A Review of Recent Projects on Forest Biodiversity Investigations in Europe Including Russia

Khanina, L.G., Bobrovsky, M.V., Karjalainen, T., Komarov, A.S.

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ABSTRACT

Information on 547 research projects on biotic diversity of forest zone of Europe (54 international projects and 493 national European projects including 193 Russian ones) was collected into the database. A classification of the projects was elaborated, and a distribution of the main parameters of collected data was analysed. The information presented in the Internet in English or in Russian was taken as a base for data collection. Information on national Russian projects was collected from different sources and it is presented first time in English. The list of selected 210 projects (altogether 85 Russian projects) as well as the list of the Web-sites used for data extraction are presented.

The original Russian method of assessment of plant diversity at the landscape, forest type and forest stand levels developed in Russian Academy of Science (Pushchino Scientific Center, Moscow region, and Centre of Ecology and Productivity of Forests, Moscow) is described. The method uses the computer information-analytical system (IAS) consisting of a set of databases, application programmes including special tools for analysis of vegetation data, linked to GIS with a module of spatial data processing. IAS can be used for monitoring of vegetation (including forest ground vegetation) under silvicultural management as well under ecosystem natural development. IAS outputs can be used in sustainable forest management for the purpose of conservation and restoration of biodiversity. Outlines of the system with description of input data, reference databases and outputs are presented.

Keywords: biodiversity, Europe, Russia, Internet

1. INTRODUCTION

Biodiversity – biotic diversity – is the total variety of life on earth (Bibby et al. 1992). According to the official definition (WRI- IUCN-UNEP 1992), biodiversity can be divided into three hierarchical categories – genes, species and ecosystems. It is a compositional diversity. Besides, there is a diversity of ecological structures, functions, and processes at all levels of life organization (Roberts and Gilliam 1995).

Various aspects of biotic diversity are investigated including the structure of populations, the patterns of communities in a region, changes in community composition and structure over time (WRI-IUCN-UNEP 1992), also diversity and dynamics of landscapes and biogeographic units (Bruenig 1996).

Different definitions of biodiversity (e.g. see collection in the BEAR Technical Report No. 4 1998) are similar in substance, and vary mainly in a breadth of notion in dependence on adjusted purposes. Hierarchy is considered as a central phenomenon of biodiversity (di Castri and Younes 1995), and a level of consideration of biodiversity problem is defined by the level of study object and by the aim of an investigation.

The following main issues regarding biodiversity in forest ecosystems are discussed in this review:

- inventory of biodiversity including taxonomy and syntaxonomy;
- monitoring of biodiversity;
- conservation and restoration of biodiversity;
- management for biodiversity;
- integration and co-ordination of information, knowledge, efforts, etc.; and
- forest and environmental policy.

All these topics are overlapping, and it is often difficult to distinguish one from another. Nevertheless, the topics were separated for analysis of biodiversity issues.

Inventory of biodiversity includes scheduling of objects of compositional biodiversity (e.g. genes, species, ecosystems). At the levels of species and plant communities, this section includes pure taxonomic or syntaxonomic works, which define the classification and typology of objects, as well as floristic, faunistic and phytocoenological works, which define the lists of objects within a study area (composition of check-lists).

Monitoring of biodiversity embraces: assessment of current state of compositional, structural and functional diversity at all levels of life organization; evaluation of interrelations and changes; prognosis of dynamics; and development of indicators for monitoring and evaluation of biodiversity.

The section of conservation and restoration of biodiversity comprises studies of necessary conditions for conservation and restoration of any object of biodiversity and studying of consequence of biodiversity protection.

Management of/for biodiversity embraces development of methods of conservation and restoration of biodiversity including silvicultural and agricultural operations as well as practical application of these methods.

Integration and co-ordination are a modern direction in the general biodiversity frame connected with a necessity to consolidate information, knowledge and efforts in biodiversity conservation and restoration over the world. Integrating of efforts is necessary in any field of science. A feature of biodiversity – a composition of biological, economic, social and political tasks – demands consideration of activities on integrating as a self-supporting issue.

The section of forest policy comprises topics of forest strategy formulation and implementation in order to promote the forest biodiversity conservation and sustainable forest management.

Biodiversity has been intensively investigated during the last decade. What has been done? What topics have been investigated, and in which European countries have these investigations taken place? What tasks have being posed? A review of recent projects on biodiversity investigations could help in understanding of these and connected questions. A review of recent European (including Russia) projects on biodiversity investigations is a purpose of this study. The study was constrained to forest biodiversity investigations embracing biotic diversity in the frame of the forest zone.

We included also, as a particular section of the review, a description of the computer information-analytical system (IAS) for assessment of plant diversity at the landscape, forest type and forest stand levels. IAS have been developed at the Russian Academy of Science. The IAS is used for monitoring of vegetation diversity, for improving methods of biodiversity conservation and restoration (Smirnova et al. 1997; Smirnova and Shaposhnikov 1999; Isaev 2000; Zaugolnova 2000). This section could be seen as a modern computer-oriented tool for analysis of some biodiversity tasks.

2. METHODS OF THE INVESTIGATION

Projects on biotic diversity in the frame of forest zone of Europe were included in the review. Levels of genes and micro-organisms were not considered. The Internet was used as a main source of information on the projects. Information in English and in Russian was used. The list of the Web-sites used for data extraction is presented in the Annex.

Special attention was paid to Russian projects, because of their weak representation in the World and in the European Internet databases, and because of dominance of Russian language in the Russian Web-sites. Publications in national press and direct examining of researchers were used also for collecting information on Russian projects. All information was collected into a database realised using Microsoft Access software. A distribution of the main parameters of collected data was analysed.

3. REVIEW OF THE RECENT EUROPEAN PROJECTS ON FOREST BIODIVERSITY INVESTIGATIONS

Information was collected for 547 projects on forest biodiversity investigations. There were: 52 international projects; 302 national European projects excluding Russian projects; and 193 national Russian projects. For the purpose of simplicity, the 354 European projects (the 52 international projects and the 302 national European projects) will be called the 'European' projects.

It is worth noting that collected information is not a completely comprehensive list of existing projects on this topic. The review comprehends only forest biodiversity projects (without projects at the genetic and micro-organism levels) found in the Internet and described in English or in Russian. There are certainly projects under relevant topics, which are not included in our review because the information about them was not found in English or in Russian in the Internet.

The database contains the following information about the projects:

Identifier (number of the project in the database)
Title of the project
Programme
Source of support
Project reference
Date of the start and end
Project type (International/National)
List of involved countries
Country
Organization
Contact person
Research area (according to the project's authors)
Keywords (according to the project's authors)
Web address
Brief summary
Study area (Region/Country/Several countries/Europe/World)
Fields of investigation
Disciplines

The two last items comprise our own classification of projects on fields of investigation and discipline. These data were used for analysis of project distribution on biodiversity issues described in the introduction – biodiversity inventory, monitoring, conservation, management, integration, and policy. For Russian projects, type of financing source supporting a project (government or non-government) was also marked.

Figure 3.1 illustrates the proportion of projects investigating different aspects of biodiversity for: (a) Europe; and (b) Russia. Full circles correspond to the total number of the projects in Europe and in Russia respectively. Comparison of the numbers of projects shows that biodiversity monitoring and policy account for a similar proportion of all projects in Europe and in Russia. Management and integrating account for a greater proportion of the projects in Europe, while biodiversity conservation and inventory account for the greatest proportion of Russian projects. We have got the results from analysis of collected information, but we think, that this reflects the main feature of distribution of resources and attention – i.e. to

biodiversity conservation and inventory in Russia, and to management for biodiversity and integrating of knowledge and efforts in Europe.

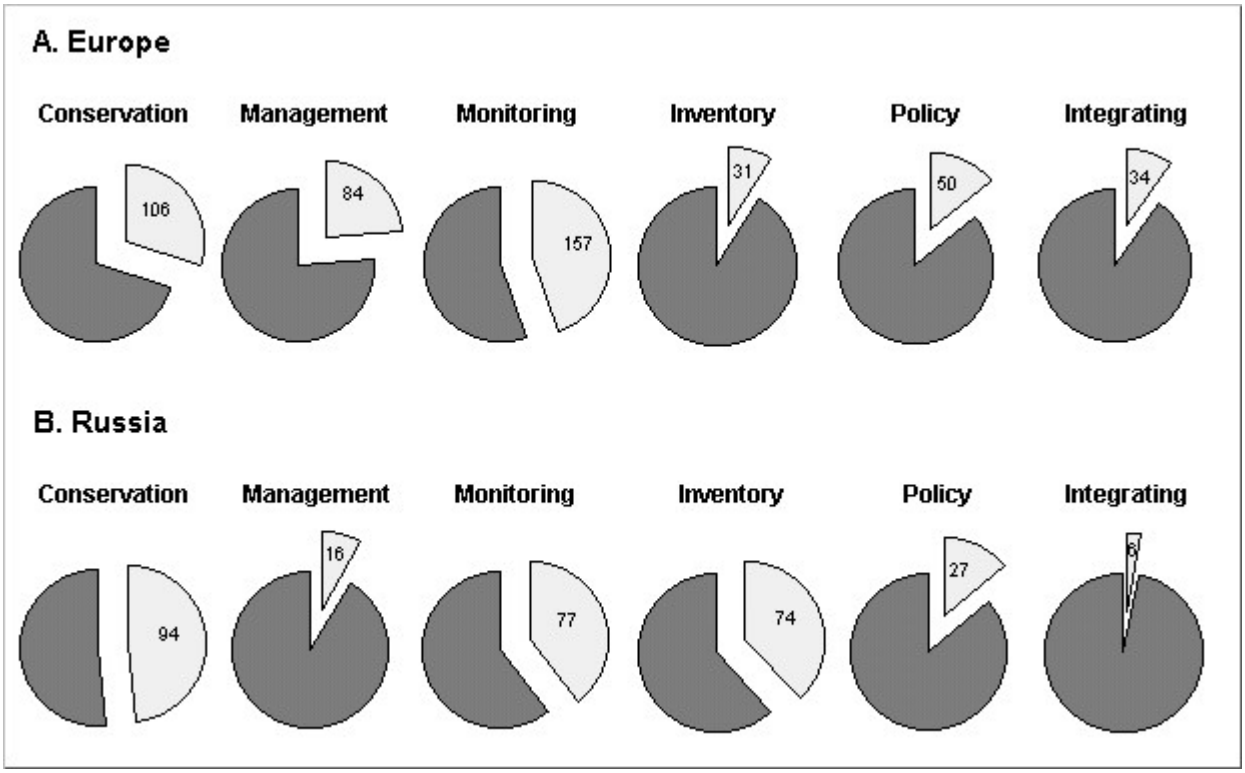

Figure 3.1. Proportion of the projects investigating different items of biodiversity in Europe (A) and in Russia (B). Full circles correspond to the total number of the projects – to 354 European (including national and international) and to 193 national Russian projects. The sum total is not equal to the total number of the projects because one project can investigate more than one issue. The groupings have been explained in the introduction.

The European and national Russian projects were further analysed in separate sections.

3.1 ANALYSIS OF THE RECENT EUROPEAN (WITHOUT NATIONAL RUSSIAN) PROJECTS ON FOREST BIODIVERSITY INVESTIGATIONS

Analysis consists of the following parts:
a) distributions of collected projects by fields of investigations and disciplines;
b) distribution of collected projects by spatial coverage; and
c) analysis of national projects.

Figures 3.2 and 3.3 present distributions of European projects by detailed issues – by fields of investigations and by disciplines, respectively. For selected topics, a total number of projects and lists of countries participating in the considerable number of projects on the topics (in descending ordering) are indicated.

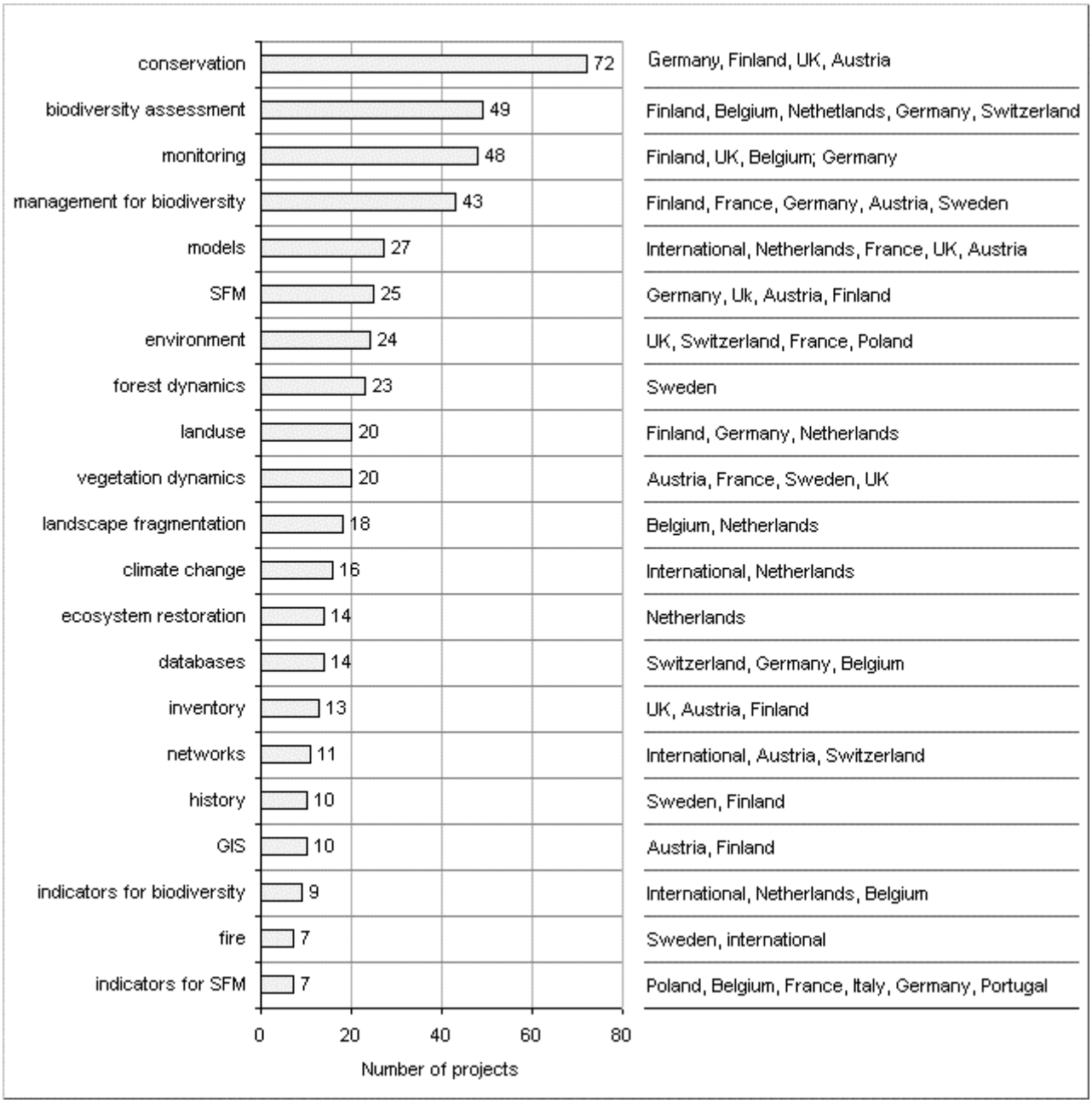

Figure 3.2. Grouping of European projects by fields of investigations based on the information available. The total number of the projects and a list of countries where the majority of the projects were performed are presented for each topic.

