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Problems in creating lists of protected species for regional Red Data Books: aquatic vascular plants of European Russia and North Caucasus as case studies

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Summary: The Red Data Books are among the major legislative instruments to protect wild plants and animals. Therefore, the clear and comprehensive criteria for the inclusion of the species in the Red Data Books and assigning them to proper conservation categories are of vital importance. IUCN Red Lists are used worldwide for this purpose on global and regional level, but are still not in use in certain countries including Russian Federation due to historical and other reasons. The purpose of this paper was to analyze the pitfalls of the regional red lists and the Red Data Book of the Russian Federation compiled using the old ranking system of protection categories based on subjective 'expert knowledge'. As a result of this work, the status of 99 protected aquatic and amphibious plant species listed in 80 regional Red Data Books or red lists and the Red Data Book of Russian Federation from 55 regions of the European part of Russian Federation and North Caucasus was revised. Numerous mistakes and deficiencies that we detected in the Red Lists are not only due to insufficient investigation effort or low taxonomic qualification of local botanists, but also because species biology, environmental requirements and effects of climate change are not properly considered. For some species, conservation will succeed only when applied to the entire watershed upstream of major rivers, which requires coordination between the regional conservation biologists. For other species, artificial habitats with ecological conditions similar to the natural can be vital.

Keywords: Red List, Red Data Book, IUCN criteria, IUCN categories

IUCN Red Lists are widely used for evaluating present situations in populations, risk analyses and priorities of protection of different organisms on global level (Brito et al. 2010). IUCN criteria for classifying threatened species in red lists were constructed primarily for application on a global scale, but are often used nationwide (Mace 1994; Gärdenfors 2001; Keller & Bollmann 2004; Miller et al. 2007; Brito et al. 2010; Juslén et al. 2013). Most of the conservation efforts are carried out at national level and therefore, there is a great demand for regional red lists (Milner-Gulland et al. 2006; Miller et al. 2007; Zamin et al. 2010). The term 'regional red list' is often used for those of one or several adjacent countries, but in cases of large countries such as Russia, a regional list deals with a certain territory within a country. Grammont & Cuaron (2006) recommend use of CITES lists that include rare and endangered taxa of commercial value as well as those taxa that can be confused with them at the customs control. A number of studies (Ginsburg 2001; Miller et al. 2007; Brito et al. 2010) indicate that the IUCN criteria work well on a national scale despite some problems (Popov et al. 2017). Common problems are (1) the status of species threatened with extinction in a given country, when the country holds an edge of native distribution range of a species (Brito et al. 2010) and (2) the problem of defining the term 'extinction' as applied to local populations of particular species (Miller et al. 2007; Mace et al. 2008) in the country. These problems were typical of the Red Data Book of the USSR (Borodin 1984; Milner-Gulland et al. 2006) and can be seen in the Red Data Book of the Russian Federation (Bardunov & Novikov 2008).

Russia is federate state; each subject of federation has a large area comparable to the area of the major European countries. According to the current legislation of the Russian Federation, legal documents defining the protection of species at a regional level are red lists approved by the regional government. These red lists contain only names and categories of protected taxa and form a basis for regional Red Data Books; the latter provide detailed scientific and management information including a list of recommendations for the protection of each species. Today, the governmentally approved red lists of protected plant and animal species exist in all the subjects of the Russian Federation and most of these subjects have printed regional Red Data Books. Currently, the Red Data Books both federal and regional are among the major legislative instruments to protect wild plants and animals. However, the official status of the federal and regional Red Data Books in Russia demands that all taxa included are provided with real conservation. This is, why people directly dealing with practical aspects of conservation prefer not to include taxa in the Red Data Books whose protection cannot be performed (Possingham et al. 2002). The majority of compilers of Red Data Books are scientists rather than conservation managers. The scientists, in contrast to managers, tend to evaluate taxa mainly on the basis of analyses of threats to their existence. Depending on the degree of involvement of these two groups (scientists and conservation managers) in compiling Red Data Books, the lists of species provided can differ considerably even in editions prepared for geographically close regions of Russia.

Following the classification of the Red Data Books of the USSR (Borodin 1984) and Russian Federation (Bardunov & Novikov 2008), authors of the regional Red Data Books and red lists use an old 'numerical' ranking system of protection categories based on subjective 'expert knowledge': 0 – Probably Extinct, 1 – Endangered, 2 – Vulnerable, 3 – Rare, 4 – Data Deficient, 5 – Recovering or Recovered. Usage of this ranking has following reasons:

1. Many Russian botanists are not familiar with international conservation literature describing how to use the IUCN criteria for assessment of protection status of species on regional level (e.g. Gärdenfors et al. 1999, 2001; IUCN 2001, 2010).

2. Usage of the IUCN criteria requires detailed information at population level which many experts do not have (Burgman et al. 1999; Gonzales-Mancebo et al. 2012; Syfert et al. 2014). Our experience in this field shows that in many regions of the Russian Federation, only a few plant species (practically all vascular plants) can be classified correctly using IUCN criteria with majority of the species being assigned to the DD category.

3. Preparation of regional red lists, their compilation, publishing, further editing and some other aspects are regulated by the Methodical Letter of Ministry of Natural Resources of Russian Federation No. 02-12-53/5987 from 27 June 2006. This document requires making compatible the protection status of species among the Red Data Books of bordering regions and the federal Red Data Book. This requirement efficiently preserves a continued usage of the old ranking system in Russia.

This paper reviews the regional Red Data Books of Russia. First, we evaluate the accuracy of existing lists of regional floras, provide the verified lists and show that almost all regional Red Data Books and red lists contain numerous mistakes and inaccuracies. Second, we analyze the major causes of these faults both objective and subjective and summarize them as a general guideline for compiling red lists of aquatic plants.

Vascular aquatic plants were chosen as study objects. This group of plants suits well purposes of the study because aquatic plants are widely distributed, represented by a relatively small number of species and their biological traits and spatial distribution in the European part of Russia is quite well known. Also, biota of continental waterbodies respond not only to the local negative impacts, but also to those that take place upwards the watershed in a neighbouring region.

Materials and methods

We use the term 'vascular aquatic plants' for those aquatic and amphibious plants that are submerged totally or except the generative structures throughout their life cycle (Papchenkov et al. 2007).

We analyzed aquatic and amphibious plants included in the red lists and the Red Data Books of Russian Federation and regions that are within the European part of Russia and North Caucasus, in total 55 regions of ca. 4 020 000 km^2. We have analyzed 9 regional red lists, 71 regional Red Data Books (including the second and further editions) and the Red Data Book of the Russian Federation (Bardunov & Novikov 2008).

