

The GIS project “Areal and population size of Russian Desman” as an essential base for the Ecological Network developing for the Russian Desman's protection and conservation.

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Translation

Summary. We have summarized the information of the last 20 years about territories settled by Russian Desman and developed a database related with e-map in a GIS project.

The database and GIS project are supposed to be used by all Desman specialists as a basis for collecting information on this species and developing actions for its protection.

The available information about present population's condition of Russian Desman is imprecise and not sufficient for protecting this animal and restoring its number. For saving Russian Desman in Nature (as a matter of fact, in the world, because Desman doesn't breed in captivity) it is necessary to know the places where Desmans are still inhabit and the number of its local populations. It allows to elaborate effective methods and plans for protecting Desman and then to realize them. According to the experts opinion, the most effective plan for protecting Desmans is the formation of the Ecological Network (a net of large protected areas connected with each other by thin protected corridors). Such Ecological Network will protect not only the Russian Desman but all freshwater ecosystems settled by this species.

For this purpose it is very important to use a GIS basis connected with a comprehensive database of all information about Russian Desman. This project has partly realized this objective.

Russian Desman (*Desmana moschata* (Linnaeus, 1758)) – is a relict species with a decreasing population inhabits within the Russia territory previously. Due to the declining population it was included in the Red Book of Russian Federation, in the Appendix of the Resolution 6 of the Bern Convention and in the IUCN Red List.

Russian Desmans inhabit small lakes and streams in river floodplains. These animals need very clean water, therefore a settlement of Russian Desmans is a good indicator of ecological health of the reservoir. Thus a creation of the Ecological Network for the Russian Desman conservation will be very important for the all freshwater ecosystems maintenance (within the areal of this species) in a good ecological conditions.

With a purpose to elaborate the Ecological Network for the Russian Desman conservation in future we have gathered and preliminary analysed the cartographical, numerical and textual information about the distribution area and the Russian Desman population size over the last 20 years. The GIS technology and a tabulated database were the enabled instruments to process the huge volume of diverse and discrete data.

The last calculations and surveys of the Russian Desman within the total areal were carried out in autumn 2000 and autumn 2001 [Khakhin, 2009]. They were organized by the Biodiversity Conservation Centre (the scientific consultant of the project was professor G.V. Khakhin), in collaboration with the Department for the Protection and Development of Hunting Resources at the Russian Ministry of Agriculture, the All-Russian Scientific Research Institute of the Russian Ministry of Natural Resources and with the direct participation of regional authorities concerned with the conservation, monitoring and management of game animals.

The survey had covered around 30,000 km of the banks of rivers, lakes and artificial reservoirs. In the database and the GIS project we have included all available data of these surveys from 17 administrative units and data from some other sources of information (Tab. 1). For the GIS project developing we used the ArcView GIS Version 3.2 software product, ESRI. As a cartographic base we used the scanned topographical maps with a scale of 1:100 000, which primarily were georeferenced to the ArcView GIS 3.2. The database was elaborated in Microsoft Office Excel.

The database contains the following information about each point of desmans' settlement disclosures:

- a source of information;
- an author of the information and his/her coordinates;
- a date of desman's finding;
- an administrative district, a name of nearest human settlement;
- a name of reservoir and the main parameters (the average length, width and depth, shoreline forest cover);
- a human impact on the ecosystem;
- a length of the examined shoreline;
- a number of habitable burrows of desmans or an approximate number of desman populations (in the examined point);
- a number of habitable burrows of European Beaver and muskrats;
- a conservation status of the territory and/or the nearest Protected Areas.

In the course of the GIS Project developing we placed a point (incoming as an object in the ArcView point shp-theme of Russian Desman settlements) near the appropriate reservoir, designated in the information source as inhabited by desmans. The characteristics of each point were put down in the tabulated database (Excel) and in the attribute table of the shp-theme (ArcView GIS 3.2). Each point had its own ID number, which provides the relationship between the database in Excel and the attribute table in ArcView GIS 3.2. The same ID and, accordingly, the same attribute values, were assigned to the objects of the shp-themes for rivers (line shp-theme) or lakes (polygon shp-theme) about which the point was placed. For large and average rivers ID were assigned to theirs segments within administrative areas and limited by boundaries of these areas. Thus the attribute tables of shp-themes were connected with the database by an identification number of the ID column.

Table 1.

