At the Trekhizbinsky cluster first swans’ nests have been discovered in 1952, at Damchiksky cluster, in 1953. Mute swans began settling outside the Reserve’s area, especially on lands near Obzhorovsky cluster. In 1961 at Obzhorovsky cluster 215 pairs were nesting, 162 of which were situated in groups by 5-7 nests, and one group even counted 30 nests. The total number of the delta population has reached 755 pairs in 1963. In 1967, the swan population size has reached its maximum of 327 pairs, and then started reducing as birds settled the adjacent areas. In 1981-1984 at Damchiksky clusters nested from 270 to 400 pairs, at Trekhizbinsky, from 4 to 11 pairs, at Obzhorovsky, from 250 to 350 mute swan pairs. The total number of pairs within the whole delta made 4-5 thousand pairs. In early 1990-s, due to the water level rise, the number of nesting pairs sharply decreased. At present time the number of nesting pairs has stabilized.
The Reserve's area plays an important role not only as a nesting area for rare species, but also as a stopover place and rare species' wintering area. Of water birds such rare species as lesser white-fronted goose (Anser erythropus) and red-breasted goose (Rufibrenta ruficollis), an endemic of Western Siberia, the only relic representative of Branta genus, are met on passage.

White-headed duck (Oxyura leucocephala), the relic specie under threat of extinction, is occasionally visiting the area. The most valuable prey birds are steppe and forest steppe representatives which often visit the reserved area during movements. These are pale harrier (Circus macrourus), Eurasian steppe endemic, spotted eagle (Aquila clanga) and the disappearing lesser kestrel (Falco naumanni).

For the disappearing white crane (Grus leucogeranus), the passing specie, the Reserve plays an important role in conservation of its Ob population. White cranes wintering in Iran stop over here. Since 1928 till 1985, from 2 to 22 white cranes have been observed at Damchiksky cluster of the Reserve. In March 1991, 5 birds were seen near the eastern boundary of this cluster. During last decades, 1-4 birds have been observed at Obzhorovsky cluster during spring and autumn flights.

Otidae family is presented by two species, great bustard (Otis tarda) and little bustard (Tetrax tetrax), both inscribed on the 2006 IUCN Red List. Small number of great bustards is noted during migrations: between 1976 and 1985 at Damchiksky cluster were registered 6 encounters of single birds and flocks of 4-11 specimens. Little bustard has been irregularly nesting near the northern boundary of this cluster, in autumn here appeared migrating flocks of up to 100 birds.

The threatened sociable lapwing (Chettusia gregaria), endemic of Russia and Kazakhstan, and black-winged pratincole (Glareola nordmanni) are rarely visiting the northern boundary of the Reserve.

Ferruginous duck (Aythya nyroca) – molting, passing by and a very rarely nesting specie. Ferruginous duck is nesting at hard to reach areas (insular reed timbers) which determines exceptional scarce nest findings. It molts also in hard to reach areas at small insular water reservoirs and at flooded reed beds. Formerly in early autumn ferruginous duck has formed small accumulations at areas with abundant aquatic vegetation (often together with common coot) at Damchiksky cluster. Autumn pass lasts until late November. Ferruginous duck has been inscribed on the IUCN Red List 2006, the population size decreases.

Marbled teal (Anas angustirostris) seems to be extinct in the Volga delta. The disappearing specie. No marbled teals were found in ducks capture for ringing in 1961-1963.

Saker falcon (Falco cherrug) – few cases of nesting registered. Specie with a decreasing population.

Roller (Coracias garrulus) – nesting and passing by specie. Stays at the delta from late April until late September. Roller is nesting in hollows and tree cracks. It is regularly met on communication and power lines.