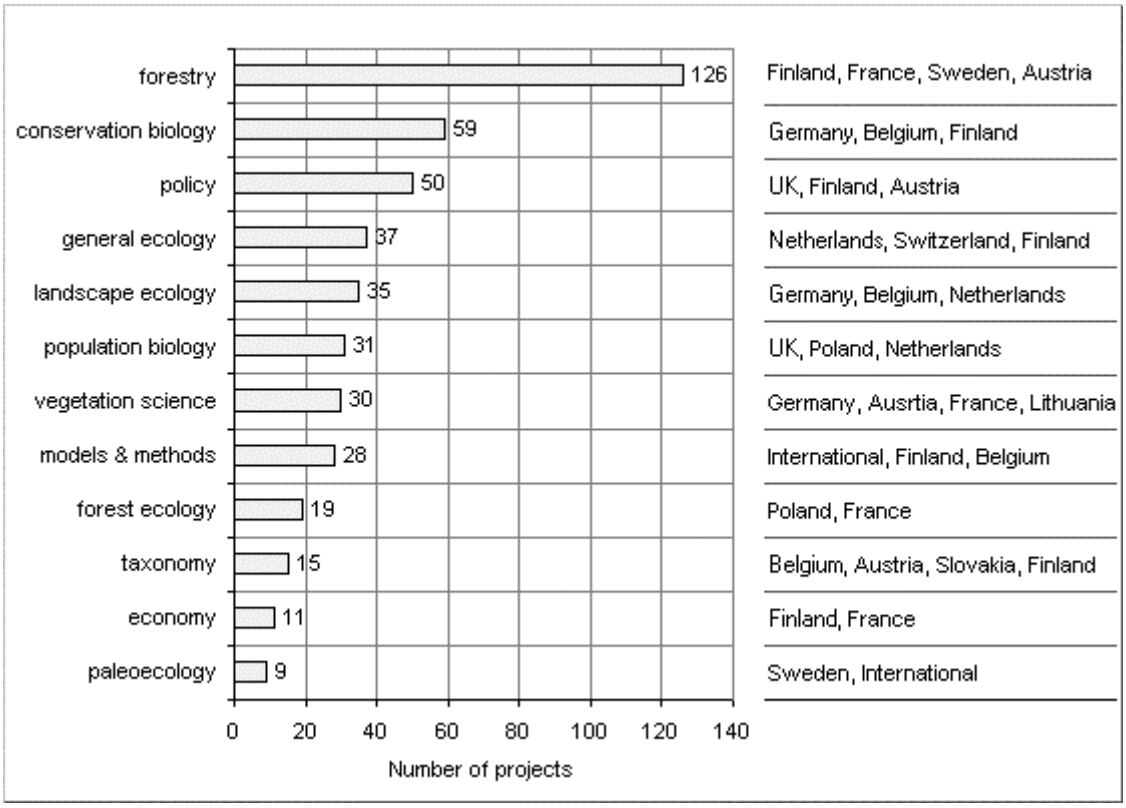

Figure 3.3. Distribution of European projects by disciplines according to available data. The total number of the projects and a list of countries where majority of the projects were performed are presented for each discipline.

Figure 3.4 shows a distribution of European projects based on spatial coverage, the level of which differs from some region within one country to the world as a whole. Most of the projects (62%) investigate biodiversity issues at the level of one country. Some 20% of the projects devoted to decision of regional tasks; 11% – to decision of all-European tasks; and 4% and 3% – to problems of several countries and of the world as a whole, respectively.

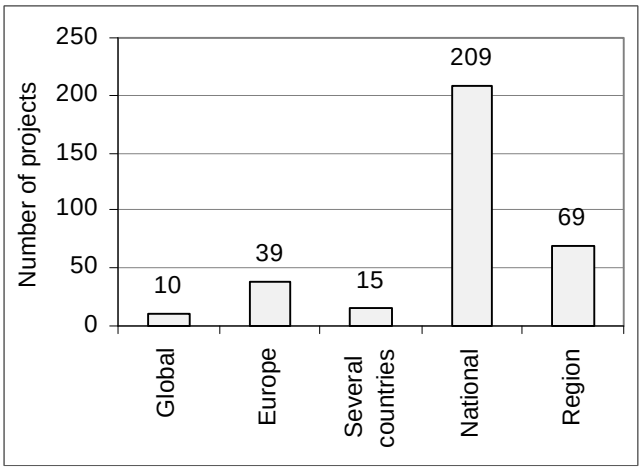

Figure 3.4. Distribution of European projects based on the spatial coverage of the investigation.

Distributions of the projects detailed in spatial coverage by biodiversity issues (Figure 3.5) show the following: projects studying biodiversity at regional and national levels (Figure 3.5, A, B) are distributed in similar way; most of the projects are devoted to monitoring, conservation and management issues; a minority of the projects investigate inventory, policy and integrating topics. Most of the projects studying biodiversity at the European level (Figure 3.5, C) refer to policy, integrating and monitoring sections; this could be expected. Projects investigating biodiversity at the global level (Figure 3.5, D) are devoted mainly to forest policy and inventory issues, and a number of monitoring projects decreases.

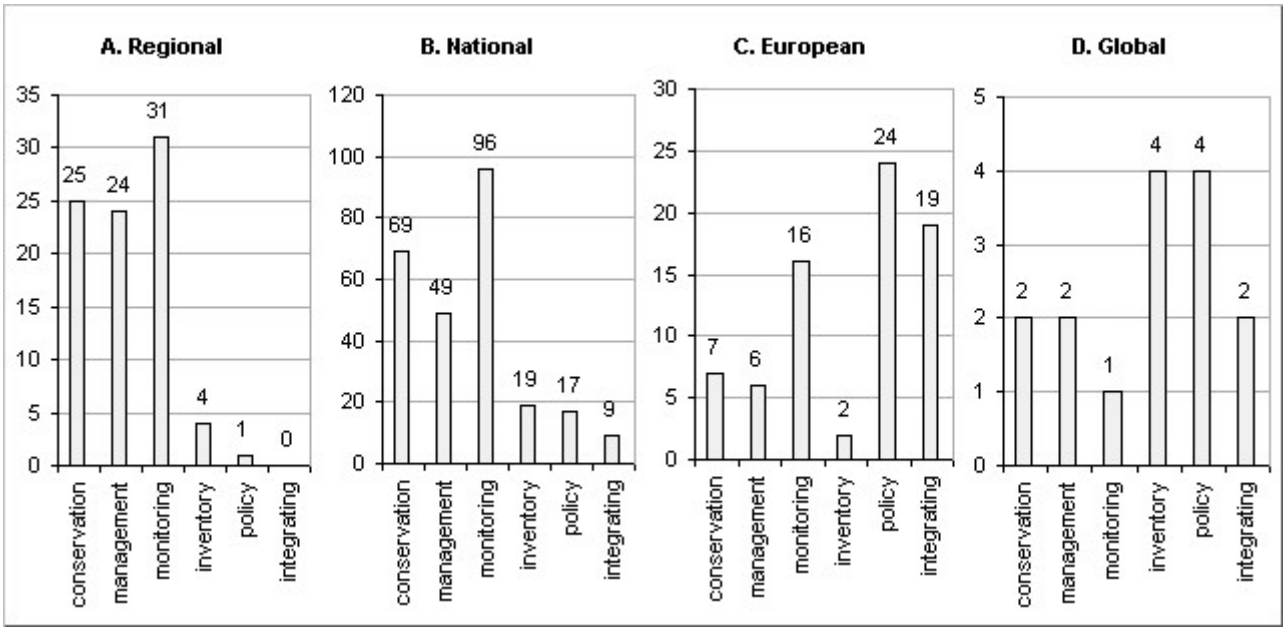

Figure 3.5. Project distribution by spatial coverage and grouping by biodiversity issues. One project can investigate more than one issue, so the total sum (at Figure 3.5) is not equal to the total number of the projects (at Figure 3.4).

In Figure 3.6, a distribution of projects by country (without respect to international or national types) is presented. Finland had the greatest number of projects investigating biotic diversity in forest zone of Europe, presented in English in the Internet. Germany was next and then France, UK, Sweden, Netherlands, Belgium, Austria and Switzerland. Note that this figure just shows which countries have been active in providing information in the Web. In several countries there have been only a few projects providing information in the Web.

To get a more detailed picture about forest biodiversity investigations in Europe, a list of 125 projects (out of the total of 547 identified projects) is presented in section 3.1.1 (Selected list of international projects) and section 3.1.2 (Selected list of national European projects). The projects were selected from the database by intersection condition of values “forest”, “forest management for biodiversity”, “sustainable forest management (SFM)”, “forest ecology”, “forestry” and values “biodiversity”, “assessment of biodiversity”, “indicator for biodiversity”, “conservation”, “conservation biology” in the database fields “Discipline” or “Field of investigation”. Later information about all the identified projects will be made accessible as a Web-database.

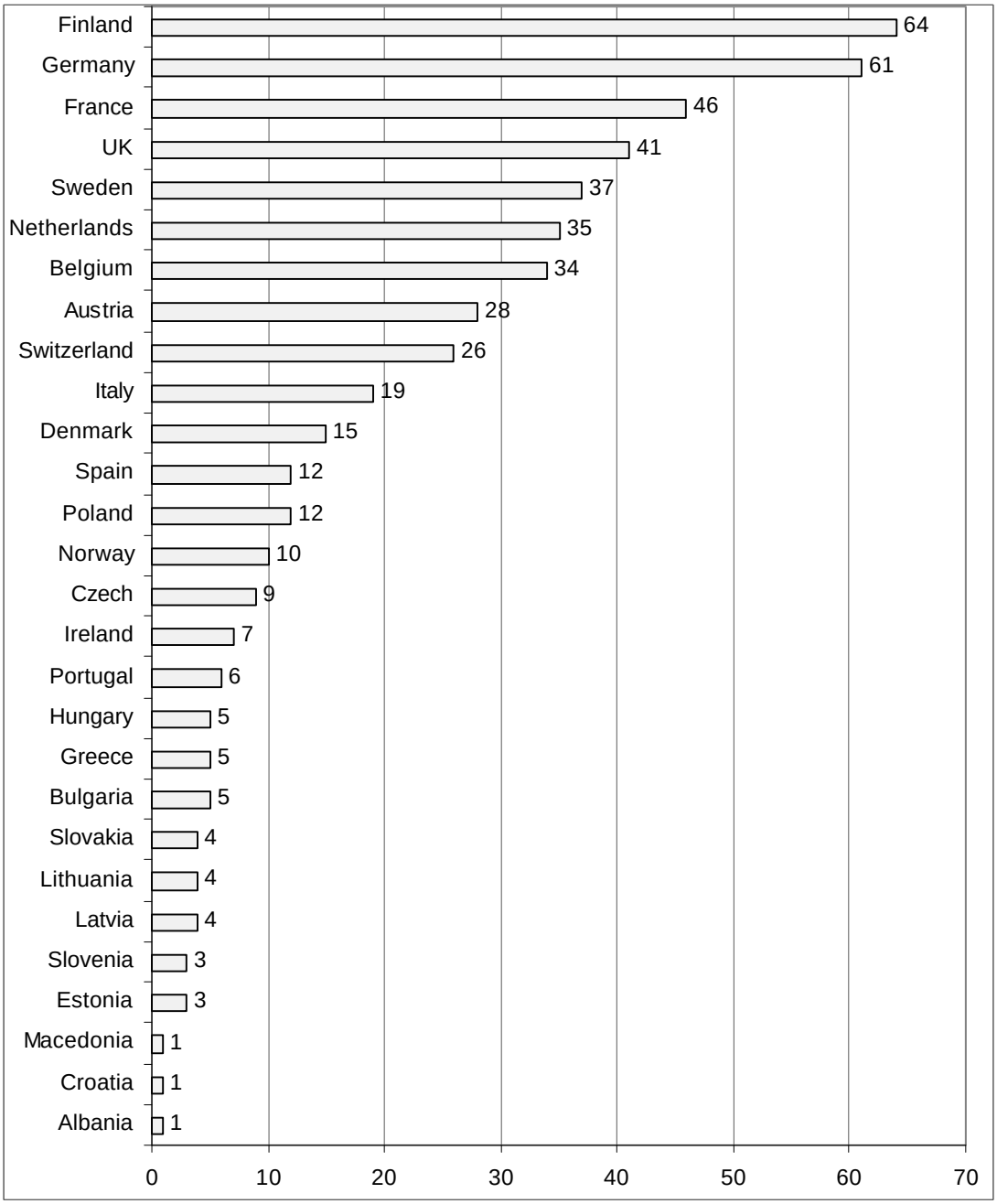

Figure 3.6. Distribution of all European projects (international and national) by countries.

The projects in the list are grouped by country, and a short characterization of national projects (without international) for countries well presented in the Web is made. International projects are described at the beginning. Information is often incomplete in the Web, so it is incomplete in our list also. This is especially the case with regard to the contact person and contact address details.

3.1.1 Selected list of international projects

European projects carried out by several countries investigate all marked biodiversity issues (Figure 3.7). There seems to be fewer projects in inventory, conservation and management than in integration, monitoring or policy.

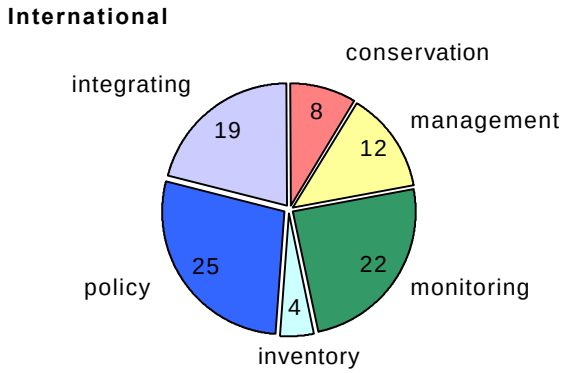

Figure 3.7. Distribution of international projects by biodiversity issues (total number of international projects is 52).

The selected list of the international projects on forest biodiversity is given here. The co-ordinating country is indicated first.

1. Analysis of regeneration success for downy oak (*Quercus pubescens*) at conversion of Austrian black pine (*Pinus nigra*) forests.
List of countries: Austria, Italy.
Organization: Institute of Silviculture.
Contact person: Vacik, Harald.

2. Assessment of naturalness in the forests of South Tyrol.
List of countries: Austria, Italy.
Organization: Institute of Silviculture.
Contact person: Vacik, Harald.

3. Biodiversity in Alpine forest ecosystems: analysis, protection and management.
List of countries: Germany, Austria, France, Italy, Switzerland.
Contact person: Müller-Starck, Gerhard.
Contact address: Lehrbereich Forstgenetik, Forstwissenschaftliche Fakultät, München (LMU), Am Hochanger 13,D- 85354 Freising (Germany).
http://www.wsl.ch/land/biodiversity/gendiv/BAFE/index.htm
http://ifff.boku.ac.at/efern/

4. Indicators for monitoring and evaluation of forest biodiversity in Europe (BEAR).
List of countries: Sweden, Finland, Denmark, Norway, Ireland, UK, Netherlands, Belgium, France, Germany, Switzerland, Austria, Portugal, Italy, Greece, Spain, Hungary, Slovenia.
Organization: Swedish Environmental Protection Agency. Research Department.
Contact person: Larsson,Tor-Bjorn.
Contact address: tel: +46-8-6981447, fax: +46-8-6981663, email: tor-bjorn.larsson@environ.se
http://www.algonet.se/~bear

5. Regeneration of native forest stands for timber production and enviromental value (RENFORS).
List of countries: Sweden, UK, Denmark, Italy.
Organization: Swedish University of Agricultural Sciences. Southern Swedish Forest Research Centre.
Contact person: Bradshaw, Richard.
Contact address: tel: +46-40-463443, fax: +46-40-462325, email: richard.bradshawe@ess.slu.se

http://dbs.cordis.lu/
http://europa.eu.int/comm/research/index_en.html

6. Requirement for treatments and logging for presentation of biodiversity in boreal forest of North-West Russia.
List of countries: Norway, Russia.
Organization: Norsk institutt for skogforskning (NISK).
Contact person: Fjulsrud, Knut.

7. Silviculture and biodiversity of Scots pine forests in Europe.
List of countries: UK, Spain, Austria, Belgium, Germany, Ireland, Sweden, Netherlands, France.
Organization: Forestry Commission. Forest Research.
Contact person: Mason, William.
Contact address: tel: +44-131-4452176, fax: +44-131-4455124, email: anqus.mackie@ed.ac.uk
http://dbs.cordis.lu/

8. The management of valuable broadleaf forests in Europe.
List of countries: Germany, Finland.
Contact person: Hein, Sebastian.
http://www.forst.uni-freiburg.de/Waldwachstum/

3.1.2 Selected list of national European projects

Finland

All directions of biodiversity investigation are presented in Finland (Figure 3.8). Most of the national projects are under monitoring, management and conservation.

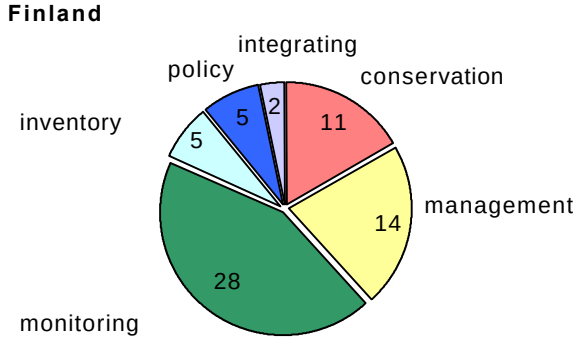

Figure 3.8. Distribution of Finnish projects by biodiversity issues (total number of national projects is 52).