Historically, independent regions in the Russian Federation have different names: oblast, kray, republic and okrug. For the purposes of analysis, we reorganized the regions according to economy and geography and grouped them into macroregions as follows (Fig. 1):

North – Republics of Karelia and Komi; oblasts: Arkhangelsk, Murmansk and Vologda; Nenets Autonomous Okrug (6 regions);

North-West – oblasts: Kaliningrad, Leningrad, Novgorod and Pskov; St. Petersburg City (5 regions);

Central Industrial – oblasts: Bryansk, Ivanovo, Kaluga, Kostroma, Moscow, Ryazan, Smolensk, Tula, Tver, Vladimir and Yaroslavl; Moscow City (12 regions);

Volga-Vyatka – Republics of Mari El and Udmurt; oblasts: Kirov and Nizhny Novgorod; Perm kray (5 regions);

Central Chernozemny – oblasts: Belgorod, Kursk, Lipetsk, Oryol, Tambov and Voronezh (6 regions);

Middle Volga – Republics of Bashkortostan, Chuvashia, Mordovia and Tatarstan; oblasts: Penza, Samara and Ulyanovsk (7 regions);

Lower Volga and Lower Don – Republic of Kalmykia; oblasts: Astrakhan, Rostov, Saratov and Volgograd; Stavropol kray (6 regions);

North Caucasus – Republics of Adygea, Chechen, Dagestan, Ingushetia, Kabardino-Balkaria, Karachay-Cherkessia and North Ossetia Alania; Krasnodar kray (8 regions).

We participated either as experts or consultants in the compilation of 9 regional Red Data Books: Lipetsk (Shcherbakov 2014), Moscow (Zubakin & Tikhomirov 1989; Varlygina et al. 2008), Ryazan (Kazakova 2002; Ivanchev & Kazakova 2011), Tula (Shcherbakov 2010b) and Nizhny Novgorod (Anufriev & Bakka 2005) oblasts. We carefully studied the aquatic flora of Moscow and Tula regions in 1982–1991 (over 600 field floristic descriptions) and of Ryazan and Orel oblasts in 1998–2008 (ca. 300 field floristic descriptions). In 2000–2015, more than

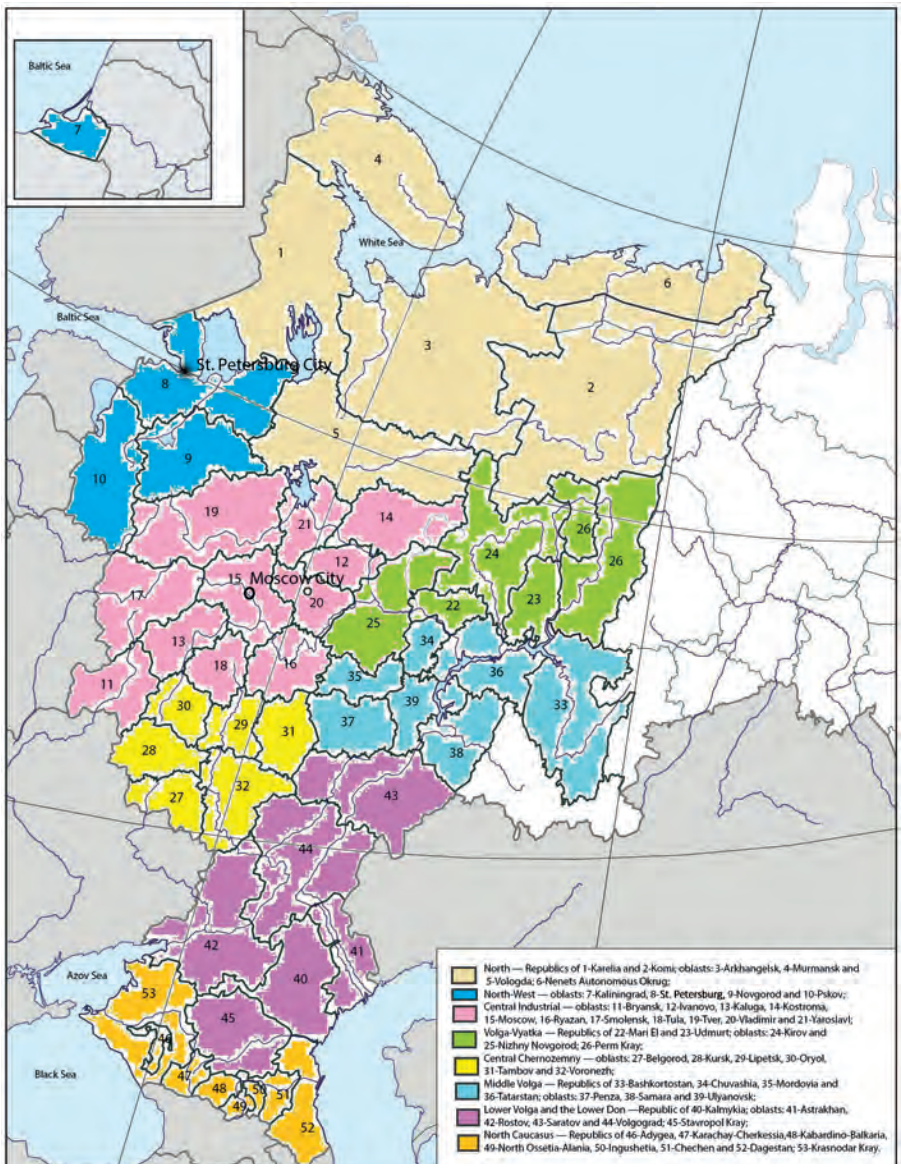

Figure 1. The administrative and economic-geographic regions of European Russia and the North Caucasus.

250 localities in the Moscow and Tula regions were revisited for collecting information on the dynamics of aquatic plants. We also examined herbarium collections [IBIW, KAZ, LE, MHA, MOSP, MW, MWG, NNSU, OHHI, OKA, RSU, TCXA, VOR, VORG, Tula SPU and some others] and relevant literature (Flora of Central Russia: Tikhomirov et al. 1998; Gubanov et al. 2002; Kalinichenko et al. 2006, 2011).

Results

Totally, 138 aquatic and amphibious plants are known for the area including alien species which naturalized completely (Lisitsyna & Papchenkov 2000). 99 species of aquatic and amphibious plants are in Red Data Books and red lists of European Russia and North Caucasus (Table 1, Appendix). Eight taxa within these 99 were omitted in the list by Lisitsyna & Papchenkov

(2000) as synonyms or lower rank taxa. Thus, ca. two thirds of aquatic and amphibious vascular plants are included in regional Red Data Books. Thirteen species of aquatic plants are included in the Red Data Book of the Russian Federation (Bardunov & Novikov 2008).

Most of the macroregions contain 30 to 40 aquatic species listed in regional Red Data Books except for the North Caucasus and the Central Industrial macroregions, which have 11 and 46 aquatic species, respectively, in their Red Data Books. Over two thirds of aquatic species from the Red Data Book of the Russian Federation occurs in the north-western part of Russia while in waters of Central Volga macroregion only one species from the Red Data Book of the Russian Federation has been observed so far.

Occurrence of aquatic species from Red Data Books and red lists of selected regions and their protective status are given in Tables 2–9 (Appendix).