DESCRIPTION
3a. Criteria under which inscription is proposed (and justification for inscription under these criteria)

The Volga Delta natural site is nominated for World Heritage status under the following criteria:

vii) Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

Because of its mosaic structure where water landform elements (narrow and wide river channels, gulfs and open water areas) are naturally combined with terrestrial landform elements (islands of different size, shoals) and vegetation (gallery osier and reed beds, mace reed, wet meadows) the Volga Delta has an low-key but very much aesthetically pleasant, pacifying landscape. However, during the blooming season of the lotus (also called Caspian Rose) the delta has an eye-catching, magnificent look thanks to floating carpets made of hundreds of splendid rose-colored flower buds.

The Volga Delta is Europe’s largest river delta and one of the world’s biggest river delta systems. The Volga River flows into the Caspian Sea, the Earth’s largest landlocked water body that is not connected to the ocean in the present geological era.

The history of the development of the Volga Delta is tightly connected with that of the Caspian Sea. The Caspian Sea level fluctuations are much higher in frequency and amplitude than those of the global sea level. The Caspian Sea level has reached its maximum highstand of +50 m AMSL in the Upper Pleistocene and was at its minimum lowstand of –110 m AMSL in the Early Holocene. The average amplitude of sea-level fluctuations was found to be about 25 meters in the late-Holocene sea level cycle (about 2500 years long) and about 3 meters in the instrumental observation period (i.e. during the last 150 years).

Over the course of its geologic history, the Volga Delta changed its location in connection with the Caspian sea level changes. Thus, the delta migrated hundreds of kilometers north and south from its current position. The modern Volga Delta began to form about 9000 years ago when the Neocaspian transgression finished 2500 years ago, since then the Volga Delta kept growing southward while the position of its top point remained unchanged. In that period the delta system possessed a high susceptibility to short-term fluctuations of generally decreasing sea level.
The causes of cyclic changes in the Caspian sea level still stay unclear but most scientists believe that they are caused mainly due to climate change. The Volga provides most of the Caspian fresh water inflow that increases with increasing precipitation in the Volga Basin. In the recent decades, the Caspian Sea coast has been drawing the attention of scientists in relation to global environmental issues. Global warming has sped up sea level rise that has resulted in coastal line changes. The forecast of the impact on the coastal ecosystems is difficult because of a slow rate of the sea level growth (by 13 centimeters per century). The average rate of the most recent Caspian sea level rise was 100 times greater than that of the eustatic global mean sea level rise. In connection to this, the Caspian Sea is an important natural laboratory to study long-term sea level fluctuations and their effects on a coastal zone (Kroonenberg et al., 2000). The Caspian Sea provides a unique chance to monitor in natural conditions the pattern of response of the coastal area to sea level rise and to use the obtained information further to build and test different forecast models.

The modern Volga Delta bank and underwater slope gradients are the lowest among large river deltas throughout the world (less than 5 cm/m). As a result, the delta has an extremely complicated hydrographic system that includes distributary channels, smaller waterways, er iks (narrow channels less than 30 meters in width), imls (small lakes) and isolated bays (kutukis). The delta also possesses an extensive avandelta (subaqueous part of the delta) with depths of 1.5-2.5 meters that stretches 35-50 kilometer out into the sea. River waters flow down slowly over a shallow avandelta off to the sea and thus the zone of the Caspian Biota, and especially intensive development of plant communities. Periods of the climate humidification coincided with marine transgressions and were characterized by the prevalence of forest and steppe ecosystems, while periods of aridification led to the development of desert ecosystems.

Sites especially important for the ecosystem of the Caspian Sea are the so-called eilfe concentration zones, that means first river deltas. The most significant of them for the Northern Caspian Sea (as well as for the entire Caspian Sea) is the Volga Delta. Tens of fish species (incl. river, anadromous and semi-anadromous fish) concentrate there; it is also a home to a number of rare water plants, such as the lataris (Laternaria aquatica) and some other species. Vast wetlands make the Volga Delta one of the most important bird habitats in Eurasia. During the flood period, the poloi system of the delta with its temporary water reservoirs takes on special significance as breeding and feeding ground for the young of many fish species. In general, the Volga Delta ecosystem possesses the highest biodiversity in the Caspian Sea region.

