MONITORING IN THE URAL RESERVES (ZAPOVEDNIKS)

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INTRODUCTION.

The Federal Nature Preserves (Zapovedniks) of Russia.

Russia and the former Soviet Union have been the scene of an unusually comprehensive attempt at biodiversity conservation through the establishment of an extensive network of protected natural areas. These natural areas include several categories of territory which today account in aggregate for some one-and-a-half percent of the land area of Russia.

Territory categories include: zapovedniks - the strictly protected scientific Nature Reserves (World Conservation Union or IUCN category I State Nature Reserves or Scientific Reserves); National Parks - (IUCN category II); Natural Parks – (IUCN category V); zakazniks – natural refuges and wildlife sanctuaries (IUCN categories IV, V); natural monuments – small scale areas protecting unique biological objects (IUCN category III); arboreta (dendrological parks) and botanical gardens (Colwell et al., 1997).

The zapovednik, or Russian Federal Nature Preserve, is a specially protected natural territory or aquatory that excludes all forms of management, even general visiting (except for the needs of research or protection), in order to preserve its indigenous complexes in their untouched natural state. At the same time, a zapovednik is an institution designed not just for the conservation of its territory but also for study. The principal tasks of the zapovedniks were formulated in the beginning of the last century by the Russian scientist Kozhevnikov (1909, 1911 and 1928) and by Dokuchaev (Shtilmark, 1996). According to the official document entitled Regulations on Federal Nature Zapovedniks in the Russian Federation the functions of the zapovedniks are defined as follows:

"Protection of the territory in order to preserve biological diversity and the maintaining of natural complexes in their natural state. Organization and realization of scientific research. Ecological monitoring. Ecological education. The study of environmental influences. The provision of experience and help for the training of scientific personnel and specialists in the field of nature conservation."

The organization of an individual zapovednik reflects its main tasks. Here are two sides to its staff structure, the wardens and the scientific personnel. The wardens exist primarily to prevent violations of the preserve's regime including trespassing, fishing, hunting and so forth, but they also participate in a number of research activities such as mammal and bird counts. Wardens fill out questionnaires designed by the scientific personnel and help provide data on animal and plant distribution, phenology, and disturbance events. The scientific department is responsible for organizing monitoring activities, collecting data, "and compiling records for the long-term data archives, the "Chronicles of Nature". Additionally the zapovednik staff will usually include a number of ancillary specialists and workers including accountants, research technicians, and drivers. Some zapovedniks have set up an educational section.

As of 2002, Russia has 100 zapovedniks with a total area of 33.5 million ha. Among them, twenty-six are designated by UNESCO as biosphere reserves (Sokolov, et al., 1997). Kostomukshskiy, Pasvik, Daurskiy, Khankaiskiy zapovedniks represent the Russian components of international zapovedniks which cover multiple international boundaries (Russian-Finnish, Russian-Norwegian, Russian-Mongolian-Chinese). Pechoro-Ilichskiy, Barguzinskiy, Baikalskiy, Baikalo-Lenskiy and Kronotskiy zapovedniks feature in the World Heritage List and are under the jurisdiction of the World Culture and Nature Convention. Nine zapovedniks (Kandalakshskiy, Astrakhanskiy, part of Cherniy Zemli, Khankaiskiy, Kerzhenskiy, Nizhne-Svirskiy, Dayrskiy, Khinganskiy, part of Koriakskiy) are included in the list of wetland territories considered to have world-wide importance under the Ramsar Convention of 1971.

The distribution of zapovedniks is not uniform across the country. There are more zapovedniks in the European part of the country, though their sizes are significantly smaller that those of the Asian part. Often zapovedniks are located on the boundaries of different natural regions and contain the features of transition zones. These transition zones are as a rule, given a sufficient area, characterized by a higher level of biodiversity. Fifty two percent of Russia's zapovedniks have areas ranging from 10000 to 100000 hectares and thirty seven percent have between a hundred thousand and a million hectares. Most (60%) of the zapovedniks' territories are integral (Sokolov et al., 1997).

A combination of four features of the zapovednik system distinguishes it from most protected natural areas in other parts of the world (Dezhkin, 1993; Kuleshova and Rusanova, 1995; Puzachenko et al., 1993; Shadrina, 1993; Shtilmark, 1996).

First, efforts were made to set aside entire ecosystems, which would function normally without human interference. Historically the zapovednik system was based on a biogeographical zoning of the country thus, the resulting system as we see it today protects a tremendous diversity of natural communities over a wide range of many distinct biogeographical regions as well as preserving rare species and unique habitats.