The number of aquatic species in regional Red Data Books varied from 0 (Republics of Ingushetia, Kabardino-Balkaria, Karachay-Cherkessia, North Ossetia Alania and Nenets Autonomous Okrug) to 25 (Tatarstan), and they comprised from 0 to 19.6% (St. Petersburg City) of the listed species. Besides Tatarstan, high numbers of aquatic species are listed in the Red Data Books of Nizhny Novgorod (23 species) and Tver (22 species) oblasts, in Republic of Mary El, Moscow, Novgorod and Yaroslavl (19 species in each) oblasts. Very few aquatic species are included in the Red Data Books of Moscow City, Oryol oblast and Perm kray (3 species in each), in Smolensk oblast and Chechen Republic (4 species in each). Besides St. Petersburg City, a high proportion of aquatic species can be found in the Red Data Books of Yaroslavl oblast (11.0%), Republic of Mary El (12.8%), Astrakhan (12.9%), Nizhny Novgorod (13.0%) and Tver (13.7%) oblasts.

The highest number of species from the Red Data Book of Russian Federation (Bardunov & Novikov 2008) is included in the Red Data Books of Leningrad oblast (9 species), followed by Tver (7 species), Novgorod and Pskov (6 species in each) oblasts, Republic of Karelia and St. Petersburg City (5 species in each).

On average, each species is listed in 5 to 6 Red Data Books or red lists. The most listed species is *Trapa natans* s.l. (along with sometimes accepted segregate species *T. astrachanica, T. caspica, T. hyrcana, T. maeotica* and *T. sibirica*), which is listed for 25 regions. It is followed by *Nymphaea alba* and *Salvinia natans* (each in 21 regions), *Nuphar pumila* (19 regions), *Isoëtes lacustris* and *I. setacea* (each in 17 regions), *Nymphaea candida* and *N. tetragona* (each in 16 regions) and *Hottonia palustris* (15 regions). Ten species are present in two regional Red Data Books or red lists and 28 species are present in a single list each.

The results of our analysis of several editions of regional Red Data Books suggest the following major points:

1) The number of species in the list and species distribution across the categories are stable over time in several regions (Republics of Bashkortostan and Karelia, oblasts Kirov and Moscow). This is usually a result of the lack of monitoring studies (for the whole list in some cases or for some groups of organisms in others) between the editions.

2) Increase in the number of aquatic plants in consecutive editions usually indicates that surveys of vegetation took place in between the two publications (Republics of Komi and Mari El, oblasts Murmansk and Volgograd).

3) Oriented monitoring studies usually lead to a decrease of the number of listed threatened species (Udmurt Republic, oblasts Lipetsk, Penza and Ryazan) or to significant changes in the species categories (Saratov oblast).

4) Unfortunately, there are no data to explain the changes in the lists of aquatic species in the Red Data Books of the Republics of Adygea and Dagestan and Krasnodar kray.

Discussion and recommendations

The distribution of aquatic species across the regional Red Data Books and lists is notably uneven as shown in Tables 1–9 (Appendix). Quite often, the neighbouring regions differ considerably by number of protected vascular aquatic species despite rather similar floristic composition and nearly identical types and effects of anthropogenic factors. For example, only six aquatic species are included in the Red Data Book of Bryansk oblast while the neighbouring Kaluga oblast has 14 species in its Red Data Book. The Red Data Book of Smolensk oblast contains four species only, but the adjacent Tver and Moscow oblasts have 22 and 19 species, respectively, in their Red Data Books. Similar situation was described for endangered fish species in countries of Central Asia (Milner-Gulland et al. 2006).

In our view, there are several objective and subjective factors responsible for these differences. We regard as objective factors: a) climatic conditions, e.g. hydrological regime determined by the evaporation to precipitation ratio; b) relief, which determines to high extent the diversity and abundance of waterbodies; c) the size of the region and the level of anthropogenic disturbance. Subjective personal-related factors are: a) the intensity of hydrobotanical investigations, b) presence of specialists in aquatic botany and their qualification, c) the skills of editors of Red Data Books in practical conservation issues. Let us analyze the relative roles of these factors. Selection of species for the Red Data Book of Russian Federation is more accurate, so it suits better than the regional red lists in estimating the role of objective factors. Aquatic species from the federal Red Data Book are more numerous in Red Data Books of north-west and central regions. It fits well aquatic species distribution within the plains of northern Eurasia: the number of species decreases along the longitude from coastal to continental regions. Along the latitude the number of species is high, where precipitation slightly exceeds evaporation (Shcherbakov 1991).

Three groups of species represent the aquatic flora: those inhabiting both lotic and lentic waters and those typical for either lotic or lentic waters. Species from the first and second group usually have wide ecological limits and they constitute the most stable part of aquatic flora. Their number is almost equal for adjacent regions on the plains (Shcherbakov 2010a). The species from the third group occur mostly in lakes and wet swamps. The number of waterbodies of these types is determined by the geological history of the region and its relief. The hydrological, thermal and chemical regime of these waterbodies depends on climate and first of all on precipitation to evaporation ratio. The number of species inhabiting lentic waters depends on diversity of environmental conditions in these waterbodies and their number, and as a result, the number of the third group species greatly varies from one region to another. However, these waterbodies usually contain the highest number of rare, vulnerable and endangered species.

The species to area relationship is well described (Arrhenius 1920, 1921; Gleason 1922, 1925; Archibald 1949) and is largely independent of geographical scale or whether the area has natural or artificially assigned borders (Allan & Flecker 1993; Miller et al. 2007; Mace et al. 2008).

The more the territory is disturbed by man the less space is left for stenotopic species and these species become more vulnerable.

Then, let us analyze subjective (personal-related) factors and provide some recommendations.

1) The low number of aquatic plants in the Red Data Books of North Caucasus is a result of not only the small number of waterbodies there, but also because of low investigation effort. The same reason explains the low number of species in the Red Data Books of Republic of Bashkortostan, Krasnodar, Perm and Stavropol krays, Belgorod, Bryansk, Kirov, Kursk, Penza and Smolensk oblasts and Nenets Autonomous Okrug.

2) The lack of qualified specialists can lead to serious mistakes in regional red lists and Red Data Books. For example, four species included in the Red Data Book of Nizhny Novgorod oblast (Anufriev & Bakka 2005) (*Ceratophyllum platiacanthum*, *Nymphaea alba*, *N. tetragona* and *Sparganium angustifolium*) do not grow in that region according to the herbarium collections. Another species from this Red Data Book, *Elatine callitrichoides* is a synonym for *E. triandra*, which is also present in that Red Data Book. We believe that only species whose local existence is confirmed by herbaria specimens and determined by taxonomists must be included in the regional Red Data Book.

3) Alien species must be excluded from regional Red Data Books, because the main idea of this document is protection of natural biodiversity (IUCN 2001, 2010). In our view, *Nymphoides peltata* in Moscow City and Moscow oblast is an alien plant forming clones that persist during long time in places of invasion, but does not spread outside. In Mordovia, this species was only found near a biological station (Silaeva et al. 2010). Only scattered localities of the species are known from the Nizhny Novgorod, Samara, Tambov and Vladimir oblasts, even though the plant was always found in widespread ecotopes. *Nymphoides peltata*, according to our observations and literature data (Lisitsyna et al. 2009; Maevsky 2014), has no specific habitat requirements in Central Russia; as such features are characteristic of alien vascular plants, this species must be excluded from the regional Red Data Books in these regions according to IUCN assessment criteria (IUCN 2010). All known populations of *Trapa natans* in Oryol oblast exist on recent artificial ponds (Elenevsky & Radygina 1997), have non-natural origin and must be excluded from the regional Red Data Book, too.