1. Biodiversity and economics of forestry.
Organization: Finnish Forest Research Institute.
Contact person: Tahvonen, Olli.
Contact address: tel: +358-9-8570 5717.
http://fibre.utu.fi/proj/index.htm
http://www.metla.fi/hanke/eindex.htm

2. Biodiversity in birch for improvement of disease resistance.
Organization: University of Helsinki. Department of Plant Biology.
Contact person: von Weissenberg, Kim.
Contact address: kim.vonweissenberg@helsinki.fi.
http://www-db.helsinki.fi/tuhti/en/

3. Biodiversity in boreal forests – ecology and dynamics of species in complex landscapes.
Organization: Division of Population Biology. Department of Ecology and Systematics.
Contact person: Hanski, Ilkka.
Contact address: tel: +358-9-191 7417.
http://fibre.utu.fi/proj/index.htm
http://www-db.helsinki.fi/tuhti/en/

4. Biodiversity in forest regeneration.
Organization: University of Helsinki. Department of Ecology and Systematics.
Contact person: Niemelä, Jari.
Contact address: jari.niemelä@helsinki.fi.
http://www-db.helsinki.fi/tuhti/en/

5. Co-ordination of the Forest biodiversity research program.
Organization: Finnish Forest Research Institute. Vantaa Research Centre.
Contact person: Annila, Erkki.
Contact address: tel. +358-9-857 051.
http://www.metla.fi/hanke/eindex.htm

6. Diversity of forest and mire vegetation.
Organization: Finnish Forest Research Institute.
Contact person: Reinikainen, Antti.
http://www.metla.fi/hanke/eindex.htm

7. Economic effect of biodiversity in forestry.
Organization: University of Helsinki. Department of Forest Economics.
Contact person: Hyytiäinen, Kari
Contact address: kari.hyytiainen@metsa.fi.
http://www-db.helsinki.fi/tuhti/en/

8. Economic effects of securing forest biodiversity.
Organization: University of Helsinki. Department of Economics and Management.
Contact person: Järveläinen, Veli-Pekka.
Contact address: Veli-Pekka.Jarvelainen@Helsinki.Fi.
http://www-db.helsinki.fi/tuhti/en/

9. Effect of forest management on insect and microbe diversity.
Organization: Finnish Forest Research Institute. Vantaa Research Centre.
Contact person: Annila, Erkki.
Contact address: tel.: +358-9-857 051.
http://ifff.boku.ac.at/efern/

10. Effect of mineral soil spatial heterogeneity on the regeneration and diversity of understory vegetation in a natural scots pine stand.
Organization: University of Helsinki. Department of Forest Ecology.
Contact person: Kuuluvainen, Timo.
Contact address: Timo.Kuuluvainen@Helsinki.Fi.
http://www-db.helsinki.fi/tuhti/en/

11. Effect of size of the retention tree groups on biodiversity in forest regeneration (RETREE).
Organization: University of Helsinki. Department of Ecology and Systematics.
Contact person: Niemelä, Jari.
Contact address: jari.niemela@helsinki.fi.
http://www-db.helsinki.fi/tuhti/en/

12. Epiphyte diversity in boreal forests.
Organization: University of Helsinki. Department of Ecology and Systematics.
Contact person: Kuusinen, Mikko.
Contact address: Mikko.Kuusinen@Helsinki.Fi.
http://www-db.helsinki.fi/tuhti/en/

13. Forest management and biodiversity.
Organization: Finnish Forest Research Institute.
Contact person: Siitonen, Juha.
http://www.metla.fi/hanke/eindex.htm

14. Forest regeneration in the light of biodiversity and economics (a consortium).
Organization: Finnish Forest Research Institute. Vantaa Research Centre.
Contact person: Henttonen, Heikki.
Contact address: FIN-01301 Vantaa, Finland.
http://fibre.utu.fi/proj/index.htm

15. Forests in geographic information systems – graduate school.
Organization: University of Helsinki. Department of Forest Resource Management.
Contact person: Laasasenaho, Jouko.
Contact address: jouko.laasasenaho@helsinki.fi
http://HONEYBEE.HELSINKI.FI/gis/
http://www-db.helsinki.fi/tuhti/en/

16. Impact of forestry and environmental change on the diversity of boreal vegetation since 1950.
Organization: Finnish Forest Research Institute.
Contact person: Tomppo, Erkki.
http://www.metla.fi/hanke/eindex.htm

17. Managing northern boreal forests landscapes for biodiversity: ecological and economic perspectives.
Organization: University of Oulu. Department of Biology.
Contact person: Mönkkönen, Mikko.
Contact address: tel:.+358-8-5531214, fax.: +358-8-5531227.
http://fibre.utu.fi/proj/index.htm

18. Measurement and monitoring of forest biodiversity.
Organization: Metsäteho Oy.
Contact person: Strandström, Markus.
http://www.woodwisdom.fi/

19. Measuring the biodiversity of the forest.
Organization: University of Helsinki, Hyytiälä Forest Station.
Contact person: Rasinmäki, Jussi
Contact address: Jussi.rasinmaki@helsinki.fi.
http://www-db.helsinki.fi/tuhti/en/

20. Monitoring the biodiversity in the national forest inventory.
Organization: Finnish Forest Research Institute.
Contact person: Tomppo, Erkki.
http://www.metla.fi/hanke/eindex.htm

21. Old forest management: ecological corridors.
Organization: Finnish Forest Research Institute.
Contact person: Henttonen, Heikki.
http://www.metla.fi/hanke/eindex.htm

22. Producing small scaled biodiversity and stand information by remote sensing.
Organization: Metsäteho Oy.
Contact person: Lukkarinen, Eero.
Contact address: tel.: +358-9-132 521.
http://fibre.utu.fi/proj/index.htm

23. Research as an active part in developing practical forest management towards ecosystem management (a consortium).
Organization: Metsäteho Oy.
Contact person: Kaila, Simo.
Contact address: tel. +358-9-132 5232 or +358-40-582 1614.
http://fibre.utu.fi/proj/index.htm

24. Silviculture of hardwoods.
Organization: Finnish Forest Research Institute. Vantaa Research Centre.
Contact person: Lähde, Erkki.
Contact address: tel.: + 358-9-857 05 480.
http://www.metla.fi/projects/

25. Structure and dynamics of natural and managed boreal forest landscapes – Linking landscape pattern, stand structure and species diversity.
Organization: University of Helsinki. Department of Forest ecology.
Contact person: Kuuluvainen, Timo.
Contact address: tel.: +358-9-1917 708, fax: +358-9-1917 605, email: timo.kuuluvainen@helsinki.fi
http://fibre.utu.fi/proj/index.htm

26. Succession of virgin forest stands.
Organization: Finnish Forest Research Institute.
Contact person: Isomäki, Antti.
Contact address: tel.: +358-9-8570 51.
http://www.metla.fi/hanke/eindex.htm

27. Temporal and spatial diversity of boreal forest and peatland vegetation.
Organization: Finnish Forest Research Institute.
Contact person: Tomppo, Erkki.
Contact address: tel.: +358-9-857 051.
http://fibre.utu.fi/proj/index.htm

28. The dynamics of biodiversity and methods for its assesment.
Organization: Finnish Forest Research Institute.
Contact person: Tomppo, Erkki.
Contact address: tel.: +358-9-857 051, fax: +358-9-625 308.
http://www.metla.fi/projects/

29. The value of biodiversity in Finnish forests.
Organization: Finnish Forest Research Institute.
Contact person: Naskali, Arto.
http://www.metla.fi/hanke/eindex.htm

France

Many of the national projects in France are in management for biodiversity (Figure 3.9). There were no projects in inventory of forest biodiversity.

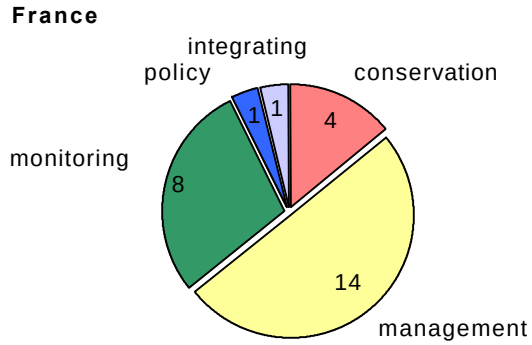

Figure 3.9. Distribution of French projects by biodiversity issues (total number of national projects is 25).

1. Analysis of tree growth and modelling for the development of decision support tools for silviculture (oak, beech, Douglas fir, valuable broadleaved trees).
Organization: INRA. Joint Research Unit for Forest Resources and Wood Quality (ENGREF). Nancy. Department for Forests and the Natural Environment.

2. Analysis and modelling of forest stand growth to develop silvicultural management tools (oak, beech, spruce).
Organization: INRA. Joint Research Unit for Forest Resources and Wood Quality (ENGREF). Nancy. Department for Forests and the Natural Environment.

3. Biodiversity and forest ecosystem health in the Landes.
Organization: National Institute for Agricultural Research (INRA). Biometrics and Artificial Intelligence Research Unit (UBIA).
Contact address: tel.: +33-(0)561 285 068.
http://ifff.boku.ac.at/efern/

4. Biodiversity in fragmented forests in the rural landscape of south-western France.
Organization: National Institute for Agricultural Research (INRA). Agrarian Systems and Development Unit (SAD).
Contact person: Balent, Gérard.
Contact address: tel.: +33-561-28 52 67.
http://ifff.boku.ac.at/efern/

5. Effect of thinning on biodiversity in coniferous plantations.
Organization: Forestry and Cellulose Association. Centre-West Area Station.
Contact person: Bailly, Alain.
Contact address: tel.: +33-555484810.
http://ifff.boku.ac.at/efern/

6. Forest biodiversity evaluation in the Brie region: stands types and surrounding forest composition influences.
Organization: French Institute for Forestry, Agricultural and Environmental Engineering (ENGREF). Paris-Center. Applied Mathematics and Computer Science (MAI).
Contact person: Franc, Alain.
Contact address: tel.: +33-(0)-1-454 98 800.
http://ifff.boku.ac.at/efern/

7. Forest restoration dynamics: a functional analysis 100 years after rehabilitation of badlands for erosion control in the south-western Alps.
Organization: Institute for Agricultural and Environmental Engineering Research (Cemagref). Department of Land Management. Mountain Forestry Division.
Contact person: Vallauri, Daniel.
Contact address: tel.: +33-4-767 627 27.
http://ifff.boku.ac.at/efern/

8. Spatial distribution and temporal evolution of vegetation diversity. Relations with stands structures heterogeneity in mountains spruce stands.
Organization: National Forestry Board (ONF). Technical section of Alps.
Contact person: Leclerc, Dominique.
Contact address: tel.: +33-4-79697845.
http://ifff.boku.ac.at/efern/

9. Impact of forest management on biodiversity in Gap-Chaudun Watershed (French Alps).
Organization: French Institute for Forestry, Agricultural and Environmental Engineering (ENGREF). Nancy Center. Forest Science Research Laboratory (LRSF).
Contact person: Rameau, Jean-Claude.
Contact address: tel.: +33-3-83 39 68 00.
http://ifff.boku.ac.at/efern/

10. Incidence of former land use on forest species diversity in the East of France.
Organization: French Institute for Forestry, Agricultural and Environmental Engineering (ENGREF). Nancy Center. Forest Science Research Laboratory (LRSF).
Contact person: Rameau, Jean-Claude.
Contact address: tel.: +33-3-83 39 68 00.
http://ifff.boku.ac.at/efern/

11. Integrating biodiversity in the management of forest ecosystems.
Organization: Institut pour le développement forestier.
Contact person: Dume, Gérard.
Contact address: tel.: +33-1-40 62 22 80.
http://europa.eu.int/comm/life/

12. Management of a major feature in Mediterranean mountain vegetation dynamics: sylvigenetic maturation of pioneer pine stands.
Organization: National Forestry Board (ONF). Regional Direction of Provence-Alpes-Ctte d'Azur.
Contact person: Maillet, Albert.
Contact address: tel.: +33-4-42175700.
http://ifff.boku.ac.at/efern/

13. Mediterranean forests: Impact of forest management on Carabidae specific and genetic diversity.
Organization: National Forestry Board (ONF). Division of Quillan.
Contact person: Noblecourt, Thierry.
Contact address: tel.: +33-4-68200675.
http://ifff.boku.ac.at/efern/

14. Mountains forest ecosystems dynamics: comparison between exploited and semi-natural forests.
Organization: Institute for Agricultural and Environmental Engineering Research (Cemagref).
Contact person: Chauvin, Christophe.
Contact address: tel.: +33-4-76 76 27 27.
http://ifff.boku.ac.at/efern/

15. Agricultural and forestry practices, landscape organization, the environment.
Organization: INRA. Agrarian Systems and Development Unit. Toulouse. Agrarian Systems and Development Department.
Contact person: Balent, Gérard.
Contact address: tel.: 33 (0)5 61 28 52 58.

16. The mediterranean holm oak grove integrated management.
Organization: Direction Régionale Languedoc-Roussillon. Department: Office National des Forêts
Contact person LLAMAS, Hervé.
Contact address: fax: +33-467046688.
http://dbs.cordis.lu/

Belgium

Many of the national projects in Belgium are in monitoring and conservation of biodiversity (Figure 3.10). Number of inventory and management projects is similar, and it is more than number of policy and integrating projects.

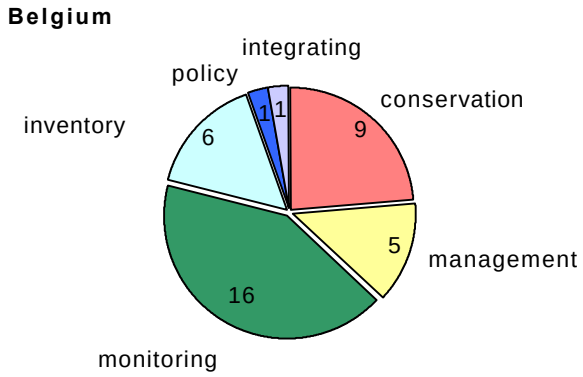

Figure 3.10. Distribution of Belgian projects by biodiversity issues (total number of national projects is 28).

1. Biodiversity indicators and sustainable management in parks.
Organization: Katholieke Universiteit Leuven (KULEUVEN, KUL). Department of Land Management. Laboratory for Forest, Nature and Landscape Research.
Contact person: Cornelis, Johnny.
Contact address: tel.: +32-(0)16-32.97.21.
http://www.br.fgov.be/BIODIV/index.html

2. Biodiversity Platform: integrating federal biodiversity research projects.
Organization: Federal office for scientific, technical and cultural affairs (OSTC) Research and Development.
Contact person: Van der Werf, Aline.
Contact address: tel.: +32-(0)2-238.36.71.
http://www.br.fgov.be/BIODIV/index.html

3. Clearcutting of a spruce catchment, consequences on the ecosystem functionning.
Organization: University of Liège (ULg). Faculty of Sciences. Ecology and Microbial Ecology Unit.
Contact person: Remacle, Jean.
Contact address: tel.: +32-43-663 845.
http://ifff.boku.ac.at/efern/

4. Development of a standardised methodology for the assessment of forest biodiversity in Flanders (Belgium).
Organization: Institute for Forestry and Game Management. Section Forestry. Division Forest Ecology.
Contact person: Vandekerkhove, Kris.
Contact address: tel.: +32-(0)54-43.71.28.
http://www.br.fgov.be/BIODIV/index.html

5. Diversification of forest production: potentialities of the birch species *Betula pubescens* Ehrh., *Betula pendula* Roth and the black locust, *Robinia pseudoacacia* L.
Organization: Gembloux Agricultural University (FSAGx, FUSAGx).
Contact person: Boreux, Damien.
Contact address: tel.: +32-(0)81-62.23.77.
http://www.br.fgov.be/BIODIV/index.html

6. Effects of site history on plant species diversity in forests.
Organization: Katholieke Universiteit Leuven (KULEUVEN, KUL). Departement of Land Management. Laboratory for Forest, Nature and Landscape Research.
Contact person: Hermy, Martin.
Contact address: tel.: +32-(0)16-32.97.57.
http://www.br.fgov.be/BIODIV/index.html

7. Impact of forest management models on biodiversity in sub-montane temperate forests.
Organization: Catholic University of Louvain-la-Neuve. Faculty of Agricultural Sciences. Unit of Forestry.
Contact person: de Warnaffe Gaktan, du Bus.
Contact address: tel.: +32-10-473 698.
http://ifff.boku.ac.at/efern/

8. Measurements of biodiversity in parks in Flanders (Belgium).
Organization Katholieke Universiteit Leuven (KULEUVEN, KUL). Departement of Land Management. Laboratory for Forest, Nature and Landscape Research.
Contact person: Cornelis, Johnny.
Contact address: tel.: +32-(0)16-32.97.21.
http://www.br.fgov.be/BIODIV/index.html

9. Methodology and sampling methods in biodiversity assessments.
Organization National Belgium Research Centre on Nature, Forests and Wood (CRNFB)
Contact person: Dufrene, Marc.
Contact address: tel.: +32-(0)81-62.64.29; fax: +32-(0)81-61.57.27; email: M.Dufrene@mrw.wallonie.be
http://www.br.fgov.be/BIODIV/index.html

Germany

In Germany, most of the national projects are concerned with biodiversity conservation issues (Figure 3.11), which was different compared to other countries. According to collected information, German organizations participated in 22 international biodiversity projects, which was more than other countries.