Another distinguishing feature of the zapovednik system is their archive system. For decades, long-term research and monitoring have been conducted on preserve territories and the results accumulated in zapovednik archives called “Chronicles of Nature”. The Chronicles of Nature comprise a valuable but seriously under-utilized informational resource. An a third unique characteristic of the zapovednik system is that all research is related to spontaneous natural processes or phenomena. The research conducted on zapovedniks is not manipulative or experimental. Finally, human activities are rigorously restricted within the zapovedniks, and the public is not allowed to visit.

MONITORING ACTIVITIES IN THE ZAPOVEDNIKS.

The first monitoring program for Russian zapovedniks was designed in 1934 and focused on long-term studies of weather and seasonal plant dynamics, on flora and fauna and the mapping of biomes. The first volumes of the Chronicles of Nature were compiled in 1945 (Shtilmark, 1996) and the Chronicle continues to be the main scientific documentary product of the zapovednik system, providing a synthesis of systematic observations of natural processes and phenomena. Isakov (1983) characterized the Chronicles of Nature as a compilation that contains studies of the dynamics of natural phenomena besides being in itself an independent program of scientific research. This scientific study contains, in addition to primary data, the conclusions drawn from its analysis: it gives valuable insight into trends in natural processes. A zapovednik's Chronicles of Nature are compiled on the basis of primary data collected not

only by researchers from its scientific section but also by technical personnel and wardens (who collect data according to a designed but simpler program) and also by those working temporarily in the zapovednik such as guest scientists, technicians from other research organizations and students. In the Chronicles of Nature is accumulated the totality of available information on the state of ecosystems of the zapovednik territory and on their individual components.

Organization of Research: Conducting Observations for Chronicles of Nature.

A thorough survey which is conducted before a territory can be given its special "preserve" status provides the zapovednik staff with primary species lists and sometimes with a series of thematic maps. At the minimum forest inventory maps are usually available from during the Federal Forest stock-taking exercise compiled every ten years for every region. These lists and maps provide a basis for the monitoring programs to be undertaken. The main objectives for a zapovednik research team typically are:

1) To compile a detailed inventory of flora, fauna and of some abiotic components of the ecosystem.

2) To record natural processes for the compilation of Chronicles of Nature archives.

3) To study structures and patterns underlying ecosystem functions, the functions of individual groups of organisms and species, the influence of environment on these organisms, inter-ecosystem connections and other related questions.

4) To provide informed recommendations for ecosystem preservation to the environmental committees of the regions.

The first two objectives are a requisite for all zapovedniks; however, the others depend on the availability of particular specialists on staff or through collaboration with experts from other scientific organizations who often participate in the research programs.

Data collection is organized so as to ensure that phenomena and processes are studied at three levels: population, ecosystems and in relation to the broader ecosystem (Filonov and Nukhimovskaya, 1985, 1990). If a zapovednik consists of significantly differing parts, separate sets of data are collected for each part. A hierarchical organized network of monitoring plots is set up and their location is chosen to represent the landscape structure of the territory. The size and number of monitoring plots depends on the heterogeneity and size of the zapovednik, specific research objectives and logistical conditions. Sites must be suitable for conducting observations over an indeterminate period. To assure continuity all sites are marked, inventoried, described and mapped. It is highly undesirable to relocate a research plot or a monitoring site. Research projects to be carried out on zapovednik territory are subject to two stringent conditions: the methods used must have minimal or no impact on the ecosystem, and the chosen methods and research objectives must allow extrapolation of results for a wider region or category of subject. On the whole data is presented in tabular form, with notes and brief commentary appended. The Federal zapovednik's Scientific Director is responsible for editing his annual Chronicles of Nature. Each Chronicle of Nature volume is completed in quadruplicate; two copies are retained by the zapovednik and the others sent respectively to the Moscow administrative center, the Federal Archive.

Some zapovedniks publish their Chronicle volumes, which allow other organizations to make use of the information they contain.

Chronicles of Nature: the Main Headings.

1. Territory

This section describes any changes to the extent, borders, or typing of the land within the zapovednik. The first volume will have provided composite tables of land distribution within different categories - forested, unforested, aquatic, roads, wetlands and a table of forest composition detailing tree species and ages.

2. Experimental Plots and Trails.

Gives details and maps of plots, trails and quadrates used in research work. .