Periodic marine transgressions and regressions caused periodic shifts in the water and salt balance of the Caspian Sea, which, in its turn, had certain effect on the evolution of aquatic organisms. Sea level fluctuations influenced not only the evolution of marine ecosystems but also influenced the development of the Caspian Sea in- land area. The Caspian Sea is the base level of tens of large, middle-size and small rivers. Sea level fall intensifies sedi- ment flow-out and results in deeper cutting of the riv- ers' valley. Sea level rise slows down the river flow, leaves solid sediment flow-out, causes ground water level rise, underflooding of coastal area, salinization of soils and, as a result, it changes causes in the species composition of coastal communities, etc.

In relation to the climatic conditions, the Lower Volga is Europe’s most arid region. Only here in the Peri-Caspian area desert phytocenoses form zoal vegetation types. The region has an acutely continental climate. However, it was not always like that. During the Holocene climate changes repeatedly caused fundamental neor- ganization of plant communities. Periods of increased precipitation often led to the precipitation-induced development of plant communities. Periods of the climate humidification coincided with marine transgressions and were characterized by the prevalence of forest and steppe ecosystems, while periods of aridification led to the development of desert ecosystems.

Thus, the mouth area of the Volga River is an illustra- tive example of significant long-term ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals. The processes have resulted in the development of plant and animal communi- ties capable to adapt to frequent and rapid changes of environmental conditions.

x) Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened spe- cies of outstanding universal value from the point of view of science or conservation.
Bird species listed in the International Red Data Book include Pelecanus crispus, Aythya nyroca, Anas angustirostris, Falco cherrug, Coracias garrulus, Otis tarda and Tetrax tetrix. The nominated property is not only the habitat of rare and endangered species. It is also a vital migratory stop-over site and wintering area for threatened migrations of birds; specifically waterfowls, some rare species are found here on passage, for example, Anser erythropus and Rhytirhyncha ruficollis, an endemic species of the Western Siberia and the only relic representative of this genus, besides, a threatened relic species, has also been observed occasionally in the Reserve. Among Falconiformes the most valuable species are Circus macrourus, an endemic of Eurasian steppes, Apus apus and Falco naumanni. The Reserve plays an important role in the conservation of the OD’ population of Grus leucogeranus, a threatened migratory species, as a stop-over point for cranes migrating to their wintering ground in Iran. Visitations of Glareola nordmanni and Chetta intermedia, an endemic species of Russia and Kazakhstan, have also been registered.

3b. Proposed Statement of Outstanding Universal Value

The Volga Delta forms where the Volga – the great Russian river – meets the Caspian Sea. The Caspian Sea is the Earth’s largest landlocked water reservoir that has not been connected to the sea in the modern geological period. The sea is characterized by rapid and significant water level fluctuations accompanied by changes in the water surface area and water volume. The average rate of the most recent Caspian sea level rise was 100 times greater than that of the eustatic global mean sea level rise, the last Caspian sea-level cycle (1929-1995) has resulted in a 3-meter water level drop. The Volga Delta is the largest delta in Europe and one of the world’s largest deltas. It is situated in the Caspian Depression, which is one of the lowest points on the Earth (27 meters below sea level). The Volga Delta bank and underwater slope gradients are the lowest among large river deltas throughout the world (less than 5 cm/km). The delta itself is extremely problematic hydrographic system and is characterized by an extensive delta (the subaqueous part of the delta) with depths of 1,5-2,5 meters that stretches 35-50 kilometer out into the sea. River waters slowly flow down over a shallow avandelta off to the sea and thus the zone of river and sea water mixing is located several tens of kilometers away from the delta’s marine edge. The total area of the Volga Delta (incl. avandelta) is over 20 000 square kilometers. The Volga Delta has the most complicated hydrographic network in the world. Approximately 900 waterways reach the marine edge of the delta. That very tangled network of channels and lakes in combination with great vegetation makes the landscape very peculiar. It also makes the delta an oasis-looking area placed against a background of flat and monotonous, water- and vegetation-lacking deserts and semideserts. The Volga Delta is a region where mass concentration of migratory birds is observed, including many rare and endangered species. Many of them form large nesting colonies. There is a number of bird species of the Astrakhan Reserve listed in the International Red Data Book, including Pelecanus crispus, Aythya nyroca, Anas angustirostris, Falco cherrug, Coracias garrulus, Otis tarda and Tetrax tetrix. The Reserve’s territory is of great importance not only for rare and endangered nesting species. It is also a vital migratory stop-over site and wintering area for threatened species, including waterfowls, some rare species are found here on passage, for example, Anser erythropus and Rhytirhyncha ruficollis, an endemic species of the Western Siberia and the only relic representative of this genus, besides, a threatened relic species, has also been observed occasionally in the Reserve. Among Falconiformes the most valuable species are Circus macrourus, an endemic of Eurasian steppes, Apus apus and Falco naumanni. The Reserve plays an important role in the conservation of the OD’ population of Grus leucogeranus, a threatened migratory species, as a stop-over point for cranes migrating to their wintering ground in Iran. Visitations of Glareola nordmanni and Chetta intermedia, an endemic species of Russia and Kazakhstan, have also been registered.