The information sources of the Russian Desman areal and population size

Administrative area of the Russian Federation	The total amount of georeferencing points		Calculation 2000- 2001	Regional Red Books (year of edition)	Internet poll (Biodiversity Conservation Center, 2009)	Other information sources [links]
	approximately	precisely				
Astrakhan Region	4	9	+			[3]
Bryansk Region	0	3		2004		[4, 5]
Vladimir Region	18	1	+			[1, 3, 9]
The border between Vladimir Region. and Ivanovo Region.		22				
Volgograd Region	15	32	+	2006		
Vologda Region						
Voronezh Region	0	2				[3, 5]
Ivanovo Region		6	+	2007		[5]
Kaluga Region	9	49	+	2006		[2, 3]
Kirovsk Region	0	4		2001		[3]
Kostroma Region	7	16	+		+	
Kurgan Region	47	66	+	2002		
Kursk Region	36	72	+			[4, 5]
Lipetsk Region	6	12	+			[5]
Moscow Region	4	10	+	2008	+	

Nizhny Novgorod Region	9	19	+	2003	+	[3]
Novosibirsk Region	0	4		2000		
Orenburg Region	3	13	+	1998		[8]
Orel Region	0	4				[3, 5]
Penza Region	3	18	+	2005		[8]
Republic of Bashkortostan		0		2004		[5]
Republic of Mari El	0	2		2002		[3]
Republic of Mordovia	15	19	+	2005		[3, 5]
Republic of Tatarstan	0	1		2009		
Rostov Region	0	5		2004		[4]
Ryazan Region	0	5		2001		[3, 6]
Samara Region						[3]
Saratov Region	0	7	+	2006		[3]
Смоленская Region	5	22	+	1997		[5]
Smolensk Region	45	24				[3, 5]
Tver Region	2	4		2002		[7, 9]
Tomsk Region	0	4		2002	+	
Ulyanovsk Region	0	7		2002	+	
Chelyabinsk Region	0	2		2002		
Chuvash Republic	0	3				[3]
Yaroslavl Region	5	27	+			[3, 5]
Total amount	233	494				

By the reason of the large-scale topographical basis lack for a number of points we could not find reservoirs, designated by the observation authors. Data on these “indefinite” points were summarized according to their location near any major geographical object (large pond, village or administrative district).

In these cases a so-called “summary point” (Sum point) was put on a topographic base in the GIS project. The attribute table of a “Sum point” combined the data of all “indefinite” points incorporated into this summary point. Each Sum point had the own ID number connected the database and the attribute table.

Each “indefinite” point had a personal ID (and notes in the database and in the attribute table of the GIS project) as well. This enables to involve the “indefinite” points in the analysis which do not actually needs the accurate georeferencing points. If an “indefinite” point will be georeferenced to a map more accurately it will be removed from a corresponding Sum Point and will be placed in the group of precisely georeferencing points.

* * *

The total number of processed points of Russian Desman’s settlements was 727. 494 points (68%) had been georeferenced to a topographic base accurately, the remained 233 points (32%) had been determined on a topographic base approximately and were included in 58 “summary points” (Sum points) (Tab. 1). The distribution of all points of Russian Desman’s settlement is demonstrated on the map below (Fig. 1).