3. Relief.

The type and amount of detail in relief study depends on the geomorphologic composition of the land. The choice of recorded data and its volume should relate to the geomorphology of the zapovednik. For example, in alpine territories the following processes and phenomena are examined: ravines, landslides, river processes (the creation of new river beds, changes to river banks etc.), avalanches, sink holes, earthquakes, volcanic activity.

4. Soils.

The first volume will have given a detailed inventory and description of soil distribution. Observations of the moisture and temperature regimes of soils should be conducted during the snow-free period on experimental plots.

5. Weather.

Most preserves have a meteorological station on their land. This section will contain all standard readings - temperature of air and soil, air humidity, atmospheric pressure, rainfall, wind, and weather descriptions in tabular form together with accounts of the seasonal variations based on past weather

6. Water.

The first volume lists and describes the zapovednik's rivers, lakes, and wetlands. Monitoring programs differ between “terrestrial” and “aquatic” zapovedniks. Terrestrial zapovedniks conduct elementary observations of aquatic phenomena (they are mostly seasonal) and the dynamics of temperatures and water levels. These are closely related to weather observations and are likely to be conducted at the same place. Zapovedniks that have their territories located mostly in water ecosystem have specific monitoring programs.

7. Flora and Vegetation.

This section contains: inventories of flora with descriptions and notes of observed changes; records of new species; changes in distribution of those already recorded; special data on rare, endangered, relict and endemic species, including effects of seasonal phenomena and the dynamics of their reproduction.

The topics covered when recording changes to vegetation are as follows:

- Seasonal dynamics of plant communities. Phenological observations of typical and rare community members in basic types of plant communities (phenological graphs are used).
- Dynamics of growth of the upper ground mass of herbaceous communities. Fluctuations in the composition and structure of plant communities.

- The quantity and biomass of phytoplankton and phytobenthos. Fruiting and placentation of woody plants. The abundance of berries and of fungi.
- Changes resulting from successional processes of plant communities in different successional stages – (e.g. virgin forest, secondary forest, clear-cut, and grassland).
- All unusual phenomena affecting plant communities are recorded, as also cases of obvious and significant deviation from normal development resultant on disease, weather or animal activity.

8. The Animal Population and its Composition.

Species composition is described, with species and population estimates for each order and any changes in these from previous years. New species are registered with the location and date when they were seen. Rare species are treated analogously to rare flora. Game species of mammals are counted in winter, rodents in summer and special counts made of such species as bear, mink, otter and deer are made depending on a suitable season.

Birds counts are carried out for members of the *Tetraonidae* family and for wetland species and waterfowl. Amphibian and reptile populations are estimated by counts on transects within some of their communities during the summer months. Populations of fish, terrestrial invertebrates, and aquatic invertebrates (only in "aquatic zapovedniks) are similarly estimated.

An ecological review provides information on the ecological prospects of animals taking into account population structure, distribution, foraging success, birth rates, the survivability of progeny, death rates, seasonal questions, and behavioral characteristics together with information on tagging and rates of recapture.

9. The Calendar of Nature.

This provides a table of the year which is divided into seasons (and possibly smaller divisions) and contains weather data and data on the seasonal life of biota.

MONITORING EFFORTS OF THE URAL ZAPOVEDNIKS

At present, facing poor economic conditions, zapovedniks have started to unite and form regional unions in order to consolidate their efforts in nature conservation. These regional unions of zapovedniks, along with other protected areas, provide wide opportunities for coordinating monitoring activities across a vast amount of territory.

In the Ural Mountain region such a union began in March of 1995. Every natural zone of the Ural Mountains is represented in some category of natural protected areas in this region (table 1, Mishin, 2001; Marin, 2001). Thus, by combining the variety of different experiences and expertise (Means staff talents or special focus), geographic conditions, and land use histories in their neighborhood, the Ural zapovednik staff has achieved a unique opportunity in land preservation, research organization, monitoring, and ecological education (Zhigalskiy and Marin, 2000).