3c. Comparative analysis (including state of conservation of similar properties)

1. GEOGRAPHIC ANALYSIS

1.1. The Udvardy scheme-based analysis (biographic realm level)

The Volga Delta (Astrakhansky State Biosphere Reserve) is located in Eastern Palearctic that, according to the Udvardy’s realm, biome and province classification (1975) is one of the largest biogeographic kingdoms. However, this vast biogeographic region contains a comparatively small part of World Heritage (hereafter WH) properties (about 20 WH sites of 166 in total). Besides, that the sites are distributed disproportionately and are located mainly in the central and eastern parts of the region (in Siberia, Russian Far East, China, Korea and Japan), while the western part of Eastern Palearctic that possesses a wide range of ecosystems from arctic tundra on the Taymyr peninsula and taiga plains in Western Siberia to the Western Asia’s uplands and Arabian deserts until recently has been represented by the only WH site – the Azadegan Oryx Sanctuary in Oman (in 2007 the sanctuary became the first site removed from the WH List since the List was established). Thus, the Volga Delta is situated in a region with an obvious deficiency of WH sites and the designation the Astrakhansky Reserve as a WH property will be a step towards a more balanced and representative WH List.

1.2. Thematic analysis (IUCN’s Global Themes) Currently the WH List includes more than 60 properties, which can be (fully or partly) defined as wetlands, plenty of lakes, high dynamics of natural processes due to rapid Caspian Sea level fluctuations. Expansive lotus fields add a special charm and peculiarity to the Volga Delta landscape. During the blooming period of the Caspian Lotus (Nelumbo lutea) the Delta becomes an area of exceptional natural beauty and aesthetic importance.
The Volga Delta is a unique natural phenomenon, there is no exactly the same site existing in the world. However, as follows from a comparison of some general characteristics of the Volga Delta and other World Heritage properties containing river deltas, they have some certain similarity. It is probably best illustrated by the results of a comparison of the Volga Delta with the deltas of its nearest geographical neighbors - large Eurasian rivers (see Table 3).

**CRITERION VII – natural phenomenon/scenic site**

Because of its mosaic structure where water landform elements (narrow and wide river channels, gulfs and open water areas) are naturally combined with terrestrial landform elements (islands of different size, shoals and vegetation (gallery oyster and reed beds, mace reed, wet meadows) the Volga Delta has a low-key but very much aesthetically pleasant, pacifying landscape. During the blooming season of the lotus (also called Caspian Rose) the delta has an eye-catching, magnificent look thanks to floating carpets made of hundreds of splendid rose-colored flower buds.