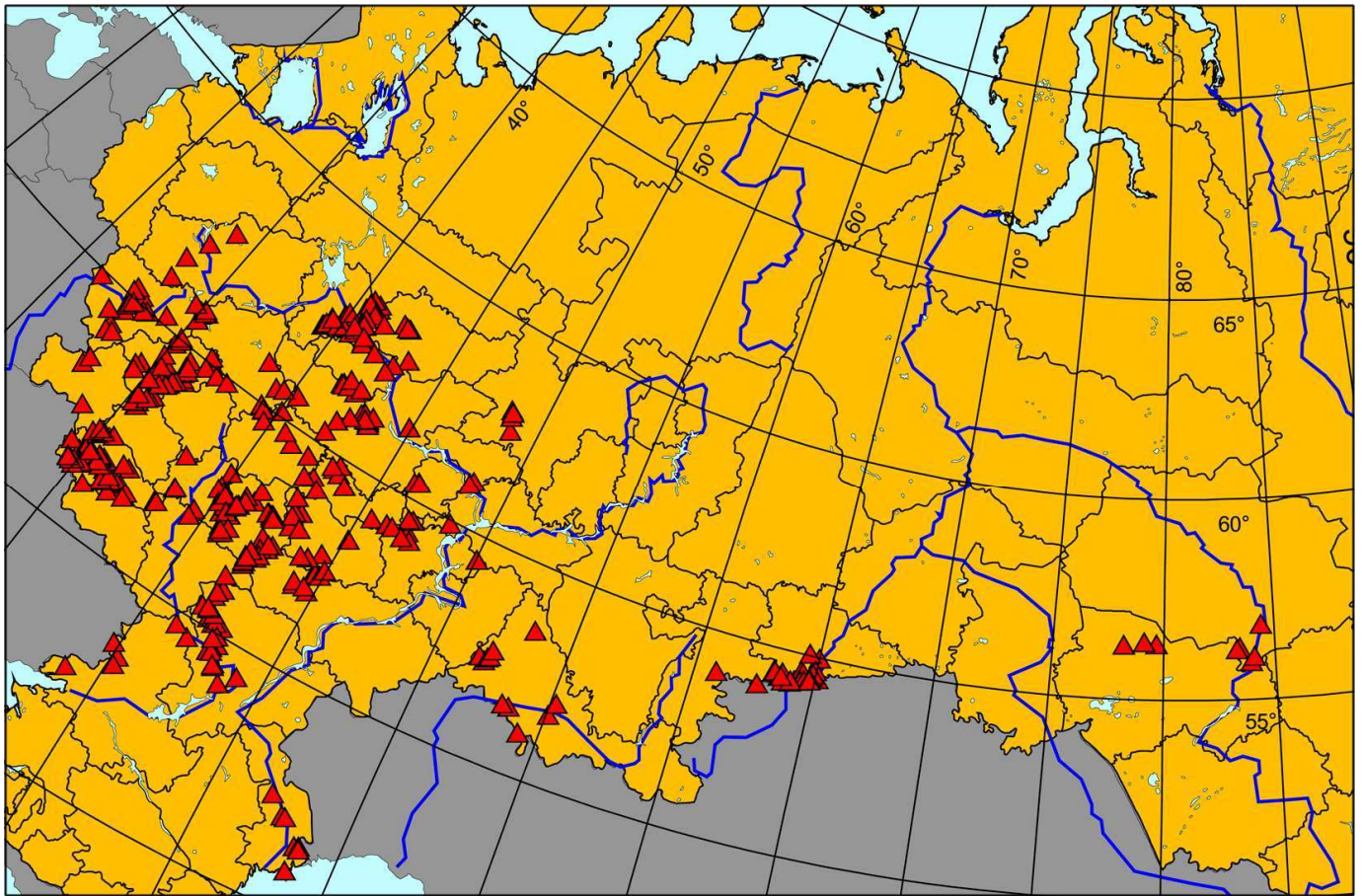


Figure 1. The distribution of all points of Russian Desman's settlement within the Russian Federation

For the primary analysis of the Desman's settlements distribution in protected areas the shp-themes of all points and reservoirs (rivers and lakes) were superposed with the shp-themes of the Federal and Regional Protected Areas (Fig.2). With a use of reference materials and scientific publications a database of Protected Areas inhabited (or possibly inhabited) by Russian Desman was made.