Table 1. General characteristics of the Ural zapovedniks

Name	Administrative region	Natural region	Year of creation	Area (th. ha)	The year of monitoring initiation	Overall staff	Scientific personnel

Pechoro-Ilichskiy Biosphere reserve	Komi republic, Troicko-pecherskiy raion	The western slopes of the Northern Ural ridge, northern and mid taiga. Dark coniferous taiga of the northern type (*Picea obovata, Abies sibirica, Pinus sibirica*). Sub alpine tamarack (*Larix sibirica*) forests and bare rock in the upper elevations.	1930	721	1930	49	9
Visherskiy zapovednik	Perm oblast, Krasnovisherski y raion	The middle part of the main ridge of the Northern Ural, western slopes in the rover Vishera basin. Mountainous northern and mid taiga (*Picea obovata, Abies sibirica, Betula* sp.). Sub alpine spruce-birch forests, meadows and bare rocks.	1991	241	1996	35	11
Zapovednik "Denezhkin Kamen"	Sverdlovsk oblast, Severouralskiy raion	Mid-mountainous central part of the Northern Ural, eastern slopes, mountain Denezhkin Kamen. The northern taiga. Sub alpine forests, mountainous tundra, and bare rocks in the upper elevations. The western part is covered by dark conifers (*Picea obovata, Abies sibirica, Pinus sibirica*), eastern part – by scotch pine forests (*Pinus sylvestris*).	1946-1961, 1992	78	1993	15	3

Zapovednik "Basegi"	Perm oblast, Gremiachinskiy raion	Western slopes of the Middle Ural, the sub-zone of middle taiga, the border of middle and southern taiga. Mountainous dark conifer forests (*Picea obovata, Abies sibirica*). Park-like open forests and meadows, mountainous tundra in the upper elevations.	1982	38	1988	25	8
Visimskiy biosphere reserve	Sverdlovsk oblast, Kirovgrad and Gornozavodskoy raion	The part of central Mid Urals with lower elevations, the western macro slope, the riverheads of Suliom. The sub-zone of southern taiga. Virgin spruce-fir forests (*Picea obovata, Abies sibirica*), secondary forests, bogs and meadows, sub alpine meadows.	1946-1951, 1971	33	1976	15	7
Ilmenskiy zapovednik	Chelyabinsk oblast	Eastern slopes of the Southern Urals, low elevations, southern taiga.	1920	34	1929	99	31

Yuzhno-Uralskiy zapovednik	Bashkortostan republic, Beloreckiy raion, Chelyabinsk oblast, Katav-Ivanovskiy raion	The central part of the southern Urals, Mountains Mashak, Zigalga, Yamantau comprise the highest mountain complex of the Southern Urals with elevation of 1639 m above sea level. Virgin dark coniferous forests (the southern border of the distribution), mixed broad-leaf and dark coniferous forests, tamarack-scotch pine (*Pinus sylvestris-Larix sibirica*) forests; and secondary birch and aspen (*Betula* sp., *Populus tremula*) forests.	1978	254	1979	92	5
Bashkirskiy zapovednik	Bashkortostan republic, Burzianskiy raion	The central part of the Southern Urals, Yuzhniy Kraka ridge and the western slope of the Uraltau ridge. Scotch pine (*Pinus sylvestris*), tamarack-scotch pine (*Pinus sylvestris-Larix sibirica*) and deciduous forests. Mountainous steppes in the upper elevations.	1930-1951, 1958	50	1952	45	12

Zapovednik "Shulgan-Tash"	Bashkortostan republic, Abzelilovskiy raion	Western slopes of the Southern Urals. Western boundary of the broad-leaf deciduous forests, oak (*Quercus* sp.) forests and mixed broad-leaf deciduous forests. Park-like forests, meadows, steppes in the upper elevations.	1958	22	1987	40	11
Orenburgskiy zapovednik.	Orenburg oblast, Kuvandikskiy raion	Southern Urals. From the north the territory is bordered by river Ural. Erosion hills. Rocky steppes with steppe bushes, park-like birch-aspen (*Betula* sp., *Populus tremula*) forests, alder forests along creeks.	1989	21	1993	28	6

The main goal of monitoring in zapovedniks is to study the condition and dynamics of indigenous ecosystems, both of which depend on geographic characteristics. Mountainous ecosystems, like those in the Urals, have a number of features that have to be considered in research planning. First, the heterogeneity of landscapes makes the extrapolation of results difficult and requires a larger number of study plots and transects, that have to be located in different elevation zones. Secondly, processes characteristic of mountainous ecosystems (erosions, river-bed dynamics, ecotones, primary succession) need to be specially studied. Depending on their natural conditions, each zapovednik in the region uses additional methodologies, which are appropriate for data collection for their system.

However, overall, the monitoring program stays uniform and most of the parameters are utilized by all zapovedniks (table 2, Marin, Loskutova and Kvashnina, 2000).