4) It does not make sense to include species with a doubtful taxonomic position in the Red Data Books, but this situation is less clear. We believe, if a species is characteristic of a unique habitat, it should be kept in the regional Red Data Book until its true taxonomic status is clarified. At the molecular level, it is proved that only *Ceratophyllum demersum, C. submersum* and *C. tanaiticum* grow in eastern Europe (Mesterhazy et al. 2015). So, the 'fractional' species of the genus (*C. penthacanthum*) must be excluded from regional Red Data Books as well as similar 'species' of *Trapa*, *Zannichellia* and *Potamogeton*.

5) Mistakes of species identification during observations in natural environment or in herbarium occur quite often as well as poor knowledge of taxonomical changes. Thus, most references for *Nymphaea alba* and *N. tetragona* in the Central Industrial, Central Chernozemny, Volga-Vyatka and Middle Volga macroregions actually belong to large or small specimens of *N. candida* (Volkova 2009; Maevsky 2014). *Najas marina* is reported by mistake for Samara oblast as well as *Potamogeton rutilus* was erroneously included in the Red Data Books of Mordovia and Tatarstan

and *Potamogeton filiformis* for Republic of Bashkortostan. In these and similar cases, only species verified by highly qualified taxonomists should be included in the regional Red Data Books.

6) It is hardly worth to include species in the Red Data Books whose distribution is determined entirely by climate. These species will expand or shrink their range depending on whether the climate becomes more or less favourable (Mohseni et al. 2003; Newson at al. 2009; Johnston et al. 2013). As far as we cannot influence these changes, they will take place regardless of any protective measures. Species of this group are expanding their distribution ranges in Central Russia. Some of them have moved 200–500 km eastward or northward in the last 20–30 years (Shmytov et al. 2003; Shcherbakov et al. 2008). This group includes species that inhabit rivers but can also live in reservoirs and ponds: *Alisma gramineum*, *Caulinia minor*, *Ceratophyllum submersum*, *Lemna gibba*, *Najas major*, *Potamogeton acutifolius*, *P. nodosus*, *P. trichoides*, *Wolffia arrhiza*, *Zannichellia palustris*. For this reason, *Salvinia natans* and *Trapa natans* can be excluded from the Red Data Books of certain regions or transferred into the monitoring list which is available in the majority of regional Red Data Books.

7) It does not make sense to include species in the Red Data Books which are characteristic for particular short stages of progressive succession (Kazakova 2005). Territorial protection of these species is meaningless. These species, as a rule, have no commercial value and are not collected by local people. Therefore, *Elatine alsinastrum*, *E. hungarica*, *Potamogeton acutifolius*, *P. trichoides*, *Ranunculus polyphyllus*, *Zannichellia palustris* must be delisted from the regional Red Data Books.

8) When compiling the lists of species affected by habitat loss, the presence of artificial habitats with similar ecological conditions has to be taken into account. The species that live in peat bogs and oligotrophic continental lakes strictly demand protection. These plants can be protected only by conservation of their specific localities. However, aquatic plants able to survive temporal desiccation may occur in reservoirs of power plants and water supply systems, large fish ponds and in other artificial waterbodies with similar hydrological regime. These reservoirs have conditions comparable to natural habitats and can act as their substitutes in the case of loss of natural habitats. In this case, species from the genera *Marsilea*, *Zannichellia* and some others will not need special protection.

9) There is no argument to include species that are rare in one or another region for unknown reasons, although they can thrive in rivers or in the transformed waterbodies, e.g. *Potamogeton friesii*, *P. pusillus* and *Utricularia australis*.

10) Real protection of several species of aquatic plants can be achieved only when applied to the entire watershed upstream of major rivers, which requires combined efforts of all the relevant regions, e.g. *Batrachium circinatum*, *B. kauffmannii*, *Myriophyllum spicatum*, *Nuphar lutea*, *Potamogeton crispus* and *P. pectinatis*.

11) Commonly, the terms 'rare species', 'exploited species' and 'threatened species' are confused. That is why species from *Nelumbonaceae*, *Nymphaeaceae* and *Trapaceae* are often present in Red Data Books. In reality, the threat of picking up *Nuphar lutea*, *Nymphaea alba* and *N. candida* is overestimated. These species have strong rhizomes and the loss of the generative part does not affect the plant seriously. These species are much more vulnerable by trampling by swimmers and decreasing availability of waterbodies.

12) The local conservation authorities are often reluctant to include species in the Red Data Books that probably got extinct in the region (old category – 0 or new category – RE). For example, 39 species of vascular plants were declared as extinct in the first edition 'Identification book of the vascular plants of Oryol Oblast' (Elenevsky & Radygina 1997), but 15 from them were found in the region before 2012 (Kiseleva et al. 2012). As a result, if a not-listed species is discovered in a region, it may be impossible to protect it, until it is included in the next edition of the regional Red Data Book.

Several general conclusions derive from this study. The lists of aquatic species in most of regional Red Data Books of European Russia and the North Caucasus need serious corrections. Numerous mistakes and deficiencies that we detected in the red lists are not only due to insufficient investigation effort or low taxonomic qualification of local botanists, but also because species biology and environmental requirements as well as effects of climate change are not properly considered. For some species, conservation will succeed only, when applied to the entire watershed upstream of major rivers, which requires coordination between regional conservation biologists. For other species, artificial habitats with ecological conditions similar to the natural can be vital.

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Appendix

Table 1. Number of aquatic vascular plants included in regional Red Data Books of European Russia and North Caucasus. Abbreviations: **N** – North macroregion, **NW** – North-West macroregion, **CI** – Central Industrial macroregion, **VV** – Volga-Vyatka macroregion, **CC** – Central Chernozemny macroregion, **MV** – Middle Volga macroregion, **LV** – macroregion of the Lower Volga and the Lower Don, **NC** – North Caucasus macroregion.

Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are in bold; species which are absent in Flora of waterbodies of Russia (Lisitsyna & Papchenkov 2000) are in sansserif typeface. Number after the slash in the line 'Total' indicates the number of species included in the Red Data Book of the Russian Federation (Bardunov & Novikov 2008).