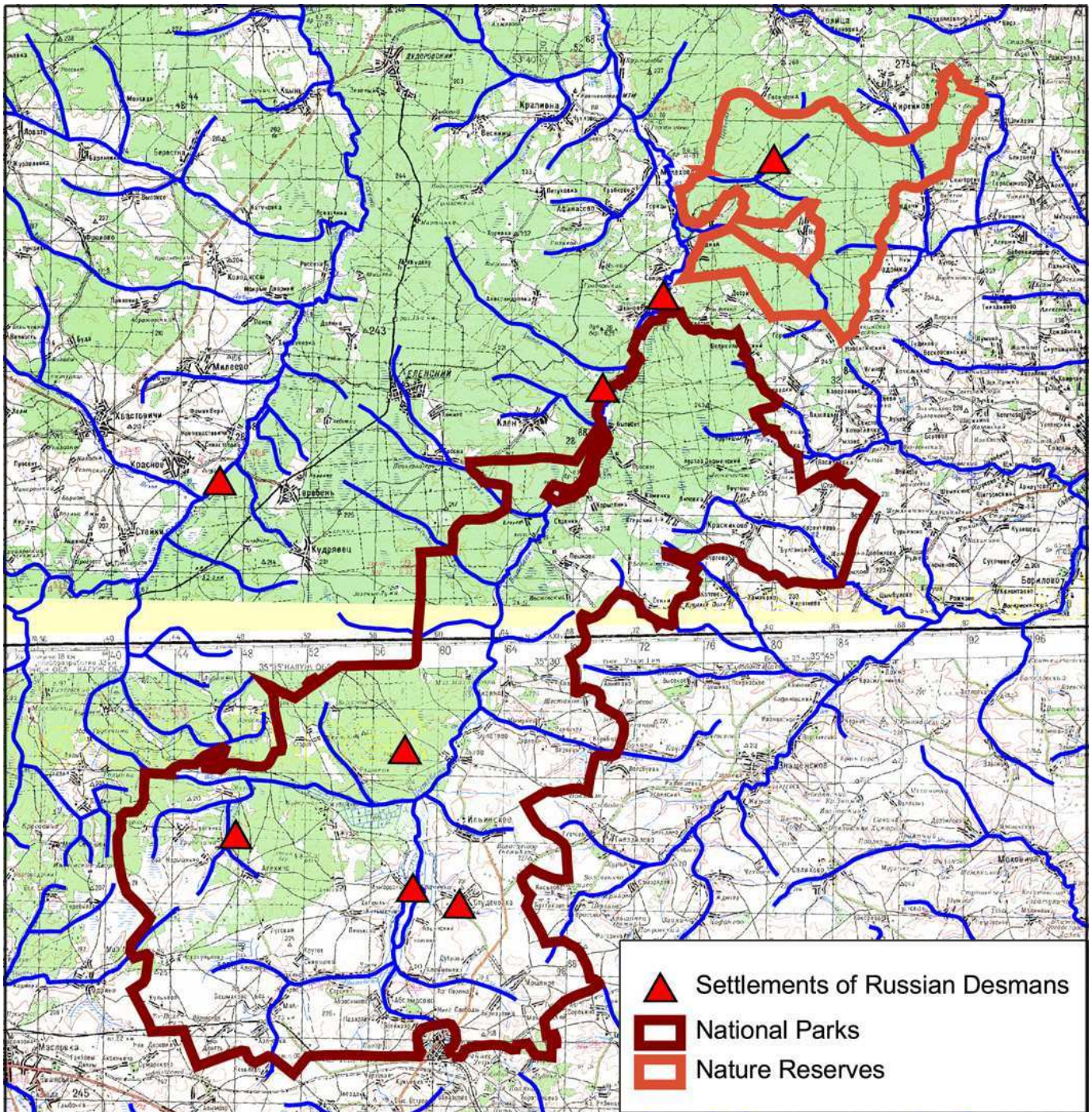


Figure. 2. The local territories settled by Russian Desman (example)

The list of protected areas in the database was currently made up from the State Nature Reserves (a category I by the classification of the IUCN), the National Parks (category II), the Federal and Regional Wildlife Preserve (category IV), the Nature monuments (category III or IV). Additionally the list includes some of the highly developed hunting farms (actually relevant category VI by the classification of the IUCN).

Below is a resulting list of the protected areas in which Russian Desmans live. The most important of them formatted by *italic*.

Astrakhan Region: the Astrakhan State Nature Reserve.

Bryansk Region: the State Nature Reserve “Bryanskiy Les”; the Kletnyanskiy Federal Wildlife Preserve.

Vladimir Region: *the Federal Wildlife Preserves Kljazminskiy (part) and Muromskiy*; the Meshchera National Park; the *Regional Wildlife Preserves Klyazminsko-Lukhskiy, Vyaznikovskaya poyma and Klyazmenskiy beregovoy*; the *Seltsovskoye hunting farm*.

Volgograd Region: the Nature monuments: Nizhnekhoperskiy, Ust-Medveditskiy, Donskoy.

Voronezh Region: *the State Nature Reserves Voronezhskiy and Khoperskiy*; the Federal Wildlife Preserve Voronezhskiy; Nature monuments: “A part of river Savala”.

Ivanovo Region: the *Federal Wildlife Preserves Klzyazminskiy (part)*; the Regional Wildlife Preserve Zavolzhskiy.

Kaluga Region: *the National Park “Ugra”; the State Nature Reserve “ Kaluzhskiy zaseki”; the Nature monuments: the lakes Gorozhenoye, Oreshnya, Yamnoye.*

Kirov Region: *the State Nature Reserve Nurgush*;

Kostroma Region: *the Federal Wildlife Preserve Sumarokovskiy*;

Kurgan Region: the Federal Wildlife Preserve Kurganskiy; the Regional Wildlife Preserve Proryvinskiy.

Kursk Region: the Regional Wildlife Preserves Lomovoye, Malino Lezvino, Vet, Makovoye, Karyzhskiy;

Lipetsk Region: *the State Nature Reserve Voronezhskiy*; the Regional Wildlife Preserves Dobrovskiy, Lipetskiy, Yamanskiy, Kolodetskiy, Pervomayskiy; the Nature monuments – lakes Stolpetskoye, Zalanskaya Luka, Maloye Ostabnoye, Kashi Shirokoye, Kolovertnoye, Kostyl, Krutets, Kurkino, Osinovoye, Perevalnoye, Plotskoye, Podgornoye, Sovkino, Dolgoye, Izlegoshcheye, Krivoye, Lyubovitskoye, Mogilishche, Chernaya Meshcherka, rivers Meshcherka, Dvurechka.