Table 2. Main issues, listed according to the Chronicles of Nature, monitored in the Ural zapovedniks. Monitoring issues present +/absent –

Main monitoring issues	Pechoro-Ilichskiy	Visherskiy	"Denezhkin Kamen"	Basegi	Visimskiy	Ilmenskiy	Yuzhno-Uralskiy	Bashkirskiy	Shulgan-Tash	Orenburgskiy
1. Territory										
Tables of land distribution within different categories – forested, unforested, aquatic, roads, wetlands and a table of forest composition detailing ages	+	+	+	+	+	+	+	+	+	+

and tree species.										
2. Study plots and trails										
Description of new plots (trails)	+	-	+	+	+	+	+	+	+	+
3. Relief										
Description	+	+	+	+	+	+	+	+	+	+
4. Soils										
Soil temperature dynamics	-	+	+	+	+	-	-	+	+	-
Soil moisture dynamics	-	-	+	+	-	-	+	+	-	-
Descriptions of soil types	-	+	+	+	+	-	-	-	-	-
5. Weather										
Weather station	+	+	-	+	+	+	+	+	-	+
Soil temperature dynamics (depth of 0, 5, 10, 15 cm), maximal and minimal air temperature, air moisture (25 cm from the ground level) measured daily	-	-	+	+	+	+	-	+	-	-
Seasonal characteristics	+	+	+	+	-	+	+	+	+	+
Wind velocity and direction	+	+	-	+	+	+	+	+	+	+
Snow depth dynamics	+	+	+	+	+	+	+	+	+	+
Amount of moisture in snow cover	-	-	+	+	+	+	-	+	-	-
6. Water										
Water level	-	-	-	+	-	+	+	+	-	-
Water temperature dynamics	-	-	-	+	-	+	+	+	-	-
Seasonal phenomena	+	+	+	+	+	+	-	+	+	+
Subsoil level dynamics	-	-	-	+	-	+	-	-	-	-
Ice thickness	-	-	-	+	-	+	-	-	-	-
7. Flora and Vegetation										
Number of species according to taxon	+	-	+	+	+	+	-	+	-	-
Registration of new species	+	+	+	+	+	+	+	+	+	+
Species lists with annotations	+	-	+	+	+	+	+	+	-	-
Presence and distribution of weedy species	-	-	+	+	+	+	-	-	-	-
Rare species										
General reviews, lists and distribution	+	-	+	+	+	+	-	+	+	+
Studies of populations conditions studies of some rare species	-	-	+	+	+	+	-	+	+	-
Atypical (extraordinary) phenomena in plant communities	-	-	+	+	+	-	+	+	+	+
Vegetation, sucessional studies										
Geobotanical studies from plots	-	-	+	+	+	+	+	+	-	-
Community regeneration studies	-	-	-	+	+	+	-	-	-	-
Phenology of plant communities	+	-	+	+	+	+	+	+	+	-
Berry abundance estimated by sight	+	-	+	+	+	+	+	+	-	-
Berry abundance measured instrumentally	+	-	-	+	-	-	+	+	-	-
Seasonal dynamics of fungi abundance for common species	+	-	-	+	+	-	-	+	-	-
8. The Animal Population and its Composition										

The number of species of each taxon	+	-	+	+	+	+	-	+	+	+
Registration of new species	+	-	+	+	+	+	+	+	+	+
Distribution and status of newly found rare species;	+	-	+	+	+	+	+	+	+	+
Animal and bird counts										
Winter counts of game mammals	+	-	+	+	+	+	+	+	+	+
Specialized counts of bear, beaver, mink, otter, fox, and badger	+	-	-	+	+	+	-	+	+	+
Small mammal counts (traps)	+	-	+	+	+	+	+	+	+	+
Winter and summer complex bird counts	-	-	+	+	+	+	-	+	-	-
Fall counts of hatches of *Tetraonidae*	+	-	+	+	+	+	+	+	+	+
Counts of waterfowl and wetland bird species	+	-	+	+	+	+	-	-	-	+
Relative estimates of raptors	+	-	+	+	+	+	-	+	-	+
Amphibians and reptiles counts	-	-	-	+	-	+	+	-	-	-
Invertebrate counts	-	-	-	+	+	+	+	+	-	-
Ecological reviews of the following groups										
Mammals	+	-	+	+	+	+	+	+	+	+
Birds	+	-	+	+	+	+	+	+	+	+
Amphibians and reptiles	-	-	-	+	-	+	+	+	+	-
Fish	+	-	-	+	-	+	-	-	-	-
Terrestrial invertebrates	-	-	-	+	+	+	+	+	+	-
9. The Calendar of Nature										
A tabular calendar with divisions by season, dates of seasonal events, average dates.	-	-	+	+	+	+	+	+	+	-
10. The conditions of the zapovednik regime, estimation of internal and external human impacts										
Monitoring of internal impacts	-	-	+	+	+	-	+	+	+	-
Studies of direct and indirect external impacts	-	-	+	+	+	+	-	+	+	-
Content of heavy metals in the snow, water and soil.	-	+	-	+	+	+	-	-	-	-