Species / Macroregion	N	NW	CI	VV	CC	MV	LV	NC
1. ***Aldrovanda vesiculosa* L.**		2			4		3	1
2. *Alisma gramineum* Lej.	1	2		2	1	2		
3. ***A. wahlenbergii* (Holmb.) Jus.**		2	1					
4. *Althenia filiformis* F. Petit							4	
5. *Batrachium aquatile* (L.) Dumort.	1							
6. *B. circinatum* (Sibth.) Spach	1					1		
7. *B. eradicatum* (Laest.) Fries	1			1				
8. *B. kauffmannii* (Clerc) V. Krecz.			1	2		1		
9. *B. trichophyllum* (Chaix) Bosch	1		2			1		
10. *Berula erecta* (Huds.) Cov.		1						
11. ***Caldesia parnassifolia* (L.) Park.**					3			
12. *Callitriche fimbriata* (Schotsman) Tzvel.							1	
13. *C. hermaphroditica* L.			1					
14. *C. transvolgensis* Tzvel.							1	
15. ***Caulinia flexilis* Willd.**	1	3	3	1				
16. *C. minor* (All.) Coss. & Germ.		1	2	2	3	3	2	
17. ***C. tenuissima* (A. Br. & Magnus) Tzvel.**		3	2					
18. *Ceratophyllum kossinskyi* Kuzen.							1	
19. *C. penthacanthum* Haynald		1						
20. *C. platiacanthum* (Haynald) Soó				1				
21. *C. submersum* L.			1			1		
22. *C. tanaiticum* Sapjeg.					1	1	4	
23. *Elatine alsinastrum* L.		1	3	1		1		
24. *E. callitrichoides* (W. Nyl.) Kauffm.				1				
25. *E. hungarica* Moesz.							1	
26. *E. hydropiper* L.	2		5	1		3		
27. *E. orthosperma* Dueben	2							
28. *E. triandra* Schkuhr	1		3	1			1	
29. *Hippuris vulgaris* L.				1	1		1	
30. *Hottonia palustris* L.	1	2	7	1	4			
31. *Hydrilla verticillata* (L. f.) Royle		1						
32. *Hydrocharis morsus-ranae* L.							1	2
33. ***Isoëtes lacustris* L.**	5	4	6	1		1		
34. ***I. setacea* Durieu**	5	4	6	2				
35. *Lemna gibba* L.							1	
36. ***Littorella uniflora* (L.) Aschers.**	1	2						
37. ***Lobelia dortmanna* L.**	4	4	1					
38. ***Marsilea aegyptica* Willd.**							1	
39. *M. quadrifolia* L.							1	3
40. ***M. strigosa* Willd.**							3	
41. *Montia fontana* L.			6	1		1		
42. *Myriophyllum spicatum* L.						1		
43. *M. verticillatum* L.	1		1					
44. *Najas major* All.		2		2	3	2	1	
45. *N. marina* L.		2				1		

46. ***Nelumbo nucifera* (DC.) Fisch.**							2	1
47. *Nuphar lutea* (L.) Smith			1		1	1	3	3
48. *N. pumila* (Timm) DC.	2	2	6	5		4		
49. *Nymphaea alba* L.	1	3	4	1	2	3	3	4
50. *N. candida* J. Presl	1		6	1	3	4	1	
51. *N. tetragona* Georgi	4	2	2	5		3		
52. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze			1	4	1	4	1	
53. *Potamogeton acutifolius* Link		1	3	1	2	1	1	
54. *P. alpinus* Balb.			2		1	2		1
55. *P. chakassiensis* (Kaschina) Volobaev							1	
56. *P. crispus* L.	1							
57. *P. filiformis* Pers.	2		1			1		
58. *P. friesii* Rupr.	3		1	1				
59. *P. gramineus* L.			2	1	2	4	1	
60. *P. nodosus* Poir.		1			1	2		
61. *P. obtusifolius* Mert. & Koch	1		2	1	3	4	1	
62. *P. pectinatus* L.	2					1		
63. *P. praelongus* Wulf.			6	2	2	3	1	
63. *P. pusillus* L.	1		1			1		
65. *P. rutilus* Wolfg.	3	2	2	1		2		
66. *P. sarmaticus* Mäemets					3	1	1	
67. *P. trichoides* Cham. & Schlecht.	1	2		1				
68. *Ranunculus pallasii* Schlecht.	1							
69. *R. polyphyllus* Waldst. & Kit. ex Willd.		1	3	1	1	4		
70. *R. reptans* L.			3	1				
71. *Ruppia brachypus* J. Gay		1						
72. *R. drepanensis* Tineo							2	
73. *R. maritima* L.		1					1	
74. *Sagittaria natans* Pall.	3	1	1					
75. *Salvinia natans* (L.) All.			5	4	2	7	2	1
76. *Sparganium angustifolium* Michx.			2	2				
77. *S. emersum* Rehm.							1	
78. *S. gramineum* Georgi		1	6	2				
79. *S. minimum* Wallr.			1			3	1	
80. *Stratiotes aloides* L.							1	
81. *Subularia aquatica* L.	1	2	2					
82. ***Tillaea aquatica* L.**	2	3	1	1				
83. *T. vaillantii* Willd.					1		2	
84. *Trapa astrachanica* (Flerow) N.A. Winter							1	
85. *T. caspica* V. Vassil.							1	
86. *T. hyrcana* Woronow								2
87. *T. maeotica* Woronow								1
88. *T. natans* L.		1	9	1	4	3	3	1
89. *T. sibirica* Flerow						1		
90. *Utricularia australis* R. Br.			2					
91. *U. intermedia* Hayne	1		7	1	1	4		
92. *U. minor* L.			9		2	5		
93. *U. stygia* G. Thor	1							
94. *U. vulgaris* L.					1	1	2	
95. *Wolffia arrhiza* (L.) Horkel ex Wimm.					1			
96. *Zannichellia clausii* Tzvel.							1	
97. *Z. palustris* L.	1	1	1	1				
98. *Z. pedunculata* Reichenb.	1							
99. *Z. repens* Boenn.	1			1				
TOTAL	36/5	33/9	46/7	38/4	27/2	39/1	39/4	11/2

Table 2. Aquatic vascular plants included in regional Red Data Books of the North macroregion.

Abbreviations: **Kar** – Karelia, **Km** – Komi, **Arh** – Arkhangelsk, **Mu** – Murmansk, **Vol** – Vologda, **Nen** – Nenets Autonomous Okrug. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	Arh	Vol	Kar	Km	Mu	Nen
1. *Alisma gramineum* Lej.		4				
2. *Batrachium aquatile* (L.) Dumort.		4				
3. *B. circinatum* (Sibth.) Spach		4				
4. *B. eradicatum* (Laest.) Fries			3			
5. *B. trichophyllum* (Chaix) Bosch			3			
6. ***Caulinia flexilis* Willd.**			1			
7. *Elatine hydropiper* L.				4	4	
8. *E. orthosperma* Dueben			3		3	
9. *E. triandra* Schkuhr			3			
10. *Hottonia palustris* L.		2				
11. ***Isoëtes lacustris* L.**	1	3	3	3	5	
12. ***I. setacea* Durieu**	1	3	3	2	5	
13. ***Littorella uniflora* (L.) Aschers.**			2			
14. ***Lobelia dortmanna* L.**	1	3	3		1	
15. *Myriophyllum verticillatum* L.			4			
16. *Nuphar pumila* (Timm) DC.	3	2				
17. *Nymphaea alba* L.		4				
18. *N. candida* J. Presl					2	
19. *N. tetragona* Georgi	3	2		3	1	
20. *Potamogeton crispus* L.				4		
21. *P. filiformis* Pers.				4	3	
22. *P. friesii* Rupr.		3	3		2	
23. *P. obtusifolius* Mert. & Koch					2	
24. *P. pectinatis* L.			3		2	
25. *P. pusillus* L.			1			
26. *P. rutilus* Wolfg.	2	2	3			
27. *P. trichoides* Cham. & Schlecht.				4		
28. *Ranunculus pallasii* Schlecht.					2	
29. *Sagittaria natans* Pall.		2		3	3	
30. *Subularia aquatica* L.		3				
31. ***Tillaea aquatica* L.**			3		1	
32. *Utricularia intermedia* Hayne		3				
33. *U. stygia* G. Thor			4			
34. *Zannichellia palustris* L.		4				
35. *Z. pedunculata* Reichenb.			3			
36. *Z. repens* Boenn.					3	
Date of confirmation red list / edition Red Data Book	2007/2008	2004/2004	2007/2007	2008/2009	2014/2014	2005/2006
Total number species vascular plants in the regional Red Data Book	90	201	199	236	189	102
Aquatic and amphibious plants	6	16	17	8	15 (2)	0
Number of edition	2nd	1st	3rd	2nd	2nd	2nd