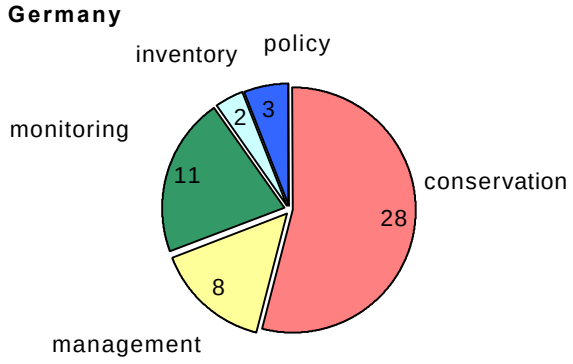

Figure 3.11. Distribution of German projects by biodiversity issues (total number of the national projects is 39).

1. Conception and construction of growth and prognosis models for mixed and pure species stands.
Organization: Ludwig-Maximilians-University Munich. Faculty of Forest Science. Chair of Forest Growth and Forest Yield Science.
Contact person: Pretzsch, Hans.
Contact address: tel.: +49-8161-714 711.
http://ifff.boku.ac.at/efern/

2. Biodiversity mapping for protection and sustainable use of natural resources (BIOMAPS).
Organization: Botanisches Institut und Botanischer Garten. Rheinische Friedrich-Wilhelms-Universität Bonn. Abteilung Systematik und Biodiversität.
Contact person: Barthlott, Wilhelm.
http://www.botanik.uni-bonn.de/system/biomaps.htm

3. Development of biodiversity indicators.
Organization: National Germany Federal Agency for Nature Conservation
Contact person: Droschmeister.
http://www.ceh.ac.uk/subsites/connect/

4. Development of forest fringes of high conservation value.
Organization: Federal Agency for Nature Conservation (Bundesamt fur Naturschutz; BfN).
Contact person: Schwickert.
http://www.ceh.ac.uk/subsites/connect/

5. Processes determining biodiversity in both managed and unmanaged forest stands analysed in the Bavarian Forest, Germany.
Organization: Technical University Munich. Faculty of Forest Sciences. Chair of Soil and Site Science. Division of Soil Science.
Contact person: Fischer, Anton.
Contact address: http://www.forst.tu-muenchen.de/EXT/LST/GEOBO/index.html

6. Investigations of the importance of managed forests for nature conservation: comparison of nature forest reserves and managed forests.
Organization: Technical University Munich. Faculty of Forest Science. Chair of Landuse Planning and Nature Conservation.
Contact person: Rediger, Detsch.
Contact address: http://ifff.boku.ac.at/efern/
7. Ancient woodlands in northern Brandenburg (East-Germany).
Organization: Center for Agricultural Landscape and Land Use Research (ZALF). Institute of Land Use Systems and Landscape Ecology.
Contact person:Wulf, Monika.
Contact address: tel.: +49-33432-823 10.
http://ifff.boku.ac.at/efern/

8. The role of game in semi-natural woods.
Organization: Federal Agency for Nature Conservation (Bundesamt fur Naturschutz; BfN).
Contact person: Wolf.
http://www.ceh.ac.uk/subsites/connect/

Sweden

Most of the national projects in Sweden dealt with monitoring, there were some that dealt with management and conservation, but there were none that dealt with inventory, policy and integrating (Figure 3.12). Note, that Sweden is active in international biodiversity investigations – it participated in 17 international projects (including 3 integrating and 5 policy projects).

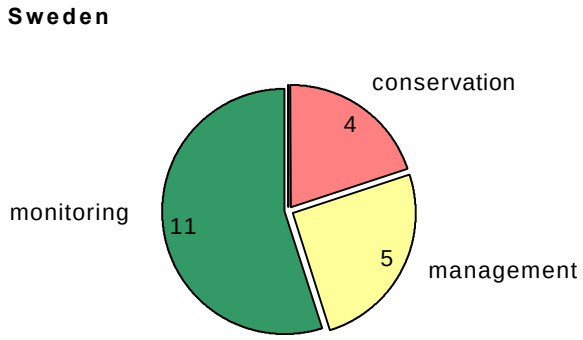

Figure 3.12. Distribution of Swedish projects by biodiversity issues (total number of the national projects is 20).

1. Fire in boreal forests: the charcoal effect on plant growth and ecosystem function.
Organization: Department of Forest Vegetation Ecology.
Contact person: Zackrisson, Olle.
http://www.svek.slu.se/defaulte.htm

2. Long-term effects by forestry on biodiversity and ecosystem function in the boreal forest problem complex related to an increase of Empetrum hermaphroditum.
Organization: Department of Forest Vegetation Ecology.
Contact person: Nilsson, Marie-Charlotte.
http://www.svek.slu.se/defaulte.htm

3. Predation on conifer seeds and juvenile seedlings. Predator behaviour and opportunities for control through habitat modifications.
Organization: Department of Forest Vegetation Ecology.
Contact person: Anders Granström.
http://www.svek.slu.se/defaulte.htm

4. Protection of western taiga in Sweden.
Organization: Swedish Environmental Protection Agency (SEPA).
Contact person: Lonnstad, Jenny.
Contact address: fax: +46-8-6981662, email: jel@environ.se
http://dbs.cordis.lu/
5. Protection of western taiga in northern Norrland.
Organization: Swedish Environmental Protection Agency (SEPA).
Contact person: Lonnstad, Jenny.
Contact address: fax: +46-8-6981662, email: jel@environ.se
http://dbs.cordis.lu/

6. Protection of forests and mires in Sweden.
Organization: Naturvardsverket
Contact person: Lonnstad, Jenny.
Contact address: jenny.lonnstad@environ.se
http://dbs.cordis.lu/

7. Sustainable forestry in southern Sweden (SUFOR).
Contact person: Nihlgård, Bengt.
Contact address: tel.: +46 46 222 93 05, fax: +46 46 222 44 23.
http://www.planteco.lu.se/sufor
http://www.mistra-research.se/

8. The use of fire in forest management for a high biodiversity.
Organization: Department of Forest Vegetation Ecology.
Contact person: Schimmel, Johnny.
http://www.svek.slu.se/defaulte.htm

Austria

All issues of biodiversity investigations are represented almost equally in Austrian national projects (Figure 3.13).

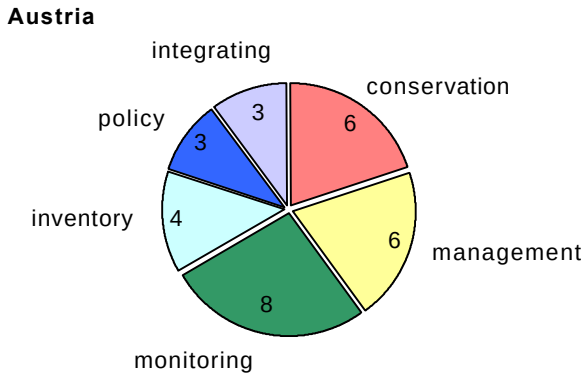

Figure 3.13. Distribution of Austrian projects by biodiversity issues (total number of the national projects is 21).

1. Effects of direct and indirect influences on forest ecosystems in Austria – an ecosystem based approach concerning the convention of biological diversity.
Organization: University of Agricultural Sciences Vienna (BOKU). Institute of Silviculture.
Contact person: Vacik, Harald.

2. Evaluation of existing and new policy means for ensuring sustainable management, conservation and sustainable development of forests.
Organization: Institut für Sozioökonomik der Forst- und Holzwirtschaft, Universität für Bodenkultur Wien.
Contact person: Glück, Peter.
Contact address: Gregor-Mendel-Str. 33, A-1180. Wien.

3. Elaboration and practical service of silvicultural methods for selected ‘Weiserbestände’ in the protection forests of the forest management unit Wildalpen.
Organization: University of Agricultural Sciences Vienna (BOKU). Institute of Silviculture.
Contact person: Vacik, Harald.

4. Forest ecosystems in Austria: forest management, problems and prospects – a hypermedia system for information and teaching.
Organization: University of Agricultural Sciences Vienna (BOKU). Institute of Silviculture.
Contact person: Vacik, Harald.

5. Forest reserves.
Organization: Austrian Federal Forest Research Centre (FBVA).
Contact person: Frank, Georg.
Contact address: tel.: +43-1-979 67 19 or +43-1-878 38-2207.
http://ifff.boku.ac.at/efern/

6. Protection forest “Bleiberger Erzberg”. Development of specific silvicultural techniques for the management of the protection forest.
Organization: University of Agricultural Sciences Vienna (BOKU). Institute of Silviculture.
Contact person: Hochbichler, Eduard.

7. Silviculture and biodiversity in Scots pine forests in Europe.
Organization: University of Agricultural Sciences Vienna (BOKU). Faculty of Forest- and Wood Sciences. Institute of Silviculture.
Contact person: Lexer Manfred.
Contact address: tel.: +43-1-47654 4050.

Netherlands

Many projects in the Netherlands are concerned with monitoring and conservation of biodiversity (Figure 3.14). Inventory, policy and integrating projects are absent between Dutch national projects, but they are present between international ones. The Netherlands participated in 15 international projects, and of these 4 were concerned with integrating, and 5 with investigating biodiversity issues connected with forest policy.

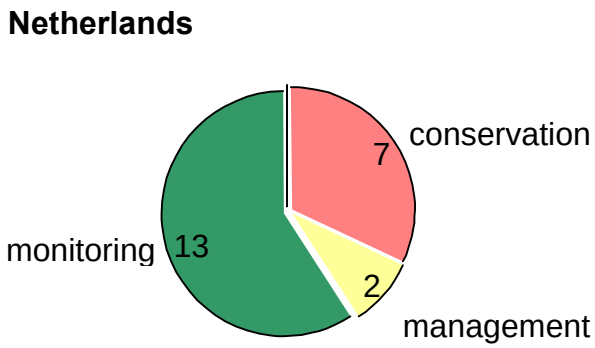

Figure 3.14. Distribution of Dutch projects by biodiversity issues (total number of the national projects is 20).

1. Belowground biodiversity in forests and derived (disturbed) ecosystems: stability of food webs and ecosystem functioning.
Contact person: de Ruiter, P.C.
http://www.nwo.nl/english/nwo/

2. Climate change and forest ecosystem dynamics: carbon and water relations, competitions, and consequences for forest development and forest use.
Organization: Alterra.
Contact person: van der Meer, P.J.
Contact address: P.J.vanderMeer@alterra.wag-ur.nl

3. The woodpecker guild as a tool for guiding biodiversity-supporting forest management.
Contact person: Menken, S.B.J.
http://www.nwo.nl/english/nwo/

4. Ungulates in temperate forest ecosystems.
Organization: Institute for Forestry and Nature Research (IBN-DLO).
Contact address: a.t.kuitersbn.dlo.nl.
http://www.ceh.ac.uk/subsites/connect/

Poland

Most of the national projects in Poland are in biodiversity monitoring (Figure 3.15). There were no projects in integrating.

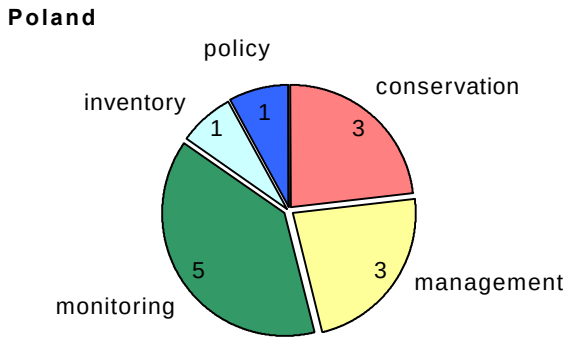

Figure 3.15. Distribution of Poland projects by biodiversity issues (total number of the national projects is 10).

1. The influence of forest health conditions on the biodiversity taking into consideration the results of air pollution in the Karpathy Mountains.
Organization: Forest Research Institute. Forestry Management in the Highlands.
Contact person: Grodzki, Wojciech.
Contact address: tel.: +48-12-266 39 64.
http://ifff.boku.ac.at/efern/

2. Natural diversity of species composition and stand structure in Poland according to environmental changes.
Organization: Forest Research Institute. Silviculture Department.
Contact person: Kopryk, Witold.
Contact address: tel.:+48-22-822 49 43.

3. Species composition, structure and dynamics of entomocenosis of natural ecosystems of the Bialowieza Primeval Forests.
Organization: Forest Research Institute. Natural Forest Department.
Contact person: Gutowski, Jerzy.
Contact address: tel.: +48-835-12 396 or +48-835-12 549.

4. National spatial study of forest functions and biological protection of forest ecosystems.
Organization: Forest Research Institute. Geographic Information Systems and Research Department.
Contact person: Hildebrand, Robert.
Contact address: tel.: +48-22-846 46 60.
http://ifff.boku.ac.at/efern/

United Kingdom

All types of projects are well presented in the UK (Figure 3.16). The UK is a leader between European countries in a number of national projects investigating policy and integrating biodiversity issues.

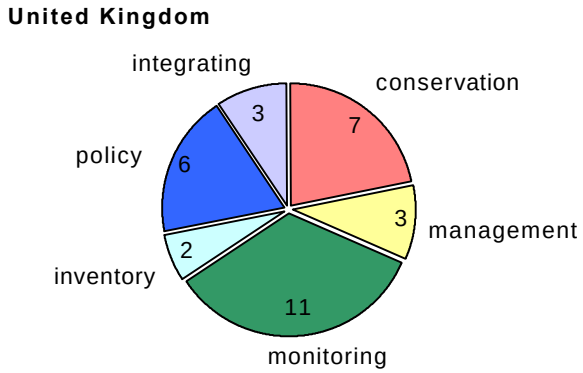

Figure 3.16. Distribution of UK projects by biodiversity issues (total number of national projects is 23).

1. Native black poplars.
Organization: Environment Agency Research & Development, UK.
Contact person: Brown, Henry.
Contact address: email: Henry.Brown@Environment-Agency.gov.uk
http://www.environment-agency.gov.uk/envinfo/

2. Native Scots Pine: Establishing a scientific basis for its conservation.
Organization: Scottish Crop Research Institute. Cell & Molecular Genetics.
Contact address: tel.: +44-1382-562731.

3. The National Forest: a Contribution to Global Environmental Sustainability.
Organization: Department of Geography, Loughborough University.
Contact person: Beaverstock, Jonathan.
Contact address: tel: 01509-222794, fax: 01509-223930, email: Geography@lboro.ac.uk
http://www.sussex.ac.uk/Units/gec/

Bulgaria

1. Biological diversity in the forests of Bulgaria (abiotic and biotic factors).
Organization: Bulgarian Academy of Sciences. Forest Research Institute. Department of Forest Ecology.
Contact person: Alexandrov, Alexander.
Contact address: tel.: +359-2-622 961.
http://ifff.boku.ac.at/efern/

2. Biological diversity, genetic and physiological investigations on the forest tree species.
Organization: Bulgarian Academy of Sciences. Forest Research Institute. Department of Forest Ecology.
Contact address: tel.: +359-2-622 961.
http://ifff.boku.ac.at/efern/

3. Species composition, biology and ecology of the egg parasitoids of the pine processionary moth.
Organization: Bulgarian Academy of Sciences. Forest Research Institute. Department of Forest Ecology.
Contact person: Mirchev, Plamen.
Contact address: tel.: +359-2-622 961.

Denmark

1. Biodiversity and structure of the macro-invertebrate community in forest streams – a comparison between streams running through nature and production forestry.
Organization: Ministry of Environment, National Environmental Research Institute (NERI).
Contact person: Friberg, Nikolai.
http://www.ceh.ac.uk/subsites/connect/

2. Conservation management of oak shrubs.
Organization: National Environmental Research Institute (Danmarks Miljøundersøgelser). Department of Terrestrial Ecology.
Contact person: Knud, Tybirk.
http://www.dmu.dk/1_english/1_om_dmu/2_afdelinger/3_teri/

3. Forest management and biodiversity.
Organization: Ministry of Environment, National Environmental Research Institute (NERI).
Contact person: Flemming, Skov.
http://www.ceh.ac.uk/subsites/connect/

Latvia

1. Floristic and phytocenologic valuable pine (*Pinus sylvestris*) forests in Latvia.
Organization: Latvian Forestry Research Institute (LFRI).
Contact person: Bambe, Baibe.
Contact address: http://www.silava.lv/projects/pr_bambe.html
http://ifff.boku.ac.at/efern/

2. The biodiversity of natural forests in Latvia and its optimization.
Organization: Latvian Forestry Research Institute.
Contact person: Baumanis, Imants.
Contact address: Rigas iela 111,2169, Salaspils, Latvia.
http://dbs.cordis.lu/

3. Theoretical models of multifunctional forestry in Latvia.
Organization: Latvian Forestry Research Institute (LFRI).
Contact person: Zalitis, Peteris.
Contact address: http://www.silava.lv/projects/pr_zal1.html.