The presence of the lotus in the landscape is the main visual difference between the Volga Delta and two other European river deltas - Guadalquivir River Delta and Danube Delta - inscribed on the UNESCO WH List under criterion vii (aesthetic value; see Table 3). Besides that, the avadavats of the two abovementioned deltas are either weekly developed (Danube) or not developed at all (Guadalquivir River). In contrast to them, the Volga Delta in the Astrakhan Reserve possesses numerous islands, bays, channels and shallow that make the landscape very picturesque.

**CRITERION VIII – geology / paleontology / terrain**

The Volga Delta is a unique landform occurred as a result of interaction between two large hydrological systems of Eurasia, the Volga River and the Caspian Sea.

<table>
<thead>
<tr>
<th>Name of a WH property for its inscription on the UNESCO WH List</th>
<th>Approximate measure/area of an entire delta complex</th>
<th>WH property: name</th>
<th>WH property: General characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volga Delta (Russian Federation) Proposed criteria: vii viii ix x</td>
<td>150x200 kilometers/ about 2 million ha (1 million ha is an avadavat)</td>
<td>Astrakhanksky Biosphere Reserve (3 clusters with buffer zones) 100 000 ha / 5,5 %</td>
<td>a) Southern temperate zone, desert zone b) about 200 mm c) Early Holocene</td>
</tr>
<tr>
<td>Danube Delta (Romania) vii x</td>
<td>70x100 kilometers/ 800 000 ha</td>
<td>Danube Delta Biosphere Reserve 680 000 ha / 85%</td>
<td>a) Southern temperate zone, steppe zone b) about 450 mm c) Late Pleistocene (Wurm-III)</td>
</tr>
<tr>
<td>Guadalquivir river delta - Marismas (Donana National Park WH site) (Spain) vii ix x</td>
<td>20x15 kilometers/ approx. 25 000 ha</td>
<td>Donana National Park 50 000 ha / 100 %</td>
<td>a) Mediterranean zone, sclerophyll forest zone b) about 550 mm c) Holocene</td>
</tr>
<tr>
<td>Ganges-Brahmaputra Delta (Sundarbans WH site, India-Bangladesh) ix x</td>
<td>300x300 kilometers/ about 8 million ha</td>
<td>Sundarbans National Park (India) and 3 sanctuaries (Bangladesh) with a total area of 300 000 ha / about 4%</td>
<td>a) Subequatorial zone, Monsoon zone b) 2000-3000 mm c) Holocene</td>
</tr>
</tbody>
</table>

The Volga Delta in the Astrakhan Reserve possesses geographical neighbors - large Eurasian rivers (see Table 3).

**Proposed criteria:**

- **vii** scenic site
- **viii** significant historical or architectural property
- **ix** important natural property
- **x** nature reserve

<table>
<thead>
<tr>
<th>Name of WH property in the South African Republic</th>
<th>Approximate measure/area of an entire delta complex</th>
<th>WH property: name</th>
<th>WH property: General characteristics:</th>
</tr>
</thead>
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The Volga Delta in comparison with the Eurasian delta systems belonging to natural World Heritage sites.
CRITERION IX – ecological processes

The key factors determining site-specific features of ecological processes in the Volga Delta are as follows:

1) Huge size of the delta. It is Europe’s largest river delta and one of the world’s largest delta systems. Among river delta complexes presently enjoying World Heritage status the Volga Delta is exceeded only by the Ganges-Brahmaputra Delta (Table 3) whereas all others are significantly smaller. The Lena Delta are larger than the Volga Delta but they are not designated as World Heritage sites yet.