Table 3. Aquatic vascular plants included in regional Red Data Books of the North-West macroregion.

Abbreviations: **Kgd** – Kaliningrad, **Le** – Leningrad, **Nog** – Novgorod, **Ps** – Pskov; **SPb** – St. Petersburg City. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 0 – Probably Extinct; 1 – Endangered; 2 – Vulnerable; 3 – Rare; 5 – Recovering or Recovered; X – status not determined.

Species / Region	Kgd	Le	Nog	Ps	SPb
1. ***Aldrovanda vesiculosa* L.**		2		3	
2. *Alisma gramineum* Lej.	1				2
3. ***A. wahlenbergii* (Holmb.) Jus.**		1			1
4. *Berula erecta* (Huds.) Cov.				3	
5. ***Caulinia flexilis* Willd.**		1	X	0	
6. *C. minor* (All.) Coss. & Germ.				3	
7. ***C. tenuissima* (A. Br. & Magnus) Tzvel.**		1	X		1
8. *Ceratophyllum penthacanthum* Haynald					3
9. *Elatine alsinastrum* L.			X		
10. *Hippuris vulgaris* L.	1				
11. *Hottonia palustris* L.		3	X		
12. *Hydrilla verticillata* (L. f.) Royle				3	
13. ***Isoëtes lacustris* L.**		3	X	2	1
14. ***I. setacea* Durieu**		3	X	1	1
15. ***Littorella uniflora* (L.) Aschers.**		2		2	
16. ***Lobelia dortmanna* L.**		3	X	1	1
17. *Najas major* All.		2		3	
18. *N. marina* L.		3		3	
19. *Nuphar pumila* (Timm) DC.			X		2
20. *Nymphaea alba* L.		2	X	1	
21. *N. tetragona* Georgi		2	X		
22. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze	1				
23. *Potamogeton acutifolius* Link			X		
24. *P. nodosus* Poir.			X		
25. *P. obtusifolius* Mert. & Koch	1				
26. *P. praelongus* Wulf.	1				
27. *P. rutilus* Wolfg.	1		X		
28. *P. trichoides* Cham. et Schlecht.			X	3	
29. *Ranunculus polyphyllus* Waldst. & Kit. ex Willd.			X		
30. *R. reptans* L.	1				
31. *Ruppia brachypus* J. Gay		3			
32. *R. maritima* L.			X		
33. *Sagittaria natans* Pall.		2			
34. *Sparganium gramineum* Georgi			X		
35. *Subularia aquatica* L.			X	3	
36. ***Tillaea aquatica* L.**		2	X		1
37. *Trapa natans* L.				2	
38. *Utricularia minor* L.	2				
39. *Zannichellia palustris* L.				1	
Date of confirmation red list / edition Red Data Book	1988/2010	2015/2000	2011/ no	2013/2014	2014/2004
Total number species vascular plants in the regional Red Data Book	83	201	139	155	46
Aquatic and amphibious plants	8	16	19	16	9
Number of edition	1st	1st	1st	1st	1st

Table 4. Aquatic vascular plants included in regional Red Data Books of the Central Industrial macroregion.

Abbreviations: **Br** – Bryansk, **Iv** – Ivanovo, **Kal** – Kaluga, **Kst** – Kostroma, **MsR** – Moscow, **Rya** – Ryazan, **Sm** – Smolensk, **Tul** – Tula, **Tv** – Tver, **Vl** – Vladimir, **Ya** – Yaroslavl; **MsS** – Moscow City. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 0 – Probably Extinct; 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	Br	Vl	Iv	Kal	Kst	MsS	MsR	Rya	Sm	Tv	Tul	Ya
1. ***Alisma wahlenbergii* (Holmb.) Jus.**										4		
2. *Batrachium kauffmannii* (Clerc) V. Krecz.									3			
3. *B. trichophyllum* (Chaix) Bosch						1		3				
4. *Callitriche hermaphroditica* L.				4								
5. ***Caulinia flexilis* Willd.**		2								1		1
6. *C. minor* (All.) Coss. & Germ.		2					2					
7. ***C. tenuissima* (A. Br. & Magnus) Tzvel.**								1		1		
8. *Ceratophyllum submersum* L.							4					
9. ***Isoëtes lacustris* L.**		2	2				1	1		3–2		1
10. ***I. setacea* Durieu**		1	2				1	1		3–2		1
11. *Elatine alsinastrum* L.			3	4			2					
12. *E. hydropiper* L.			3	3	3		3			4		
13. *E. triandra* Schkuhr			3		3		2					
14. ***Lobelia dortmanna* L.**										3–2		
15. *Hottonia palustris* L.		4	2	3	0		3				1	3
16. *Montia fontana* L.	3		0		2		2			3		2
17. *Myriophyllum verticillatum* L.		3										
18. *Nuphar lutea* (L.) Smith									2			
19. *N. pumila* (Timm) DC.		2	1		3		2			2		3
20. *Nymphaea alba* L.	2		3							4		2
21. *N. candida* J. Presl	3	5				3			2		3	3
22. *N. tetragona* Georgi					2					4		
23. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze	1											
24. *Potamogeton acutifolius* Link				4						4		2
25. *P. alpinus* Balb.		3										3
26. *P. filiformis* Pers.										3–2		
27. *P. friesii* Rupr.		3										
28. *P. gramineus* L.				4							1	
29. *P. obtusifolius* Mert. & Koch					3							3
30. *P. praelongus* Wulf.		3	3	4	3			3				3
31. *P. pusillus* L.		3										
32. *P. rutilus* Wolfg.							4			4		
33. *Ranunculus polyphyllus* Waldst. & Kit. ex Willd.				1			1				1	
34. *R. reptans* L.							2				1	3
35. *Sagittaria natans* Pall.										0		
36. *Salvinia natans* (L.) All.	1	3		3			1				1	
37. *Sparganium angustifolium* Michx.							1			3–2		
38. *S. gramineum* Georgi			2	1			2	2		3		1
39. *S. minimum* Wallr.						1						
40. *Subularia aquatica* L.										3		0
41. ***Tillaea aquatica* L.**										4		
42. *Trapa natans* L.	1	2	1	1	1		2	5	2	3		
43. *Utricularia australis* R. Br.				4								3
44. *U. intermedia* Hayne		3		3	3		2	3		2		3
45. *U. minor* L.		3	3	3	3		3	3		2	0	3
46. *Zannichellia palustris* L.												3
Date of confirmation red list / edition Red Data Book	2003/ 2004	2008/ 2008	2008/ 2010	2000/ 2006	2008/ 2009	2008/ 2011	2008/ 2008	2011/ 2011	1993/ 1997	2006/ 2002	2009/ 2010	2004/ 2004
Total number species vascular plants in the regional Red Data Book	133	169	149	205	141	122	206	138	87	161	165	173
Aquatic and amphibious plants	6	16	13	14	11	3	19	9	4	22	7	19
Number of edition	1st	1st	1st	1st	1st	2nd	2nd	2nd	1st	1st	1st	1st