Lithuania

1. Morphological and plant species diversity transformations of the forest ecosystems in context of the forest state monitoring.
Organization: Lithuanian Forest Research Institute. Department of Forest Ecology and Silviculture.
Contact person: Ozolincius, Remigijus.
Contact address: tel.: +370-7-799 921.

2. Investigations on the syntaxonomic diversity of forest and bog vegetation in Lithuania and substantiation on protection on its components.
Organization: Lithuanian State Research Institutes. Institute of Botany. Laboratory of Flora and Geobotany.
Contact person: Rasomavicius, Valerijus.
Contact address: tel.: +370-2-697 462.

3. Ecological and economic fundamentals of the species composition and structure formation of productive and sustainable stands in the wood sites.
Organization: Lithuanian Forest Research Institute. Department of Forest Ecology and Silviculture
Contact person: Miksys, Virgilijus.
Contact address: tel.: +370-7-799 921.
http://ifff.boku.ac.at/efern/

Estonia

1. Analysis of forest ecosystem as a basis for planning sustainable and biodiversity supporting forest management.
Organization: Estonian Agricultural University. Faculty of Forestry. Forest Research Institute.
Contact person: Tamm, Ülo
Contact address: tel.: +372-7-422 346.
http://ifff.boku.ac.at/efern/

2. Bark- and wood-boring insects in forest ecosystems: maintenance of species diversity in managed forests.
Organization: Estonian Agricultural University, Faculty of Forestry, Forest Research Institute.
Contact person: Voolma, Kaljo.
Contact address: tel.: +372-7-422 346.
http://ifff.boku.ac.at/efern/

Norway

1. Effects of habitat fragmentation on biodiversity in boreal spruce forests.
Organization: Norwegian Foundation for Nature and Cultural Heritage Research (NINA-NIKU). Norwegian Institute for Nature Research (NINA).
Contact person: Toemmeraas, Bjoern Aage.
Contact address: http://www.ninaniku.no
http://ifff.boku.ac.at/efern/

2. Population ecology and behaviour of goshawks accipiter gentilis in relation to forestry practices and habitat change.
Organization: Norwegian Institute for Nature Research. Department of Terrestrial Ecology.
Contact person: Halley, Duncan John.
Contact address: tel.: +47-73580500.
http://dbs.cordis.lu/

Slovakia

1. Introduction, preservation and reproduction of endangered dendrotaxa of autochtonous flora of Slovakia in Arboretum Mlynany.
Organization: Slovak Academy of Sciences. Institute of Dendrobiology. Arboretum Mlynany.
Contact person: Tomasko, Ivan.
Contact address: tel.: +421-814-94571 or +421-814-94211.
http://ifff.boku.ac.at/efern/

2. Quantitative analysis of anthropogenic impacts in the Mala Fatra National Park on the basis of bioindicative species, populations and communities.
Organization: Slovak Academy of Sciences. Department of Biomathematics.
Contact person: Valka, Jozef.
Contact address: tel.: +421-855-20914.

Switzerland

Most of the projects in Switzerland were concerned with monitoring (Figure 3.17). There were no project in management and inventory.

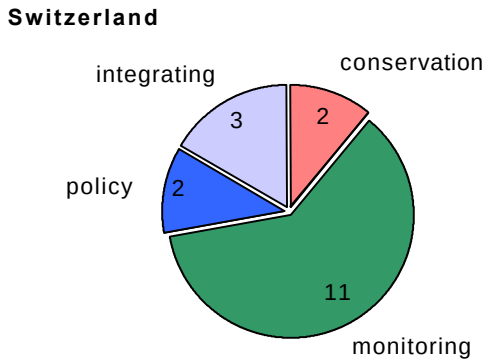

Figure 3.17. Distribution of Swiss projects by biodiversity issues (total number of national projects is 16).

1. Forest vegetation in Switzerland.
Organization: Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).
Contact person: Kull, Peter.
Contact address: http://www.wsl.ch/forest/risks/
http://ifff.boku.ac.at/efern/

2. The contribution of forest ecotone structures to regional biodiversity.
Organization: Eidg.Forschungsanstalt für Wald, Schnee und Landschaft.
Contact person: Duelli, Peter.
Contact address: tel.: 01 739 23 76.
http://www.snf.ch/Projektframeset_e.html

Albania

Ecological survey of selected high forests of Albania.
Organization: Ministry of Agriculture and Food. Forest and Pasture Research Institute (FPRI).
Contact person: Maxhun, Dida.
Contact address: tel.: +35-542-71237.
http://ifff.boku.ac.at/efern/

Croatia

Tree breeding and seed husbandry improvement for reconstruction of forests.
Organization: Forest Research Institute.
Contact person: Gracan, Joso.
Contact address: http://www.mzt.hr/mzt/hrv/znanost/projekti/4/00240101.htm
http://ifff.boku.ac.at/efern/

Czech Republic

Present condition and developmental trends of floodplain forest ecosystems in the region of southern Moravia (Czech Republic).
Organization: Mendel University of Agriculture and Forestry, Brno. Faculty of Forestry and Wood Technology. Institute of Forest Ecology.
Contact person: Klimo, Emil.
Contact address: tel.: +420-5-4513 4180.
http://ifff.boku.ac.at/efern/

Hungary
Forest ecosystems, biodiversity of Hungarian forests.
Organization: University of Sopron.
Contact person: Simonyi, Ágnes.
Contact address: simonyi@mail.kozut.hu.
http://www.iene.org/

Ireland
Forest location and enhancement strategies for biodiversity: birds and fish.
Organization: University College Cork. Faculty of Science. Department of Zoology and Animal Ecology.
Contact person: O'Halloran, John.
Contact address: tel.: +353-21-904 051.
http://ifff.boku.ac.at/efern/

Italy
Conservation of priority habitats with *Abies alba* in Natura 2000 Sites in central and southern Italy.
Organization: WWF Italia.
Contact person: Bardi, Alessandro.
Contact address: fax: +39-6-8554410, email: mc2237@mclink.it
http://dbs.cordis.lu/

Portugal
Pine ecosystems: biodiversity conservation and resource management.
Organization: New University of Lisbon. Faculty of Sciences and Technology.
Contact person: Paiva, Rosa.
Contact address: tel.: +351-12954464.
http://ifff.boku.ac.at/efern/

Slovenia
Taxonomic, cytologic and isoenzymatic investigations of oak species (*Quercus* L.) and occurrence of taxa in natural stands of Slovenia.
Organization: University of Ljubljana. Biotechnical Faculty. Department of Agronomy.
Contact person: Batic, Franc.
Contact address: tel.: +386-61-123 1161.

3.2 ANALYSIS OF THE RECENT NATIONAL RUSSIAN PROJECTS ON FOREST BIODIVERSITY INVESTIGATIONS

In the European part of the Russian Federation, biodiversity investigations have been implemented within the following main programmes: the Federal Objective Programme "Biodiversity"; the programme "Conservation of biological diversity in Russia" (on a base of the Global Ecological Foundation, GEF); the Federal Objective Programme "Integration"; and the Russian Foundation of Basic Research (RFBR). Some forest biodiversity investigations in European Russia are also run by: the World Conservation Union (IUCN); WWF; the Forest Campaigns of the Socio-Ecological Union (SEU) and Greenpeace Russia; the programmes of the Institute of Sustainable Communities (ISC); and others.

The programme "Biodiversity" is a special programme financed by the Russian Government since 1994. The aim of the programme is to assess biodiversity in Russia at all levels of life and to develop scientific background, methods and technology for conservation, restoration,

and rational use of biodiversity. According to the report (Pavlov et al. 1999), numerous results have been received within the programme. However, information about concrete projects in the frame of the programme is not published, and we could get data only on a few recent projects within this programme due to a direct acquisition.

The programme "Conservation of biodiversity in Russia" based on the GEF has been ongoing since 1997. The last year of the programme is 2001. The programme includes three components (Amirkhanov 1997): (1) development of National Strategy of biodiversity conservation; (2) development of protected areas; and (3) regional Baikal component. Biodiversity investigation projects carried out in nature reserves and national parks are brought under the second component (Shvartc and Alejnikova 1998). Information about projects within the programme is presented in Russian on the Internet (http://www.ecoprojects.ru).

The Federal Objective Programme "Integration" aims to improve basic and engineering research by linkages to the higher education system and Academic science. Biodiversity investigations are supported partly by this programme. Information about supported projects has being presented annually in the Russian newspaper "Poisk".

The Russian Foundation of Basic Research (RFBR) is financed from the National Budget. The foundation supports, as a rule, small projects investigating local questions of basic research. Taxonomic and syntaxonomic investigations, population research, development of methods of biodiversity assessment, methods of conservation and restoration are the typical topics of supported projects related to biodiversity issues. Annual lists of projects supported by the foundation are available in Russian on the Internet (http://www.rfbr.ru).

There are also other projects on forest biodiversity partly supported by organizations and foundations in European Russia. For example, the IUCN supports projects related to forest policy (Neronov and Moshkalo 1999). The WWF supports projects on protected areas, rare and endangered species, sustainable development (WWF Russian division projects 2000). The ISC leads a programme for Replication of Lessons Learned (ROLL) including the projects on nature conservation and ecosystem land-use. Some projects are financed by governments of European countries (for example, Ministry of agriculture, environment and fisheries of the Netherlands, Environment Ministry of Finland, etc.). Information about Russian projects within these foundations is available on the Internet (http://www.ecoprojects.ru). The Forest Campaigns of the SEU and Greenpeace Russia also lead projects on forest biodiversity. In addition, many regional biodiversity projects are ongoing under financing by regional and local administration. However, lists of these projects are not widely published, so these projects are not analysed in this review.

Thus, forest biodiversity investigations in the European Russia are financed from government (Russian and non-Russian), non-government and mixed sources. Distribution of the projects by financing foundation is presented in Figure 3.18. Note that only those projects for which information has been collected for the database have been analysed.

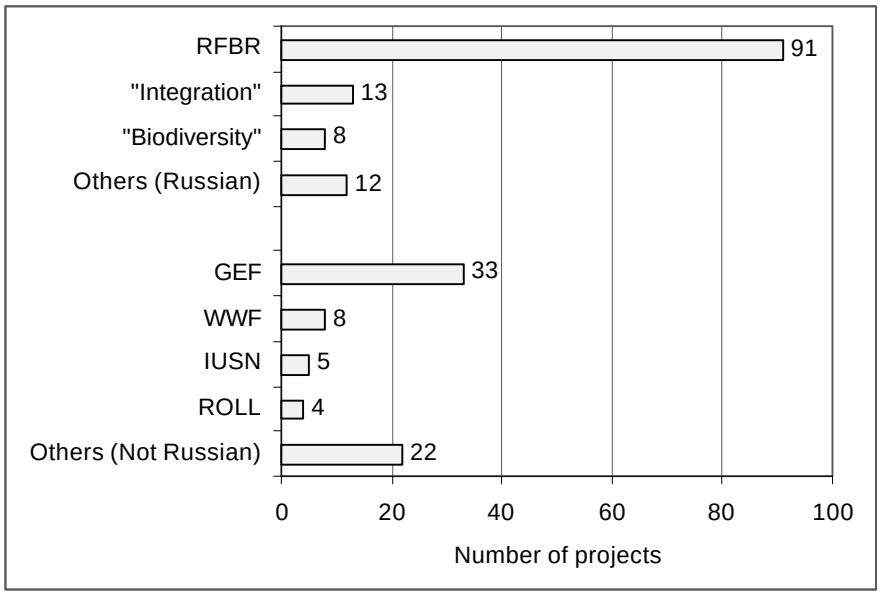

Figure 3.18. Distribution of Russian projects by financing foundation.

Distribution of projects carried out in the European Russia (grouped by biodiversity issue) is presented in Figure 3.19. The majority of the projects are concerned with biodiversity conservation, inventory and monitoring issues. Fewer projects are concerned with policy and management, and only a small number of projects are concerned with integrating questions. The result corresponds to financing foundation specific: conservation, monitoring and inventory issues are well supported by GEF and RFBR.

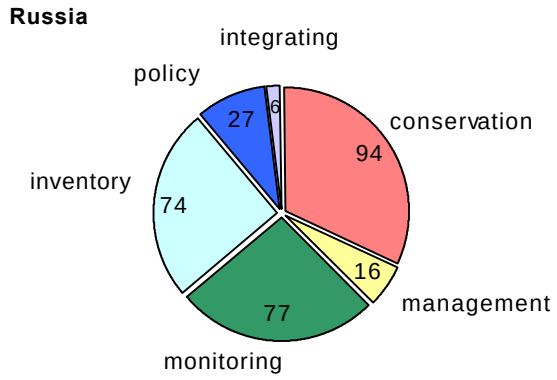

Figure 3.19. Distribution of national Russian projects by biodiversity issue.

A distribution of projects by fields of investigation (Figure 3.20) shows that the majority of Russian projects are devoted to conservation questions. There is also a large proportion of the projects that are concerned with monitoring. A similar situation was identified in the distribution of European projects (Figure 3.2). The main difference between the distribution of Russian and European projects is a large number of inventory projects in Russia. Very few projects investigated questions of management for biodiversity and biodiversity assessment (in descending order) in Russian as well in European projects, but their share in total number of projects is much smaller in Russia. There are many projects on database development in Russia, while in Europe, development of models holds the same position. As a whole, the distribution of European projects by fields of investigations is more even than the distribution of Russian projects.

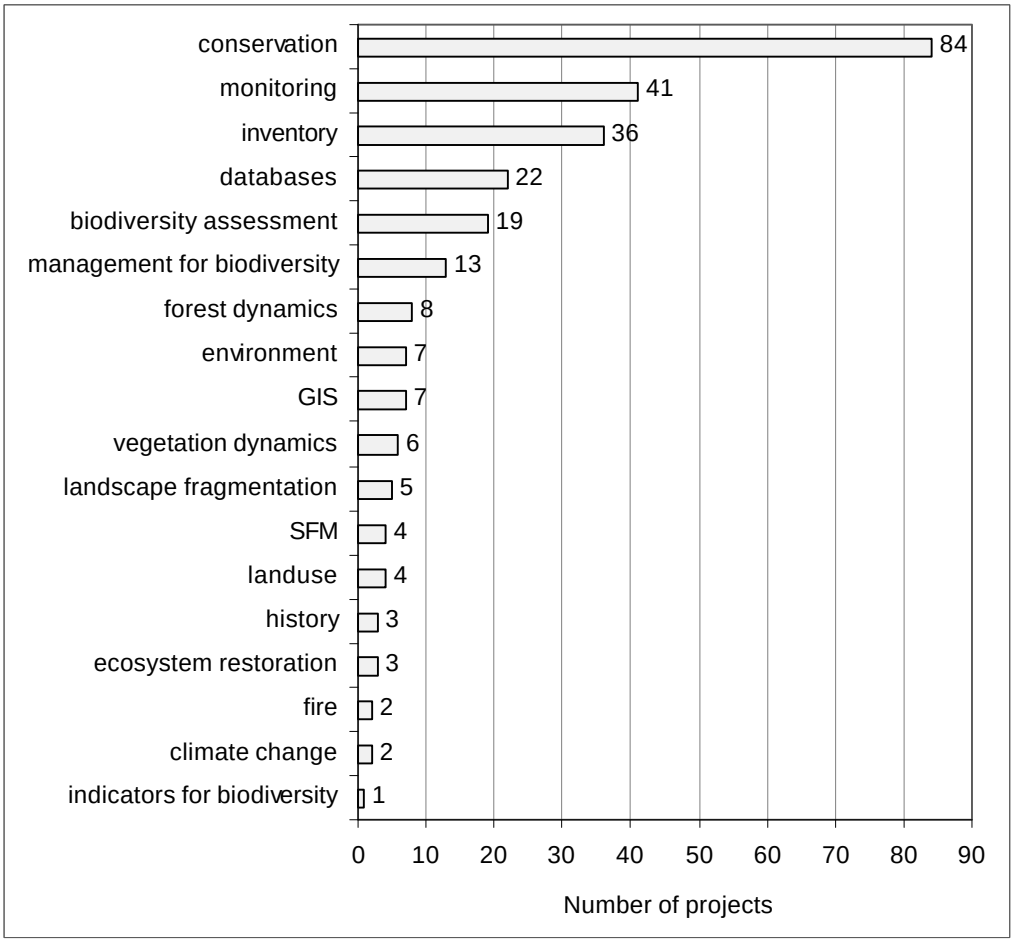

Figure 3.20. Distribution of Russian projects by fields of investigations.