2) Well developed avadelta. It is a 40–50-kilometer-wide, mildly sloping, shallow intermediate zone where natural processes are the most intensive. Water level here is highly changeable, the coastline is very indented and the landscape is especially diverse. Among natural WH sites containing river deltas a similar avadelta can only be found in the Ganges-Brahmaputra Delta with its vast mangrove thickets growing below the highest tide level and plenty of small islands. Monsoonal climate contributes much to significant seasonal changes in the life of this delta. The Danube Delta is considerably elevated in relation to the Volga Delta. Its coastline is formed mainly by sandy hills and therefore it is relatively smooth. There is no such abundance of small coastal islands here as in the Volga Delta. Even in spite of annual spring floods, hydrological regime of the Danube Delta is comparatively more stable than that of the Volga Delta. The Guadalquivir Delta is a landlocked delta, however seasonal changes (floods in the winter rain season, for example) have also been observed here.

3) Distinctive hydrological features of the Volga Delta area, namely, almost complete absence of lakes (to compare, there is a great many round-shaped lakes in the Danube Delta) and a complicated network of small channels (erikis) that serve as a connecting link between larger waterways (similar channels can also be found in the Danube Delta, but the network is well-developed only in the northern part of the delta).

4) Location in the lowland zone. Some areas within the Volga Delta lie at the level of Caspian Sea, i.e. 27 meters below sea level! This phenomenon is thought to be caused by the low-lying location and landlocked situation of the Caspian Sea. The Danub Delta, Guadalquivir Delta and the Ganges-Brahmaputra Delta lead into the Black Sea, the Atlantic Ocean and the Bay of Bengal opening to the Indian Ocean, respectively, and so they are (approximately) at sea level (zero elevation). Thus, talking about the Volga Delta we mean the lowest part of one of the world’s lowest deltas.

5) Desert environment of the adjacent areas also plays a significant role. It contrasts with steppe areas surrounding the Danube Delta, subequatorial mangrove thickets of Sundarbans and Mediterranean-type scyphophytous vegetation of the Guadalquivir Delta region. The Volga Delta is characterized by a pronounced continental climate (annual temperature swing is from -30°C to +40°C).

Thus, the Volga Delta is characterized by large-scale, highly intensive and very specific natural processes that make the nominated property an important scientific research polygon.

It is relevant to mention that the three clusters of the Astrakhan Reserve proposed for inscription on to the World Heritage List though not completely but adequately represent the whole complex Delta. The clusters are located in western, central and eastern portions of the delta and include both upper delta and avadelta, thereby representing the most interesting and dynamic section of the Volga Delta, which is directly dependent on the water conditions of the Caspian Sea.

CRITERION X – biodiversity/ rare and endangered species

The Volga Delta is an oasis surrounded by arid areas. The highest biodiversity and species richness of main taxonomic groups of this region can be compared with that of those delta systems, which have already received WH status (Table 3).

Birds is the most representative group of the vertebrates tightly connected with the delta landscape. Let’s compare the avifauna of the Volga Delta with that of its closest neighbor – the Danube Delta.

On the one hand, the number of bird species is approximately the same (280 and 300, respectively), but

- sides, mass gathering of waterfowl including some duck species (mallard, gadwall, teal, pochard and others), goose and swan species (whooper swan and mute swan) have been observed in both sites. Other bird inhabitants of the Volga Delta (bootes, ibises, storks and herons, commonos, glossy ibis, different species of sandpipers and also Balmatian and white pelicans). Thus, the list of bird species looks quite similar for both properties, at least in relation to the most mass waterfowl and water-related species. On the other hand, the avifauna of the Volga Delta has some singularities in comparison with the Danube Delta (Table 3).
   - High number of white-tailed eagles (about 60–70 nesting pairs and numerous young birds). The species is listed in the International Red Data Book;
   - White crane (International Red Data Book). Small number, but regularly seen on passage;
   - Buff-backed heron (RF Red Data Book) is nesting not too regularly in the Volga Delta;
   - A very rare phenomenon: common nesting of great white heron and little heron, glossy ibis, mallard duck, spoonbill, pond heron.