Moscow Region: the State Nature Reserve Prioksko-Terrasniy; the Regional Wildlife Preserves Yegoryevskiy, Sosnovoe lake.

Nizhny Novgorod Region: the State Nature Reserve Kerzhenskiy; the Regional Wildlife Preserves Pustynskiy, Vachskiy, Navashinskiy, Pustynskiy, Tumbotinskiy, Varnavinskiy; the Nature monuments: Pustynskiye lakes, Zhelnino-Pushkino-Seyma territory, Viterevo lake, floodplain of Oka near the vil. Vnutrenniy, 11 Nature monuments in Buturlinskom, Vachskom, Volodarskom, Voskresenskom, Vyksunskom, Kulebaskom, Lyskovskom, Navashinskom, Pavlovskom, Sergachskom districts.

Novosibirsk Region: the Regional Wildlife Preserve Mayzaskiy.

Orel Region: *the National Park Orlovskoye polesye.*

Penza Region: *the Regional Wildlife Preserves Kamzolskiy, Belinskiy*;

Republic of Bashkortostan: the Nature monuments lakes Bolshaya and Malaya Yelan.

Republic Mariy El: the National Park Mariy Chodra.

Republic Mordoviya: *the State Nature Reserves Mordovskiy; the Nature monuments - Simkinskiy Landscape Preserve, Beliye lakes, the Turf Swamp “U kordona”.*

Ryazan Region: *National Park Meshcherskiy; the State Nature Reserve Okskiy and its frontier zone; Regional Wildlife Preserve Ryazanskiy and Sosnovskiy*; the Nature monuments: Beloe Lake (Kasimovskiy district), Zhitkovo, Dubskoye, Yerkhinka, Rumka, Hunting farms Muromskoye, Izhevskoye, Seletskoye, Spasskoye, Skopinskoye.

Samara Region: the National Park Samarskaya Luka.

Saratov Region: the National Park Khvalynskiy; hunting farm Bakurskoye and Yekaterinenskoye.

Smolensk Region: the Regional Wildlife Preserve Solovyevskiy; the Nature monument Mezhdurechenskiy.

Tambov Region: the State Nature Reserve Voroninskiy.

Tomsk Region: the Federal Wildlife Preserve Tomskiy.

Ulyanovsk Region: the Federal Wildlife Preserve Surskiy; the Nature monument Picherskoye lake.

Chuvash Republic: the National Park Chavash varmane; the State Nature Reserve Prisurskiy; the Nature monument: Staraya Staritsa (the group of lakes), Bezdna river, Urgul (the group of lakes and swamps).

Yaroslavl Region: the National Park Pleshcheyevo lake, the Regional Wildlife Preserves Sotinskiy and Ustyevskiy.

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Based on the collected data, we carried out a preliminary estimation of the effectuality of the existing protected areas for Russian Desman's conservation within European part of Russia. For each protected area were used the following characteristics:

- a total number and density of Russian Desman's population within the protected area;
- a guarding regime in the protected area;
- a security level of the protected area which depends from the guarding regime, the level of human impact and the geographical location of the protected area.

The evaluation showed that a large part of Desman's population lives outside the Reserves, National Parks and Wildlife Preserves, but within protected coastal zones of rivers and other Protected territories where good and safe conditions for these animals have been supported. The last areas, where the Desman's protection measures were made efficiently, included the Seltsovsky specialized hunting farm of the Vladimir Region. It is reasonable to involve this area in the Ecological Network as a conservation area where the conservation will be supported by the initiative of nature users.

A number of small protected areas of some regions by their complex ensure the preservation of large populations of Russian Desman, although each of them has only a small quantity of these animals. For instance the total amount of small lakes and oxbow lakes of the floodplain of Oka River in the Ryazan Region is the largest center of Desman settlements. Their number (in 1999) was estimated as 5-6 thousand animals [Khakhin, 2009].

It is necessary to include such small protected areas in the Ecological Network as the key areas connected with each ones by other natural areas supported the favourable regime for a Desman's settlement.

In particular it is necessary to include in the Ecological Network the small Protected Areas of lakes, backwaters and channels of the Oka River floodplain in the Ryazan Region related with each other by natural areas of the Oka coastal protection zone. Besides, the coastal protection zone of Oka should be extended to the ecologically reasonable size, i.e. up to a width of the floodplain (the appropriate legal acts should be changed for this purpose). The similar measures for the favourable environment maintenance should be taken with regard to other rivers inhabited by Russian Desmans.

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