Distribution of projects by discipline for Russia (Figure 3.21) and Europe (Figure 3.3) are similar when distribution by fields of investigations is compared (Figures 3.2 and 3.20, respectively). The main differences based on available data are the large number of taxonomic projects in Russia and of forestry projects in Europe. Conservation biology (by number of projects and by ordinal position) and forest policy (only by ordinal position) hold a similar place among Russian and European projects. Note, the small number of taxonomic projects in Europe results from the fact that usually European projects study taxonomic diversity outside Europe, in particular in Africa and Asia.

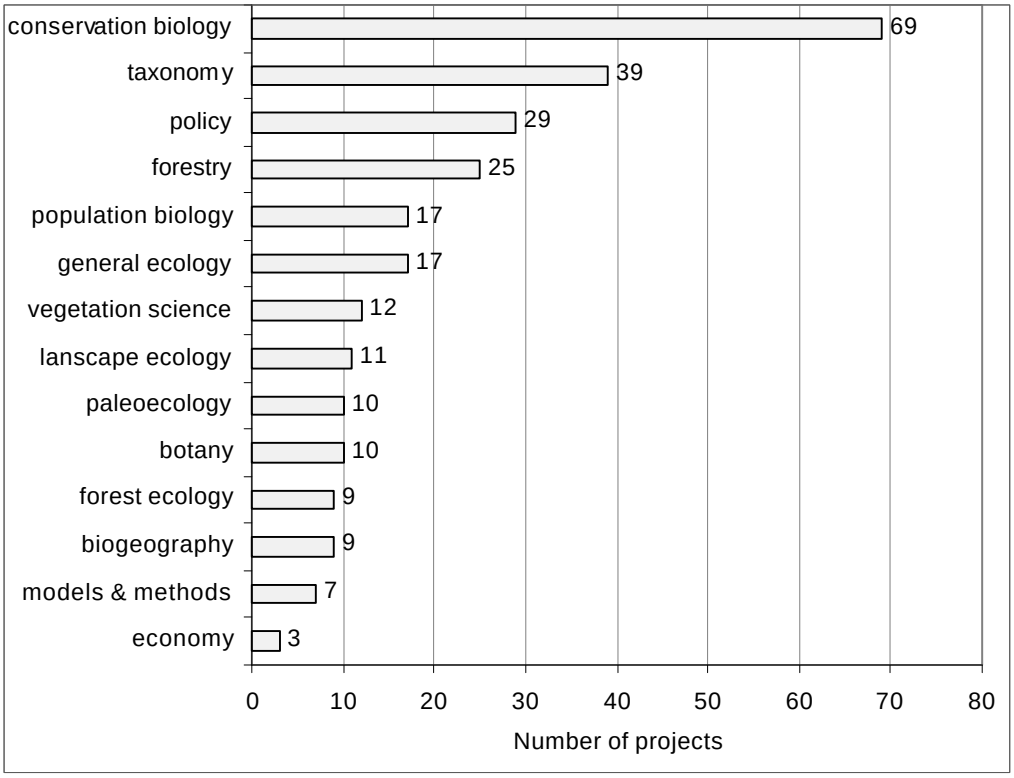

Figure 3.21. Distribution of Russian projects by discipline.

A distribution of Russian projects by spatial coverage is presented in Figure 3.22. Regional projects compose a majority among Russian projects (74%). Projects investigating biodiversity for the European part of Russia were considered as "regional". National projects studying biodiversity at the level of the whole country take a second place (18%). There were a small number of projects studies biodiversity at the level of several countries (4%), at the pan-European (3%) and the global (1%) levels. In comparison with Europe, the share of national projects in Russia is much smaller, but the share of regional projects is larger. We think that this inference is right not only for projects of European part of the country, but for all Russian biodiversity projects. It is defined by the very large area of Russia.

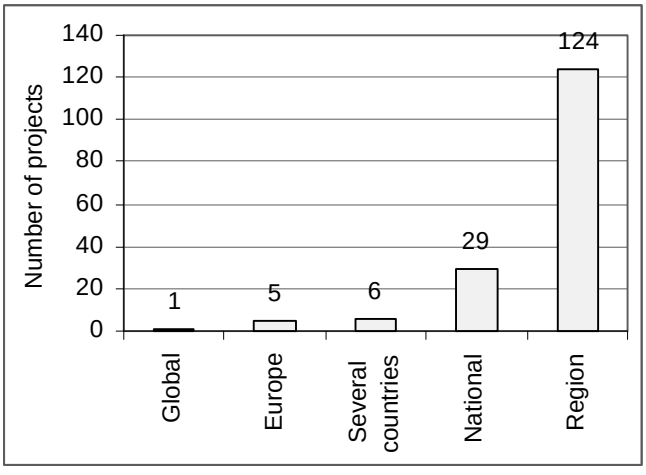

Figure 3.22. Distribution of Russian projects by spatial coverage.

In order to present a more detailed picture of Russian biodiversity investigations, Chapter 3.2.1 gives a list of 85 selected Russian projects. As a rule, resumes of the projects are absent in the sources of information, and titles of the projects are often couched “in general” terms. So, for more full-scale acquaintance of non-Russian reader with Russian biodiversity investigations, we have selected the projects using softer criteria in comparison with the European projects. The list presented here includes all projects from the database where the values “forest”, “biodiversity”, “vegetation” or “population” were met in the database fields “Discipline” or “Field of investigation”.

The projects in the list are grouped by disciplines. Unfortunately, contact addresses are often absent in the sources of information, and therefore they are also absent in the list. You can find them in the Web through the name of the organization. We have translated titles of the projects from Russian, and those may not always match with translations provided by the authors.

3.2.1 List of national Russian projects

Biogeography

1. Plant species of East-European boreal forests: ecology and geography.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Nosova, L.M.
Source of support: Pr. “Biodiversity”.

2. Spatial distribution of floristic diversity: role of allochthonous and autochthonous agents.
Organization: Institute of Geography RAS.
Contact person: Kozharinov, A.V.
Source of support: RFBR No. 00-04-48347.

3. Theoretic and experimental investigations of plant species areas for understanding constitution of boreal forests in the European part of Russia.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Nosova, L.M.
Source of support: RFBR No. 98-04-48329.

Conservation biology

1. Assessment and conservation of unique and reference plant communities and populations of rare plants in frame of phytomonitoring.
Organization: Institute of Ecology of Plants and Animals, Ural Dep. of the RAS.
Contact person: Gorchakovskii, P.L.
Source of support: RFBR No. 99-04-49025.

2. Assessment of ecosystem, structural and taxonomic diversity in State Nature Reserve “Voroninskii” (Tambov region). Offering activities for maintenance and restoration of biotic diversity.
Organization: Voroninskii Reserve.
Source of support: GEF No. B.2.5.11.

3. Atlas of biological diversity of forests in the European part of Russia.
Organization: IUCN.
Contact person: Moshkalo, V.V.
Source of support: Ministry of agriculture, environment and fisheries of the Netherlands.

4. Biodiversity of terrestiral and water ecosystems in Eastern Fennoscandia (within the biosphere reserve “North Karelia”, Finland, and adjoining regions of Karelia Republic, Russia).
Organization: Istitute of Biology, Karelia Scientific Center, RAS.
Contact person: Yeshko, E.P.

5. Biodiversity of the Sochi National Park.
Organization: Sochinskii National Park.
Source of support: GEF No. B.2.5.30.

6. Consistent patterns of forming and spatial-temporal structure of ecotones in forest-steppe zone of the Middle Volga area on the example of the reserve “Privolzhskaya Lesostep”.
Organization: Reserve “Privolzhskaya Lesostep”, Penza.
Contact person: Dobroljubova, T.V.
Source of support: RFBR No. 98-04-49426.

7. Ecological corridors in forests of the European part of Russia.
Organization: IUCN.
Source of support: Ministry of agriculture, environment and fisheries of the Netherlands.

8. Ecosystem biodiversity of Eastern Fennoscandia in frame of the biosphere reserve “North Karelia”.
Organization: Institute of Forest, Karelia Scientific Center, RAS.
Contact person: Kravchenko, A.V.

9. Geologic basis of biodiversity in Karelia Republic.
Organization: Institute of Geology, Karelia Scientific Center, RAS.
Contact person: Systra, Ju.I.

10. Historical, landscape and coenotic factors of biodiversity forming of taiga ecosystems in Eastern Fennoscandia. Problems of protection of general and species diversity.
Organization: Institute of Forest, Karelia Scientific Center, RAS.
Contact person: Kravchenko, A.V.

11. Initial step to develop GIS for biodiversity monitoring in Valday State National Park.
Organization: Valdaj National Park.
Source of support: GEF No. B.2.5.26.

12. Inventory of nature, justification of border and preparation of scientific background for organization of national parks “Kalevalskii”, “Kojtajoki”, “Tulos”.
Organization: Institute “RosGiproLes”, Karelia Scientific Center, RAS.
Contact person: Krutov, V.I.
Source of support: Environment Ministry of Finland No. F0005002.

13. Investigation of biodiversity of “Green belt” at border with Finland areas, which are planed for national parks “Kalevalskii”, “Tulos”, “Kojtajoki”.
Organization: Institute of Forest, Karelia Scientific Center, RAS.
Contact person: Krutov, V.I.
Source of support: Environment Ministry of Finland No. F0005001.

14. Investigation of biological diversity and assessment of the main biotic elements of the national park “Samarskaya Luka” ecosystems.
Organization: National Park “Samarskaya Luka”.
Source of support: GEF No. B.2.5.28.

15. Investigation of mechanism of sustainable maintenance of protected forest stand under conditions of spontaneous dynamics and reasoning of strategy of its conservation.
Organization: Central Forest Reserve.
Source of support: GEF No. B.2.5.25.

16. Monitoring and conservation of biodiversity. Sustainable use of biodiversity components.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Isaev, A.S.
Source of support: Pr. “Biodiversity” No. 504-1/2/3(00)- Ï.

17. Multipurpose expedition for investigation of biodiversity of the European part of Russia (flora and vegetation).
Organization: St Petersburg State University.
Source of support: Pr. “Integration” No. K0237.

18. Prognosis of forest vegetation dynamics in the Prioksko-Terrasnyj Reserve (Moscow region) by GIS.
Organization: Prioksko-Terrasnuj Reserve.
Source of support: GEF No. B.2.5.51.

19. Theoretical basis for conservation and restoration of biological diversity of forest ecosystems in the health-resort areas of Kuban (Krasnodar region).
Organization: Institute “GorLesEcol”, Sochi.
Contact person: Pridnya, M.V.
Source of support: RFBR No. 00-04-96061.

Forest ecology

1. Consistent patterns of development of anthropogenic transformed forest ecosystems in the Central Black Earth Region.
Organization: Voronezh State Academy of Forestry
Contact person: Tarankov, B.I.
Source of support: RFBR No. 98-04-03430.

2. Consistent patterns of functional organization of a soil-plant system in natural ecosystems of the southern taiga.
Organization: Moscow State University.
Contact person: Dobrovolskii, G.V.
Source of support: RFBR No. 99-04-48947.

3. Consistent patterns of semi-centennial dynamics of biota in virginal taiga in the Northern pre-Ural Mountain.
Organization: Pechoro-Ilychskii Reserve.
Source of support: GEF No. B.2.5.19.

4. Development of a forest-pathological monitoring, including tracing of dendrophylous insect populations and of fungus-dendrotrophous in natural and human-disturbed forest ecosystems in Karelia Republic.
Organization: Moscow State University of Forest.
Source of support: Pr. “Integration” No. 318.

5. Ecosystems structure of Nerusso-Desnyanskoe Polesye (Bryansk region) and conditions of biodiversity sustainability.
Organization: Reserve “Bryanskii Les”.
Source of support: GEF No. B.2.5.9.

6. Experimental evaluation of renewal processes in spruce forests of the southern taiga.
Organization: Institute of Botany, RAS.
Contact person: Bogoljubov, A.G.
Source of support: RFBR No. 98-04-49900.

7. Investigation and assessment of sustainability of forests in the North-West of Russia under the current conditions: biodiversity, productivity, status.
Organization: St Petersburg Academy of Forestry.
Source of support: Pr. “Integration” No. C0183.

8. Investigation of trends of current soil formation in forest-steppe ecosystems for aims of ecological forecast and rational landuse on an example of the reserve area “Les na Vorskle”.
Organization: St Petersburg University.
Contact person: Aparin, B.F.
Source of support: RFBR No. 98-04-03391.

9. Mechanism of interaction of forest stands and black-earth areas in forest-steppe zone.
Organization: Voronezh State Academy of Forestry.
Contact person: Shatalov, V.G.
Source of support: RFBR No. 98-04-03410.

10. Mechanisms of forest succession in the center of the Russian plain: synchronism of dynamics of different forest layers and analysis of productivity of edificator tree species.
Organization: Institute of Forest, RAS.
Contact person: Maslov, A.A.
Source of support: RFBR No. 98-04-48675.

11. Natural and anthropogenic successions in beech forests.
Organization: Institute “GorLesEcol”, Sochi.
Contact person: Zajtcev, K.N.
Source of support: RFBR No. 00-04-96055.

12. Nosogenic micobiota in structure of oak ecosystems.
Organization: Ulyanovskii State University.
Source of support: Pr. “Integration” No. C0024.

13. Process of autonomous forest waterlogging in undisturbed landscapes of the southern taiga within the Russian plain (on an example of the State Biosphere Central Forest Reserve).
Organization: Central Forest Reserve.
Source of support: GEF No. B.2.5.59.

14. Scientific school of Academician A.S.Isaev “Forest ecology and forest ecosystems”.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Isaev, A.S.
Source of support: RFBR No. 96-15-97954.

15. Structural-functional organization and dynamics of forest phytocoenosis during the demutation and ontogeny of tree stands.
Organization: Institute of Forest, RAS.
Contact person: Rubtcov, M.V.
Source of support: RFBR No. 99-04-48238.

Forestry

1. Assessment of influence of forestry into biodiversity and sustainability of some biotic components in buffer zone of a biosphere reserve (on an example of the reserve “Voronezhskii”).
Organization: Voronezhskii Reserve.
Source of support: GEF No. B.2.5.37.

2. Broadleaf and coniferous-broadleaf forests in the North border of their area in European Russia.
Organization: Institute of Botany, RAS.
Contact person: Vasilevich, V.I.
Source of support: RFBR No. 98-04-49925.

3. Conservation and rational use of primary and secondary forests in Central and Eastern Europe.
Organization: IUCN.
Contact person: Sokolov, P.
Source of support: IUCN.

4. Development of forest fire management strategy in the reserve “Kerzhenskii”.
Organization: Kerzhenskii Reserve.
Source of support: GEF No. B.2.5.62.

5. Ecological basis for biodiversity conservation in forest plantations.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Nosova, L.M.
Source of support: Pr. “Biodiversity”.

6. Forest conservation and sustainable forestry in Pechora-Ilychskii region.
Organization: Pechoro-Ilychskii Reserve.
Source of support: Government of Switzerland, WWF No. RU0007.01.

7. Influence of forestry on environmental conditions and dynamics of forest ecosystems as well on biological diversity in Karelia Republic.
Organization: Institute of Forest, Karelia Scientific Center, RAS.
Contact person: Sakovetc, V.I.

8. Pskov Model Forest Territory.
Organization: the Administration and Forest Committee of Pskov Region, self-government bodies of Strugo-Krasnenskiy District, Strugo-Krasnenskiy Leshoz, local logging companies, St Petersburg Forestry Research Institute, NorthWest forest Inventory Enterprise.
Contact person: Bourmistrov, S. tel: +7(095)727 09 39; email: sbourmistrov@wwf.ru
Source of support: Swedish International Development cooperating Agency (SIDA), StoraEnso company, WWF Germany.

9. Sustainable management of Northern forests: model forest “Priluzye”, Komi Republic, Russia.
Organization: WWF, Russian progr. of.
Source of support: WWF No. RU0007.05.

Information systems

1. Database on populations of rare plant species and their areas in forests of Central Russia.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Zaugolnova, L.B.
Source of support: Pr. “Biodiversity”.

