

FORUS - database on geobotanic relevés of European Russian forests

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Abstract

There has been developed a database FORUS contained currently about 11000 geobotanic relevés of European Russian forests. The paper describes data sources for the database, the database structure and reference tables.

1 Introduction

Designing of databases is the most perspective way to generalize and to analyze geobotanical (vegetation sample plot) data, especially for the revealing of broad-scale geographical regularities. These data on Russian forests have been accumulated since 1991 and readjusted for computers in a course of the collaboration between the Centre of Forest Ecology and Productivity of RAS (CFEP, Moscow) and the Institute of Mathematical Problems in Biology of RAS (IMPB; Pushchino). The objective of our investigation was to develop the database on forest geobotanic relevés FORUS (Forests of Russia) with a view to arrange accumulated data on vegetation for analysis with different aims: for example, ecological analysis (as phytoindication or revealing of succession dynamics of vegetation), classification of vegetation (based either on dominant structure or on a calculation of floristic similarity), geographical analysis of vegetation (for example, drawing of plant species or syntaxone areals by the means of Geographic Information Systems, GIS).

2 Methods

2.1 Data sources for the FORUS database

Sources of the FORUS database are of several kinds. *The large part* of geobotanical data has been collected in our own field expeditions. *Another important source* of the data are relevés made by researchers not working initially with us, but kindly agreeing to contribute their materials into the database. Ensuing from established rules of the FORUS database management, a gratuitous and considerable contribution opens free possibilities to use other materials from the FORUS and to obtain

necessary consultations and technical support. A person giving more than 100 detailed relevés or an organization giving more than 300 ones may expect such reciprocal help for their research activity after finishing the acceptance procedure by the database administrator. *The third* part of data in the FORUS includes relevés which were earlier published somewhere.

2.2 The FORUS database structure

A general structure of the FORUS database is according to the usual way of data collected by field researchers. The relevés include several categories of information about forest communities – common, geographical, ecological and floristic. The database contains forms of two types. *The first type form* is filled with common, geographical and ecological information about a forest community. Common information presents identifiers of the relevés, author(s) name and affiliation(s), date of an observation, plot size. Geographical data include nearest settlements and other details of situation within the region and locality. Ecological characteristics are as following: relief position and moisture regime, land-use, evidences of past anthropogenic or natural disturbances, short verbal characteristics of neighbor communities, short soil characteristics, structure and cover of all vegetation layers, age of tree layer, species names of fallen trees, etc. *The second type form* is filled with floristic data: lists of plant species names with species abundance values in each vegetation layer. To execute the data in some special ways, each species (as well as each relevé) is identified in the database through its code designated also in the floristic form.

Files in the database are arranged as a table format or as a text format with separators acceptable for common table processors (as Excel) and easily convertible to Access or other database format.

Different reference tables intending to help with data execution are also integrated into the database.

3 Results

The large part of the FORUS database is about 7100 relevés collected in 1991-2005 by members of non-

formal creative scientific partnership (leaders are Prof. O.Smirnova and Dr. L.Zaugol'nova). Field expeditions were organized with support of Russian Academy of Science, Russian Foundation of Basic Research, and some non-government environmental organizations as Greenpeace Russia and Global Forest Watch. Taking a part in the field works were researchers and students from a large number of organizations, mainly from the CFEP and some other institutes of RAS, Pushchino State University (PSU) and several other Russian state universities, staff researchers from the Natural State Reserve 'Bryansky Les' and some other state reserves of European Russia, and also staff people from Forest Department of Greenpeace Russia. Particularly, the main part of data from arduous places (as Yamal pen., the Northern and Middle Urals, Western Siberia and others) of tundra-taiga, northern and middle taiga nature sub-zones (see table below) were obtained for the database by all these people.

About 3200 relevés were kindly delivered to the FORUS database by other researchers. The largest contribution was made by E.A.Starodubtseva, who gave in a computer form more than 1000 relevés from archive of the Natural State Reserve 'Voronezhsky' (forest-steppe nature sub-zone) produced in 1930-2000ths by researchers from Geographical Institute of RAS and by staff researchers of the Reserve (including by herself). A very large contribution was also made by V.V.Fedjaeva, who gave about 700 relevés conducted by G.M.Zozulin in 1950-60ths in Rostov and Volgograd regions (steppe nature sub-zone).

About 1200 relevés were input to the database from the published data. Staff people and students of the CFEP, IMPB and PSU search geobotanic relevés in the literature (especially of 1920-80ths) and readjust them into electronic files. One of the important aspects of this activity is to facilitate syntaxonomic analysis of newly obtained materials: to compare them with standards of earlier established syntaxa. In some cases, there is also a possibility to compare the past and the recently obtained data aimed to analyse vegetation dynamics.

Geobotanic relevés in the database are divided into the sub-databases according to their geographical (regional) localization (see table below).

There are the following reference tables in the FORUS database. To standard spelling of plant names, various reference species lists (vascular plants, mosses,

liver-mosses, lichens) are integrated into the database. Species ecological values produced by H.Ellenberg, E.Landolt, L.Ramensky, D.Tcyganov, and D.Vorobjev are also put into the database to help counting ecological values of relevés for their ecological ordination [1]. Besides, the lists of diagnostic species for different syntaxa (classes, orders, alliances, associations) are put into the database to facilitate classifying analysis of relevés [3]. Other species characteristics (as types of their areals and their correspondence with ecological-coenotic groups, etc.) are also included into the database [1]. Species marked in relevés are linked with all these tables through their codes, and due to that various suitable procedures for different kinds of execution can be designed within standard database packages or as a special soft. There is also a reference database PRODRUMUS [3] contained standard relevés of different published syntaxa.

4 Conclusion

Up to date, the FORUS database contains about 11000 geobotanic relevés of forests in European Russia. It is a powerful tool for monitoring, analysis and modelling of forest vegetation. Some examples of the database FORUS applications are presented in this issue [2, 4].

References

- [1] Khanina, L., Glukhova, E., Shovkun, M., 1999. Information system on vascular plant species of Central Russia. *Trudy zoologicheskogo instituta, St.Petersburg* 278, 62.
- [2] Khanina, L., Bobrovsky, M., Komarov, A., Mikhajlov, A., Smirnov, V., Glukhova, E., 2006. Simulation of ground vegetation in forest ecosystems. *This issue*.
- [3] Zaugol'nova, L., Khanina, L., Glukhova, E., 1999. Development of data base and information-diagnosis system for identification of syntaxon addresses of forest vegetation communities in the European Russia. *Trudy zoologicheskogo instituta, St.Petersburg* 278, 83-84.
- [4] Zaugol'nova, L., Baslavskaya, T., Morozova O., 2006. The database COENOFUND: an interactive tool to review forest biodiversity of European Russia. *This issue*.

Table. Actual volume of data arranged in the database FORUS

Nature sub-zones	Number of local databases	Total number of relevés
Tundra-Taiga	2	220
Northern Taiga	12	756
Middle Taiga	20	2258
Southern Taiga and Mixed Forests	25	3083
Broad-leaved Forests and Forest-Steppe	12	3543
Steppe	2	954