Table 5. Aquatic vascular plants included in regional Red Data Books of the Volga-Vyatka macroregion.

Abbreviations: **Mar** – Mari El, **Ud** – Udmurt, **Kir** – Kirov, **Nig** – Nizhny Novgorod, **Pm** – Perm. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 0 — Probably Extinct; 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	Kir	Mar	Nig	Pm	**Ud**
1. *Alisma gramineum* Lej.		1	4		
2. *Batrachium eradicatum* (Laest.) Fries					3
3. *B. kauffmannii* (Clerc) V. Krecz.		1	3		
4. ***Caulinia flexilis* Willd.**		3			
5. *C. minor* (All.) Coss. & Germ.		1	4		
6. *Ceratophyllum platiacanthum* (Haynald) Soó			4		
7. *Elatine alsinastrum* L.					1
8. *E. callitrichoides* (W. Nyl.) Kauffm.			4		
9. *E. hydropiper* L.					1
10. *E. triandra* Schkuhr			4		0
11. *Hippuris vulgaris* L.			2		
12. *Hottonia palustris* L.			1		
13. ***Isoëtes lacustris* L.**			1		
14. ***I. setacea* Durieu**		3	1		
15. *Montia fontana* L.			4		
16. *Najas major* All.		5	4		
17. *Nuphar pumila* (Timm) DC.	3	2	1	2	3
18. *Nymphaea alba* L.			4		
19. *N. candida* J. Presl		2			
20. *N. tetragona* Georgi	3	2	1	3	2
21. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze	3	3	1	2	
22. *Potamogeton acutifolius* Link					0
23. *P. friesii* Rupr.			3		
24. *P. gramineus* L.		3			
25. *P. obtusifolius* Mert. et Koch					3
26. *P. praelongus* Wulf.		2	3		
27. *P. rutilus* Wolfg.		3			
28. *P. trichoides* Cham. et Schlecht.			4		
29. *Ranunculus polyphyllus* Waldst. & Kit. ex Willd.		3			
30. *R. reptans* L.					3
31. *Salvinia natans* (L.) All.	3	5	3		3
32. *Sparganium angustifolium* Michx.		3	4		
33. *S. gramineum* Georgi		3	1		
34. ***Tillaea aquatica* L.**	3				
35. *Trapa natans* L.		1			
36. *Utricularia intermedia* Hayne					3
37. *Zannichellia palustris* L.			4		
38. *Z. repens* Boenn.		3			
Date of confirmation red list / edition Red Data Book	2009/ 2014	2009/ 2013	2004/ 2005	2007/ 2008	2007/ 2012
Total number species vascular plants in the regional Red Data Book	98	148	177	69	145
Aquatic and amphibious plants	5	19	23	3	11
Number of edition	2nd	3rd	1st	1st	2nd

Table 6. Aquatic vascular plants included in regional Red Data Books of the Central Chernozemny macroregion.

Abbreviations: **Be** – Belgorod, **Kur** – Kursk, **Lip** – Lipetsk, **Or** – Oryol, **Tm** – Tambov, **Vor** – Voronezh. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed oin bold. Nature conservation status of the species in the regional Red Data Book or Red List: 0 – Probably Extinct; 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	Be	Vor	Kur	Lip	Or	Tm
1. ***Aldrovanda vesiculosa* L.**		1	1	1		4
2. *Alisma gramineum* Lej.						4
3. ***Caldesia parnassifolia* (L.) Park.**	0	0		1		
4. *Caulinia m*inor (All.) Coss. & Germ.			2	3		2
5. *Ceratophyllum tanaiticum* Sapjeg.		2		1		
6. *Hippuris vulgaris* L.						3
7. *Hottonia palustris* L.			2	3	2	4
8. *Najas major* All.			3	5		3
9. *Nuphar lutea* (L.) Smith	5					
10. *Nymphaea alba* L.	5					3
11. *N. candida* J. Presl	5				2	3
12. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze						1
13. *Potamogeton acutifolius* Link		2		3		
14. *P. alpinus* Balb.		0				
15. *P. gramineus* L.		4		2		
16. *P. nodosus* Poir.				5		
17. *P. obtusifolius* Mert. & Koch		2		3		4
18. *P. praelongus* Wulf.		2		2		
19. *P. sarmaticus* Mäemets		2		1		4
20. *Ranunculus polyphyllus* Waldst. & Kit. ex Willd.				3		
21. *Salvinia natans* (L.) All.		3				3
22. *Tillaea vaillantii* Willd.		4				
23. *Trapa natans* L.		3		3	1	1
24. *Utricularia intermedia* Hayne				1		
25. *U. minor* L.		3		2		
26. *U. vulgaris* L.	3					
27. *Wolffia arrhiza* (L.) Horkel ex Wimm.			2			
Date of confirmation red list / edition Red Data Book	2005/ 2005	2008/ 2011	2005/ 2002	2013/ 2014	2006/ 2007	2001/ 2002
Total number species vascular plants in the regional Red Data Book	166	272	178	175	42	228
Aquatic and amphibious plants	5	13	5	16	3	13
Number of edition	1st	1st	1st	2nd	1st	1st

Table 7. Aquatic vascular plants included in regional Red Data Books of the Middle Volga macroregion.