2. Development of data bank on phytosociological releves for vegetation classification on a base of the TURBOVEG database.
Organization: Institute of Botany, RAS.
Contact person: Krylov, A.P.
Source of support: RFBR No. 98-07-90340.

3. Information system on projects financed by non-government organizations in the fields of ecology, environment protection and biodiversity conservation in Russian Federation.
Organization: Institute of Geology, RAS.
Contact person: Safonov, Ju.G.
Source of support: ROLL No. 083-4.

4. The information-retrieval system ZOONIT on animal biodiversity.
Organization: Institute of Zoology, RAS.
Contact person: Alimov, A.F.
Source of support: RFBR No. 99-07-90315.

Landscape ecology

1. Parameters and reasons of elevated biodiversity of unique karst landscapes in the European North of Russia (on an example of the reserve “Pinezhskii”).
Organization: Pinezhskii Reserve.
Source of support: GEF No. B.2.5.20.

2. Structural-dynamic organization of forest landscapes in Eastern Fennoscandia.
Organization: Institute of Forest, Karelia Scientific Center, RAS.
Contact person: Volkov, A.D.

Methods of biodiversity assessment

1. Harmonizing of methods of measurement and assessment of biodiversity of boreal forests.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Isaev, A.S.
Source of support: Pr. “Biodiversity”.

2. Theory and methods for assessment of conservation and restoration of forest biodiversity in European Russia.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Isaev, A.S.
Source of support: Pr. “Biodiversity”.

Paleoecology

1. Consistent patterns of evolution of vegetation cover and mammalia in the Russian plain during the last 30 thousand years.
Organization: Institute of Geography RAS.
Contact person: Markova, A.K.
Source of support: RFBR No. 00-04-48151.

2. History of climate and of vegetation in Vyatsko-Kamskii pre-Ural Mountain area in the quaternary period.
Organization: Vyatka State Pedagogical University.
Contact person: Pakhomov, M.M.
Source of support: RFBR No. 00-05-64610.

3. Mapping of vegetation of the last glacial-holocene period in the eastern part of Fennoscandia in connection with paleographical situation.
Organization: Istitute of Biology, Karelia Scientific Center, RAS.
Contact person: Elina, G.A.
Source of support: RFBR No. 99-04-48736

4. Modern flora, vegetation and paleography of the Holocene in the European North of Russia.
Organization: Petrazovodsk State University.
Source of support: Pr. “Integration” No. 639.

5. Modification of soil properties and structure of vegetation cover during the Holocene in depends on methods of human landuse.
Organization: Institute of Poroblems of Ecology and Evolution, RAS.
Contact person: Kiseleva, N.K.
Source of support: RFBR No. 00-04-48150.

6. Population basis of reconstruction of pre-historic forest landscapes and development of landuse methods of sustainable maintenance of biodiversity of current forest landscapes in European Russia.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Smirnova, O.V.
Source of support: Pr. “Biodiversity”.

Policy

1. Assessment of biological diversity of the North-Western region of Russia and preparation of packet of foreground projects.
Organization: Baltica Foundation of Nature.
Contact person: Zavarzin, A.A.
Sources of support: IUCN, DEPA, GBR.

2. Biological and landscape diversity in Caucasus: problems and partnership.
Organization: IUCN.
Contact person: Badenkov, Ju.P.
Source of support: Oxford University No. 75777.

3. Conservation of biodiversity of Russia: the packet of investment preposals.
Organization: WWF, Russian prog. of.
Source of support: MacArthur Foundation, WWF (USA) No 9E0040.01.

4. Development of Russian part of the global IUCN programme on temperate and boreal forests.
Organization: IUCN.
Source of support: Ministry of agriculture, environment and fisheries of the Netherlands.

5. Economical stability of Kostomukshski Nature Strict Reserve is the basis of biodiversity protection in District.
Organization: Kostomukshskii Reserve.
Contact person: Pozdnyakov, S.A.
Source of support: ROLL.

6. Forests of Central and Eastern Europe – integration of interests of forest industry and nature conservation.
Organization: IUCN.
Contact person: Moshkalo, V.V.
Source of support: IUCN.

7. Preparation of the Global Ecological Foundation project on conservation of biodiversity of Russia.
Organization: Ministiry of environmental protection of the Russian Federation.
Source of support: The World Bank, Ministiry of environmental protection of the Russian Federation, WWF (USA) No. RU0008.02.

8. Promotion of the initiative of global forest conservation in Russia.
Organization: IUCN.
Contact person: Teplyakov, V.K.
Source of support: WRI No. 75776.

9. Review of situation in the key ecosystems in forests of the European part of Russia.
Organization: IUCN.
Source of support: Ministry of agriculture, environment and fisheries of the Netherlands.

10. Support of foreground activities to biodiversity conservation in Russia, the Russian National Board GBF.
Organization: IUCN.
Contact person: Moshkalo, V.V.
Source of support: GEF, IUCN, GBR No. 75548C

Population biology

1. A comparative evaluation of the condition of small mammals populations and communities infringed and undisturbed landscapes by human.
Organization: Kostomukshskii Reserve.
Contact person: Pozdnyakov, S.A.
Source of support: Environment Ministry of Finland.

2. Analysis of current state of rare above-ground vertebrate populations in the Central and the West Caucasus, and the main trends of anthropogenic transformation of fauna.
Organization: AGU, Majkop.
Contact person: Tembotov, A.K.
Source of support: RFBR No. 00-04-96007.

3. Assessment of criteria, ontogenetic and physiological-biochemical aspects of ecological monitoring, ways of restoration and rational use of natural and artificial populations of medicinal plants in the Mari-El Republic.
Organization: Mariiskii State University, Joshkar-Ola.
Contact person: Zhukova, L.A.
Source of support: Committee of ecology of Mari-El Republic.

4. Dynamics of bird and mammal populations in ecosystems of the European taiga.
Organization: Istitute of Biology, Karelia Scientific Center, RAS.
Contact person: Danilov, P.I.

5. Dynamics of strength of terrestrial vertebrates in the reserve “Kivach” (analysis of long-term data).
Organization: Reserve “Kivach”.
Source of support: GEF No. B.2.5.46.

6. Investigation of influence of habitat fragmentation into populations of stenotopic species (on an example of the middle dappled woodpecker in the Bryansk Polesye).
Organization: Reserve “Bryanskii Les”.
Contact person: Kosenko, S.M.
Source of support: RFBR No. 99-04-49159.

7. Population monitoring of rare and vanishing plant species in the Lovozerskii Mountains.
Organization: Murmansk State Pedagogical University.
Source of support: Pr. “Integration” No. M0357.

8. Quality of habitat as a factor of strength dynamics and distribution of phytophagous wild mammalia.
Organization: Institute of Poroblems of Ecology and Evolution, RAS.
Contact person: Abaturov, B.D.
Source of support: RFBR No. 00-04-49189.

9. Spatial and social organization of some species of above-ground squirrels (genus *Spermophilus*) under modification of human impacts in the South of Russia.
Organization: Institute of Poroblems of Ecology and Evolution, RAS.
Contact person: Shilova, S.A.
Source of support: RFBR No. 99-04-48355.

10. Spatial-temporal organization of natural plant populations.
Organization: Mariiskii State University, Joshkar-Ola.
Contact person: Zhukova, L.A.
Source of support: RFBR No. 98-04-49294.

Vegetation science

1. Assessment of biological diversity of forest vegetation in the typical landscape of zandr plain in the Mari-El Republic.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Zaugolnova, L.B.
Source of support: Pr. “Integration” No. C0016.

2. Current state and inventory of vegetation in the Russian Mediterranian and problems of its conservation.
Organization: Kuban’ State University.
Contact person: Litvinskaya, S.A.
Source of support: RFBR No. 00-04-96045.

3. Development of geobotanic map of the reserve “Bryanskii Les” as a basis for plant community assessment and prognosis of vegetation dynamics.
Organization: Reserve “Bryanskii Les”.
Source of support: GEF No. B.2.5.34.

4. Development of method of slitting of forest soil vegetation into functional groups of species.
Organization: Center of Ecology and Productivity of Forests, RAS.
Contact person: Smirnova, O.V.
Source of support: RFBR No. 98-04-48846.

5. Floristic and ecological-coenotic analysis of forest ecosystems in the national park “Smolenskoe Poozerye”.
Organization: National park “Smolenskoe Poozerye”.
Source of support: GEF No. B.2.5.65.

3.3 CONCLUDING REMARKS

The results of the review of European (including Russian) projects on forest biodiversity correspond mainly with expectations. We hope that the information reflects the main features in distribution of attentions and resources in Europe within the biodiversity issue.

One of the main biodiversity questions developed in European, as well as in Russian, projects is biodiversity monitoring (Figure 3.1). Several large projects (international and national) are devoted to the development of a system of indicators for evaluation of current level of biodiversity and its dynamics. These include one large international project “Indicators for monitoring and evaluation of forest biodiversity in Europe (BEAR)” (leader T.-B. Larsson); Belgian projects “Methodology and sampling methods in biodiversity assessments” (leader M. Dufrene) and “Development of a standardised methodology for the assessment of forest biodiversity in Flanders” (leader K. Vandekerkhove); a large Finnish project “The dynamics of biodiversity and methods for its assessment” (leader E. Tomppo); a German project “Development of biodiversity indicators” (leader Mr. Droschmeister); and Russian projects “Theory and methods for assessment of conservation and restoration of forest biodiversity in the European Russia” and “Harmonizing of methods for measurement and assessment of biodiversity in boreal forests” (leader of both A.S. Isaev).

A review of results of these methodological projects is a separate interesting work, which is not a task of this review. However, in the next section, we acquaint a reader with a method and computer tools for assessment of plant species and ecosystem diversity, which have been developed on a theoretical base elaborated in the frame of the Russian projects mentioned above (leader A.S. Isaev). The method uses a computer information and analytical system (IAS) and is a joint elaboration of Pushchino Scientific Center (Moscow region) and Centre of Ecology and Productivity of Forests (Moscow).

4. THE COMPUTER INFORMATION AND ANALYTICAL SYSTEM FOR ASSESSMENT OF PLANT SPECIES AND ECOSYSTEM DIVERSITY (IAS)

The information-analytical system (IAS) is a computer system consisting of a set of databases, application programs including special tools for analysis of vegetation data, and linked to GIS with a module for spatial data processing. The general scheme of the IAS is presented in Figure 4.1.

IAS is designed for analysis of vegetation data at the landscape, forest type and forest stand levels. IAS can be used for monitoring of vegetation (including forest ground vegetation) under silvicultural management as well as under ecosystem natural development. IAS outputs can be used in sustainable forest management for the purpose of conservation and restoration of biodiversity. The IAS is described in detail in Russian (Zaugolnova et al. 1995, Zaugolnova and Khanina 1996, Khanina 1997). Below we present the outlines of the system with description of input data, reference databases and outputs.

4.1 INPUT DATA

4.1.1 Forest inventory data

Data of Russian national forest inventory are the basic data of the IAS, which are used for spatial linkage of data on vegetation and tree sampling. The typical parameters of Russian forest inventory data are the following: stand location, stand area, protection status, tree species composition (in percent by species), age classes by species, average tree species diameter and height as well as forest type (vegetation), site type (soil moisture and fertility according to Vorobyev' 1953, see Figure 4.3), stand density (coverage), stand volume, understory species with height and cover.

The forest inventory map is a basic layer of GIS used for spatial analysis of biodiversity assessments at the landscape level including spatial distribution of forest types. An example of a forest inventory map for the Prioksko-Terrsanty Reserve is presented in Figure 4.2, where dominant tree species with ages are marked, and in Figure 4.3, where site conditions are marked.

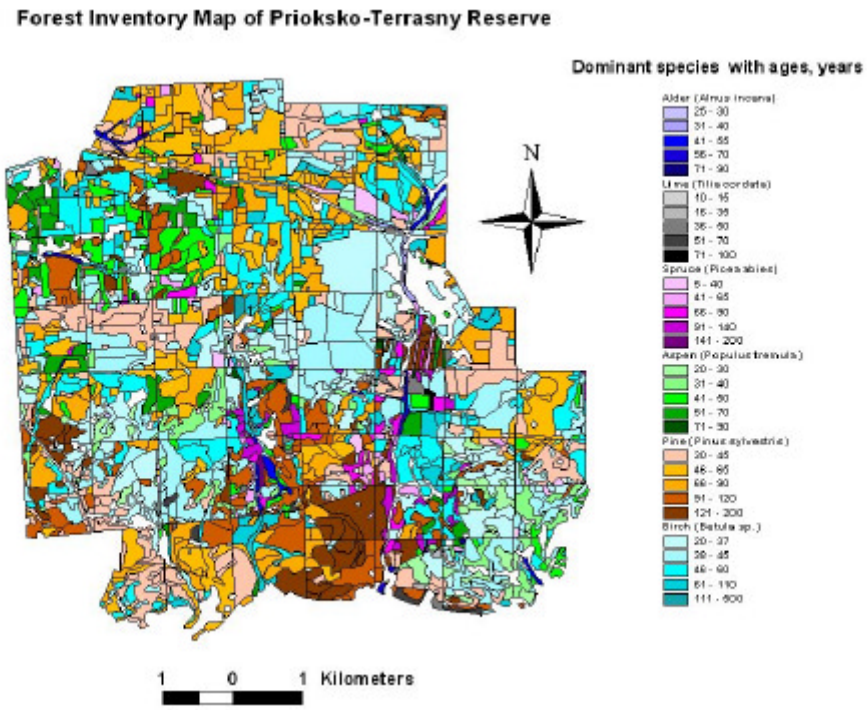

Figure 4.2. Forest inventory map of the Prioksko-Terrsany Reserve (Moscow region) with dominant tree species distributed by age.

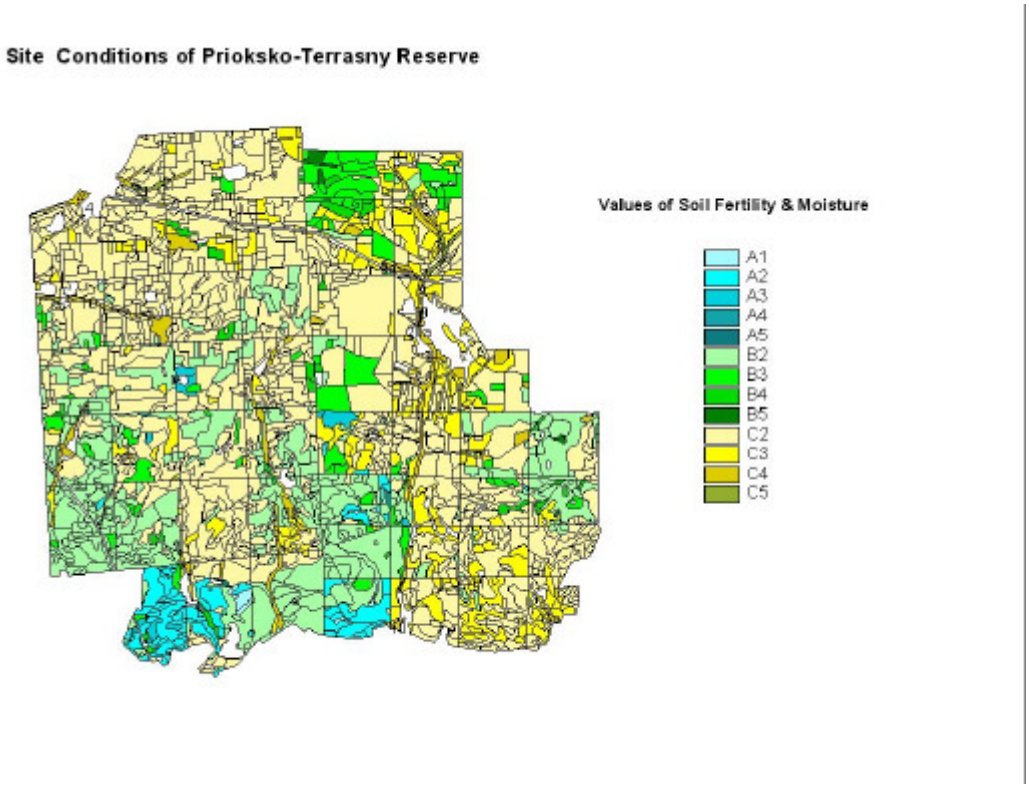

Figure 4.3. Forest inventory map of the Prioksko-Terrasny Reserve with site condition marking. Values of soil fertility increase from A to C, and values of soil moisture increase from 1 to 5 according to Vorobyev' (1953) site condition tables, which are used for all Russian forest inventory data.