DISCUSSION

In compiling the table, we included only monitoring issues that are common for all zapovedniks; however, each zapovednik also has more specialized monitoring programs which contribute to the data base for the Ural zapovednik consortium. For example, Visimskiy zapovednik has largely contributed to coordinating monitoring efforts of the Ural zapovedniks by creating a sufficient electronic database which can be used for data storage and development (Marin, 1996, 2000; Marin and Petrosian, 2001). Zapovednik "Denezhkin Kamen" has a geographic information system and a GIS database. In addition to the main program, researchers from Visimskiy zapovednik also conduct small mammal marking, study the ecology and abundance of soil invertebrates, and study species composition and the abundance of agaric *Basidiomycetes*. Researchers from Shulgan-Tash zapovednik conduct complex studies of wild bees and those from Bashkirskiy zapovednik study aquatic invertebrates.

Ilmenskiy zapovednik is a subdivision of the Ural Department of the Russian Academy of Science. Unlike other Ural zapovedniks, it has a sophisticated infrastructure and good scientific equipment and thus, their staff is able to conduct more detailed monitoring of topics such as (such as fish, mammal, and bird parasites, detailed studies of invertebrates and others).

The degree to which zapovedniks are able to cover the standard list of monitoring issues depends on two main reasons, the geographical features of the zapovednik territories and the socio-economic conditions.

1. Geographical features of the zapovednik territories.

- The remoteness of the territory from cities and villages, where the central office is located and the staff members live, the size of the territory and difficulties, connected with visitation of the area.
- High mosaic of mountainous ecosystems does not allow to concentrate plots and trails and hamper the organization of periodic observations.

2. Socio-economic conditions

- Zapovedniks, created before year 1991 (see tables 1 and 2), which was a breakpoint in Russian economy, managed to establish a good base for monitoring activities, a network of study plots, pecuniary base and normal living conditions for scientific staff. The years 1970-80s were most favorable for the zapovednik system of Russia (Shtilmark, 1996). Zapovedniks had tight connections with the Academia, supported by rules and regulations. As a result, monitoring in zapovedniks that have a 20 and larger length of service has a more fundamental base than in new ones.
- Zapovedniks that were organized after 1991(see tables 1 and 2) were initially put in the conditions of extremely poor financing and could conduct only those observations that the members of the scientific staff managed to initiate. Another problem was caused by the fact that after year 1991 the stream of new specialists coming to the zapovednik lowered significantly. The initial stage of monitoring organization was prolonged because new zapovedniks were not provided with a series of necessary thematic maps. These are zapovedniks Visherskiy, "Denezhik Kamen", Orenburgskiy.
- At present all zapovedniks lack specialists of necessary profiles. The whole program of the Chronicles of Nature, requires 5-6 specialists and 5-6 technicians. At this point of time, the scientific staffs of the Ural zapovedniks encounter from3 to 12 specialists (excluding Ilmenskiy zapovednik, see table 1).
- The lack of financing increases the differences in monitoring. Unlike other scientific organizations, zapovedniks have fewer opportunities in participating grant programs. This is caused by the fact that the main task of research in zapovedniks is long-term registration of rather simple parameters. As a rule, grants are given for short-period investigations. A crucial point for organizing long-term monitoring is continuity of financial support.

CONCLUSIONS

Overall, the significance of the zapovednik monitoring program remains unappreciated and the vast amount of fundamental ecological data collected remains underutilized by both Russian and foreign scientists alike. Currently, there is almost no information about the condition of monitoring in the zapovedniks in the administrative structures of Russia such as the environmental committees or town administrations.

Ideally, the monitoring conducted at the level of the zapovedniks, should be included into the structure of a centralized federal monitoring program, overseen by a specialized nature protecting organization and should have a strong legislative base. The monitoring functions of the zapovedniks are an important component of preservation of biota in Russia and the results should be considered in the decision-making processes related to resource management and conservation.

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