Abbreviations: **Ba** – Bashkortostan, **Chu** – Chuvashia, **Mrd** – Mordovia, **Tat** – Tatarstan, **Pen** – Penza, **Sam** – Samara, **Ul** – Ulyanovsk. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 0 – Probably Extinct; 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	Ba	Mrd	Pen	Sam	Tat	Ul	Chu
1. *Alisma gramineum* Lej.		4			3		
2. *Batrachium circinatum* (Sibth.) Spach					2		
3. *B. kauffmannii* (Clerc) V. Krecz.			3				
4. *B. trichophyllum* (Chaix) Bosch					1		
5. *Caulinia minor* (All.) Coss. & Germ.		1		3	1		
6. *Ceratophyllum submersum* L.				2			
7. *C. tanaiticum* Sapjeg.				2			
8. *Elatine alsinastrum* L.					1		
9. *E. hydropiper* L.		3		3	0		
10. ***Isoëtes lacustris* L.**					0		
11. *Montia fontana* L.					0		
12. *Myriophyllum spicatum* L.							4
13. *Najas major* All.		2			1		
14. *N. marina* L.				3			
15. *Nuphar lutea* (L.) Smith				5			
16. *N. pumila* (Timm) DC.	1			1	1		1
17. *Nymphaea alba* L.				5	1		2
18. *N. candida* J. Presl				5	2	2	3
19. *N. tetragona* Georgi				1		3	4
20. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze	0			1	0		4
21. *Potamogeton acutifolius* Link		4					
22. *P. alpinus* Balb.		3			1		
23. *P. filiformis* Pers.	1						
24. *P. gramineus* L.		4		5	1		4
25. *P. nodosus* Poir.				5	1		
26. *P. obtusifolius* Mert. & Koch		3		5	1		4
27. *P. pectinatus* L.							4
28. *P. praelongus* Wulf.		3			1		4
29. *P. pusillus* L.							4
30. *P. rutilus* Wolfg.		0			1		
31. *P. sarmaticus* Mäemets					1		
32. *Ranunculus polyphyllus* Waldst. & Kit. ex Willd.		3	1	5	2		
33. *Salvinia natans* (L.) All.	3	2	5	3	2	2	3
34. *Sparganium minimum* Wallr.			1	3	2		
35. *Trapa natans* L.		2	1				1
36. *T. sibirica* Flerow	1						
37. *Utricularia intermedia* Hayne		0			1	2	3
38. *U. minor* L.	2		3		2	1	3
39. *U. vulgaris* L.						3	
Date of confirmation red list / edition Red Data Book	2002/ 2011	2003/ 2003	2006/ 2013	2007/ 2007	2009/ 2006	2003/ 2008	2000/ 2001
Total number species vascular plants in the regional Red Data Book	232	170	200	281	308	219	212
Aquatic and amphibious plants	6	14	6	17	25	6	15
Number of edition	3rd	1st	2nd	1st	2nd	1st	1st

Table 8. Aquatic vascular plants included in regional Red Data Books of macroregion of the Lower Volga and the Lower Don.

Abbreviations: **Klm** – Republic of Kalmykia; **Stv** – Stavropol Kray; oblasts **As** – Astrakhan, **Ro** – Rostov, **Sar** – Saratov, **Wog** – Volgograd. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 1 – Endangered; 2 – Vulnerable; 3 – Rare; 4 – Data Deficient; 5 – Recovering or Recovered.

Species / Region	As	Wog	Klm	Ro	Sar	Stv
1. ***Aldrovanda vesiculosa* L.**	3	1		4(3)		
2. *Althenia filiformis* F. Petit	2	3	2	4		
3. *Callitriche fimbriata* (Schotsman) Tzvel.		3				
4. *C. transvolgensis* Tzvel.		3				
5. *Caulinia minor* (All.) Coss. & Germ.			2			5
6. *Ceratophyllum kossinskyi* Kuzen.	3					
7. *C. tanaiticum* Sapjeg.	2	3	4	3		
8. *Elatine hungarica* Moesz.			3			
9. *E. triandra* Schkuhr		3				
10. *Hippuris vulgaris* L.					3	
11. *Hydrocharis morsus-ranae* L.			3			
12. *Lemna gibba* L.	3					
13. ***Marsilea aegyptica* Willd.**	2					
14. *M. quadrifolia* L.					1	
15. ***M. strigosa* Willd.**	2	1			1	
16. *Najas major* All.						5
17. ***Nelumbo nucifera* (DC.) Fisch.**	2		2			
18. *Nuphar lutea* (L.) Smith			3	2		5
19. *Nymphaea alba* L.				2	2	5
19. *N. candida* J. Presl				2		
20. *Nymphoides peltata* (S.G. Gmel.) G. Kuntze				2		
21. *Potamogeton acutifolius* Link		3				
22. *P. chakassiensis* (Kaschina) Volobaev		3				
23. *P. gramineus* L.					3	
24. *P. obtusifolius* Mert. & Koch		3				
25. *P. praelongus* Wulf.					1	
26. *P. sarmaticus* Mäemets			3			
27. *Ruppia drepanensis* Tineo		3	3			
28. *R. maritima* L.					1	
29. *Salvinia natans* (L.) All.			2			5
30. *Sparganium emersum* Rehm.			3			
31. *S. minimum* Wallr.					2	
32. *Stratiotes aloides* L.				3		
33. *Tillaea vaillantii* Willd.	3	3				
34. *Trapa astrachanica* (Flerow) N.A. Winter	3					
35. *T. caspica* V. Vassil.	3					
36. *T. natans* L.		3	2	2		
37. *Utricullaria vulgaris* L.			2			3
38. *Zannichellia clausii* Tzvel.			3			
Date of confirmation red list / edition Red Data Book	2012/ 2014	2006/ 2006	2010/ 2014	2010/ 2014	2006/ 2006	2010/ 2002
Total number species vascular plants in the regional Red Data Book	85	173	164	197	271	202
Aquatic and amphibious plants	11	13	14	9	8	6
Number of edition	2nd	1st	1st	2nd	2nd	1st

Table 9. Aquatic vascular plants included in regional Red Data Books of the North Caucasus macroregion.

Abbreviations: **Ad** – Adygea, **Che** – Chechen, **Da** – Dagestan, **Ing** – Ingushetia, **KBa** – Kabardino-Balkaria, **KCh** – Karachay-Cherkessia, **SOA** – North Ossetia Alania, **Krd** – Krasnodar. Species from the Red Data Book of the Russian Federation (Bardunov & Novikov 2008) are printed in bold. Nature conservation status of the species in the regional Red Data Book or Red List: 1 – Endangered; 2 – Vulnerable; 3 – Rare; X – status not determined.

Species / Region	Ad	Da	Ing	KBa	KCh	Krd	SOA	Che
1. ***Aldrovanda vesiculosa* L.**						3		
2. *Hydrocharis morsus-ranae* L.	3					3		
3. *Marsilea quadrifolia* L.		2				3		1
4. ***Nelumbo nucifera* (DC.) Fisch.**		3						
5. *Nuphar lutea* (L.) Smith	3	2				2		
6. *Nymphaea alba* L.	3	2				2		2
7. *Potamogeton alpinus* Balb.	1							
8. *Salvinia natans* (L.) All.								x
9. *Trapa hyrcana* Woronow		X						2
10. *T. maeotica* Woronow						2		
11. *T. natans* L.	1							
Date of confirmation red list / edition Red Data Book	1999/ 2012	2009/ 2009	2006/ 2007	2004/ 2000	2009/ 2013	2007/ 2007	1997/ 1999	2007/ 2007
Total number species vascular plants in the regional Red Data Book	120	186	88	77	104	265	105	157
Aquatic and amphibious plants	5	5	0	0	0	6	0	4
Number of edition	2nd	2nd	1st	1st	2nd	2nd	1st	1st