With regard to the vegetation of the Astrakhan State Reserve, the blue lotus (Nelumbo nucifera) is the most remarkable of protected plant species in the reserve. It is one of the most beautiful water plants in the world, the floral symbol of Lower Volga, and a relic species that is scarce in Russia and therefore is entered into the Red Data Book of the Russian Federation. The lotus has a wide geographic range: it is found in north-east Australia, in Malaysia-Indochina, in Sri Lanka and Philippines, in the south of Japan, in Hindustan and Indo-China. In these countries it became a sacred plant, a symbol of tradition-al and religious regions. There is also a small colony of Ip-

- The Volga Delta forms where the Volga River – great Russian River, the largest river in Europe, and the true symbol of Russia - meets the Caspian Sea. It is the Earth’s largest landlocked water reservoir that does not connected to the sea in the modern geological period. The sea is characterized by rapid and significant water level fluctuations accompanied by seasonal water surface area and water volume. The average rate of the most recent Caspian sea-level rise was 100 times greater than that of the eustatic global mean sea level rise; the last Caspian sea-level cycle (1929–1995) has resulted in a 3-meter water level drop.

The Volga Delta is the largest delta in Europe and one of the world’s largest deltas. It is situated in the Caspian Depression, which is one of the lowest points on the Earth (27 meters below sea level). The Volga Delta bank and underwater slope gradients are the lowest among large river deltas throughout the world (less than 5 cm/km). The delta thereof has extremely complicated hydrographic system and is characterized by an extensive avadelta (the subaqueous part of the delta) with depths of 1.5-2.5 meters. The water temperature there (3°C) remains almost unchanged from the sea and thus the zone of river and sea water mixing is located several kilometers away from the delta’s marine edge of the delta. The total area of the Volga Delta (incl. avadelta) is over 20,000 square kilometers.

The Volga Delta has probably the most complicated hydrographic network in the world. Approximately 900 waterways reach the seacoast of the delta. That very tangled network of channels and lakes in combination with rich vegetation makes the landscape very peculiar. It is also makes the delta an oasis-looking area placed against a
background of flat and monotonous, water- and vegetation-lacking deserts and semideserts.

Volga Delta is a region where mass concentration of migratory birds is observed, including many rare and endangered species. Many of them form large nesting colonies. The delta also plays an important role in the development of fishing industry.

The Volga Delta is a unique natural property possessing outstanding universal value and therefore is worthy of inscription on to the World Heritage List. Despite of showing resemblance in some characteristics to other large river delta systems, the Volga Delta as a natural complex is notably different from any of existing World Heritage sites. The distinguishing features of the Volga Delta are as follows: huge size, extensive subaqueous part of the delta (avandelta), the zone of river and sea water mixing that is “moved” tens kilometers off to the sea, remarkably complicated hydrographic network, a very indented coastline, plenty of lakes, high dynamics of natural processes due to rapid Caspian sea level fluctuations. Expansive lotus fields add a special charm and peculiarity to the Volga Delta landscape.

The Volga Delta is situated in the Eastern Palearctic where a deficiency of WH sites has been recognized. If the delta achieves World Heritage status, it will be a significant contribution to the elimination of a disbalance in global distribution of natural World Heritage sites as well as to strengthening the credibility of the World Heritage List. Despite the List already contains quite a number of wetland sites, the Volga Delta would be the first large river delta of classic trigonal type, having such complicated hydrographic network, and situated in arid and semi-arid environment. The high dynamics of natural processes in the Volga Delta caused by rapid Caspian Sea level changes deserves special attention. In the 20th century the rate of the Caspian sea level rise was 100 times higher than that of the eustatic global mean sea level rise, and so we can consider the Caspian seashore as a natural laboratory for studying and forecasting the effects of sea level changes on coastal wetland ecosystems.

It hardly seems possible to include into the World Heritage List the total area of the Volga Delta that is huge in size, so the purpose is to obtain World Heritage status for though comparatively small but best preserved, most valuable and rapidly developing portions of the delta: lower delta and avandelta, which are represented by the three clusters of the Astrakhansky State Biosphere Reserve.