4.1.2 Data on vegetation sample plots

According to the method of biodiversity assessment, vegetation data sampling has to be done using plots of fixed size (e.g. 100 m^2). Lists of plant species for all forest layers (forest canopy, understory, ground vegetation) have to be composed with the species abundance.

The database on vegetation sample plots consists of two relational tables. The first contains general information on plots (person and date of field sampling, site location); description of site parameters and vegetation community as a whole; percentage of cover of all species for the main layers of vegetation. The second table describes the percentage of cover of each plant species for the main vegetation layers. The auxiliary database of species valid names is used for input names of plants into database.

4.1.3 Data on tree sample plots

The database on the tree sample plots is also composed of two tables – the general information about plots and site location, and the list of trees with numbers of individuals at different ontogenetic stages (Gatsuk et al. 1980, Smirnova et al. 1999), tree's origin (seed and vegetative), as well as the age of some trees.

4.2 REFERENCES DATABASES

The *lists of regional floras* include plant species, which areas of distribution coincide with the regions under investigation according to floristic resumes. The list of regional flora is used for accounting of potential flora. Information on species life forms (Raunkiaer 1934, Serebryakov 1962) is used for estimation of structural diversity of plants.

Species ecological indicator values are expressed as rank values of species concordance with environmental factors. In the frame of IAS, one can use species ecological values developed by different authors in Europe (Ellenberg 1974, Landolt 1977) and in Russia (Vorobyev' 1953, Ramensky 1956, Tsyganov 1983). General information about the most popular summaries of indicator values of plant species is presented in Table 4.1. Species ecological indicator values are used for ecological estimation of habitats, accounting of potential flora, and for interpretation of ordination axes.

Ecological-sociological species groups (ESG) are groups of species which are close to each other by their ecological and morphological features and by frequency of their occurrence in the vegetation communities of different types (see Nitsenko 1969, Van der Maarel 1993). Usually, a number of ESG varies from six to nine depending on the regional particularities and purposes of assessment (see Smirnova et al. 1997, Zaugolnova 2000). ESG are used for estimation of structural diversity of ground vegetation layer.

The main problem of widespread use of ESG analysis is a gap in statistically valid methods of splitting regional floras into the ESG. We have developed a technique of recognising the ESG on the basis of species indicator values calculated by the Dufrene and Legendre (1997) method (98-04-48846 and 01-04-49098 RFBR projects, leader Smirnova, O.V.).

List of vegetation types with diagnostic species is the syntaxonomic database 'Prodromus' (Zaugolnova 2000). It is used for definition of syntaxonomic address of plant communities.

Table 4.1. The general characteristic of the most popular resumes on ecological indicator species values (Zaugolnova 2000).

	Vorobyev (1953)	**Ramensky** (1956)	**Ellenberg** (1974)	**Landolt** (1977)	**Tsyganov** (1985)
Number of species	882	1419	2494	3411	2304
Number of species from Central Russia flora	500	765	904	912	1013
Number of evaluated parameters	2	5	6	8	10
Types of evaluation	range	range	point	point	range
Number of scores					
Soil moisture	5	120	12	5	23
Soil nitrogen			9	5	11
Soil fertility	4			5	
Solinity/fertility of soil		30			19
Soil reaction			9	5	13
Soil texture				5	
Variability of soil moisture		20			
Grazing resistance		10			
Alluvial gradient		10			
Light response			9	5	9
Temperature gradient			9	5	17
Climate continentality gradient			9	5	15
Climate humidity/aridity					15
Cryoclimatic factor					15

For the Central Russian floristic region, all reference databases for vascular plants are developed and maintained (Khanina et al. 1999). The list of valid species names (nomenclature accords to Cherepanov 1995) with specially developed species code-system for univocal correspondence is used. The Prodromus database can be at the moment used for the definition of syntaxonomic address of forest community at the levels of union and order. Associations within the union *Carpinion* of the *Querco-Fagetea* class can be also defined. Reference databases on species of boreal forests and forest-steppe zone of the European Russia have been developed (01-04-49098 RFBR project). A database on mosses developed by Ignatov and Afonina (1992) is also accessible in the frame of the IAS.

4.3 DESCRIPTION OF OUTPUTS

Outputs of the IAS can be considered as a comprehensive assessment of plant species and ecosystem diversity. The method of forest biodiversity assessment realized by the IAS is the subject of this subsection.

4.3.1 Classification of forest types

The first step of biodiversity assessment of a forest area is the definition of forest types within the study area. Forest inventory data are used for general assessment, and data on vegetation sample plots are used for specification.

Forest vegetation can be classified using a variety of methods. For large areas (from 100 to tens of thousands hectares), we proposed the original methods that have been developed in the

frame of the IAS (98-04-48486 project of RFBR, project leader Smirnova, O.V.; see Khanina et al. 2001).

The realisation of our method coincides with the idea of stand-level forest typology recommended in the BEAR project for forest biodiversity assessment (BEAR 1999; BEAR 2000). The method consists of the hierarchical assessment of forest stand by synoptic evaluation of ecological-silvicultural aspects and of vegetation ones (both floristic and phytosociological). Forest types are marked by dominant tree species in a canopy and by dominant ecological-sociological group in the ground vegetation layer. Database on vegetation sample plots and reference database with list of ecological-sociological groups as well as methods of cluster anaysis and ordination are used. The results of classification of vegetation sample plots for the reserve "Kaluzhskie zaseki" (Kaluga region, Central Russia) are presented in Figures 4.4 and 4.5.

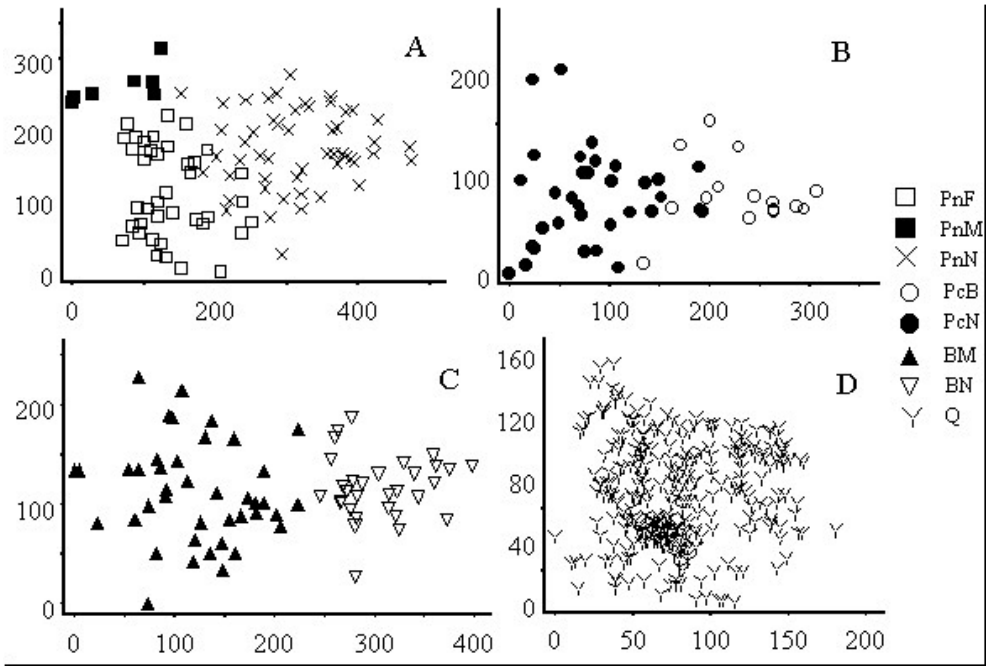

Figure 4.4. Detrended Correspondence Analysis ordination (Hill 1979) of groups of vegetation sample plots of the reserve "Kaluzhskie zaseki" (Kaluga region) for axes 1 and 2. The groups are marked out by the dominant tree species in a canopy: A – pine forests, B – spruce forests, C – birch forests, D – broadleaved forests (from Khanina et al. 2001). The legend refers to the following forest types specified by cluster analysis of sampling data:

PnF – pure pine forests closed to the subunion *Dicrano-Pinenion* (Libbert 1933) Matuszkiewicz 1962;
PnM – pine forests with meadow grasses, closed to the order *Festuco-Sedetalia* Tx. 1951 em. Krausch 1962;
PnN – pine forests with nemoral herbs, closed to the union *Querco roboris-Tilion cordatae* Solomeshch et Laivins in Solomeshch et al. 1993;
PcB – spruce forests with boreal herbs, closed to the subunion *Melico-Piceenion* K.-Lund 1981;
PcN – spruce forests with nemoral herbs, closed to the union *Querco roboris-Tilion cordatae* Solomeshch et Laivins in Solomeshch et al. 1993;
BM – birch forests with meadow grasses, closed to the order *Arrhenatheretalia* R.Tx. 1931
BN – birch forests with nemoral herbs, closed to the union *Querco roboris-Tilion cordatae* Solomeshch et Laivins in Solomeshch et al. 1993;
Q – broadleaved forests, the union *Querco roboris-Tilion cordatae* Solomeshch et Laivins in Solomeshch et al. 1993.

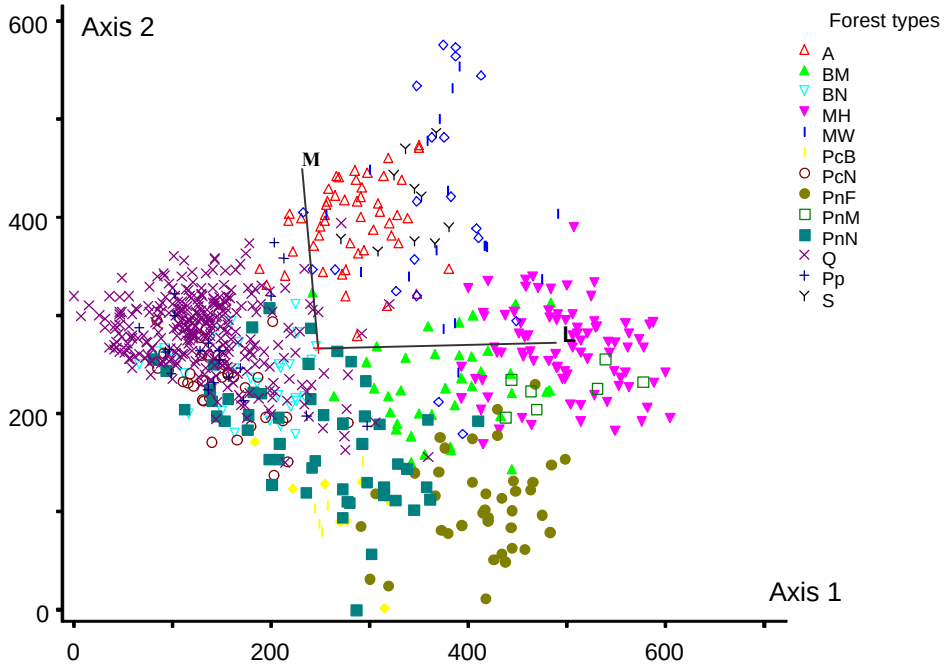

Figure 4.5. Detrended Correspondence Analysis ordination of 755 vegetation sample plots of the "Kaluzhskie zaseki" reserve for axes 1 and 2 with vectors of Ellenberg's ecological values: L – light, M – soil moisture (from Zaugolnova 2000 with modifications.) The legend refers to the following classified forest types:

A – black-alder forests,
BM – birch forests with meadow grasses,
BN – birch forests with nemoral herbs,
MH – mesophytous meadows,
MW – hyhrophytous meadows,
PcB – spruce forests with boreal herbs,
PcN – spruce forests with nemoral herbs,
PnF – pure pine forests,
PnM – pine forests with meadow grasses,
PnN – pine forests with nemoral herbs,
Pp – aspen forests,
Q – broadleaved forests,
S – willow woodlands.

Ordination axes were interpreted by the Persson's method (Persson 1981) using rank ecological values of the plots, which were calculated according to the species ecological indicator values (see section 4.3.5). Joint scores for plot ecological values were obtained by the McCune and Mefford (1999) method. The first and the second ordination axes have a good correlation with ecological values of the plots: the first axis – with light ($r = 0.89$), and the second axis – with soil moisture ($r = 0.84$).

According to the BEAR Final consolidated report (BEAR 2000), a number and a list of forest types with account of spatial parameters of their distribution represent the estimation of ecosystem diversity of the area. With regard to the IAS, we propose to use GIS technology to visualise and to analyse a spatial distribution of forest types within the study area (Figure 4.6).

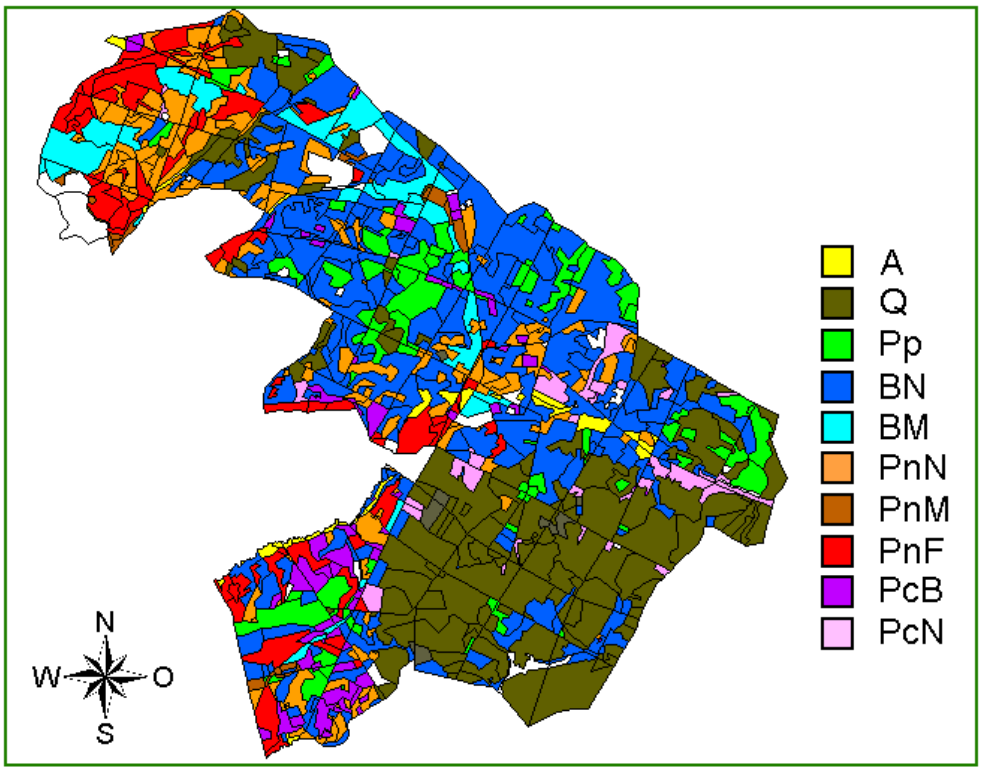

Figure 4.6. Map of the "Ulyanovo" forest in the "Kaluzhskie zaseki" reserve with visualization of the defined forest types. The legend refers to the same forest types as in Figure 4.5 (from Zaugolnova 2000 with modifications).

Further, we propose to estimate a plant diversity of each forest type on a base of sample plot data: to define alpha-, beta-, gamma-diversity as well as structural diversity of each forest type and to estimate environmental conditions and succession stages of the forest types. A comparison of these estimations for different forest types allows construction of a spacious picture of biotic diversity distribution within the study area.

4.3.2 Beta-diversity of vegetation

Beta-diversity of vegetation reflects a spatial distribution of floristic diversity within a study area. It can be estimated by different indexes: by floristic similarity coefficients (Magurran 1988), by Whittaker's index of heterogeneity (1960), by length of axes of sample plot ordination in terms of standard deviation (s.d.) units (Oksanen and Tonteri 1995; Pitkanen 1998), etc.

For example, in Figure 4.4, we can see that beta-diversity of pine forests in the "Kaluzhskie zaseki" reserve (Figure 4.4 A) is maximal among other forest types (about 5 s.d. by the first axis and more than 3 s.d. by the second axis). Beta-diversity of the broadleaved forests in the reserve is minimal (Figure 4.4 D). Beta-diversity of vegetation of all study area (Figure 4.5) is high because maximal values of their co-ordinates by the first two axes are more than 5 s.d.

4.3.3 Alpha- and gamma-diversity of vegetation

Estimation of alpha- and gamma-diversity of plant species are the main parameters of biotic diversity of vegetation. Alpha- and gamma-diversity were differentiated as species density and species richness (Hurlbert 1971). Alpha-diversity was estimated by means of number of species per sample plot within a forest type, and gamma-diversity was estimated by means of total number of species within a study area. It is useful to estimate gamma-diversity for each forest type and also for the whole study area.

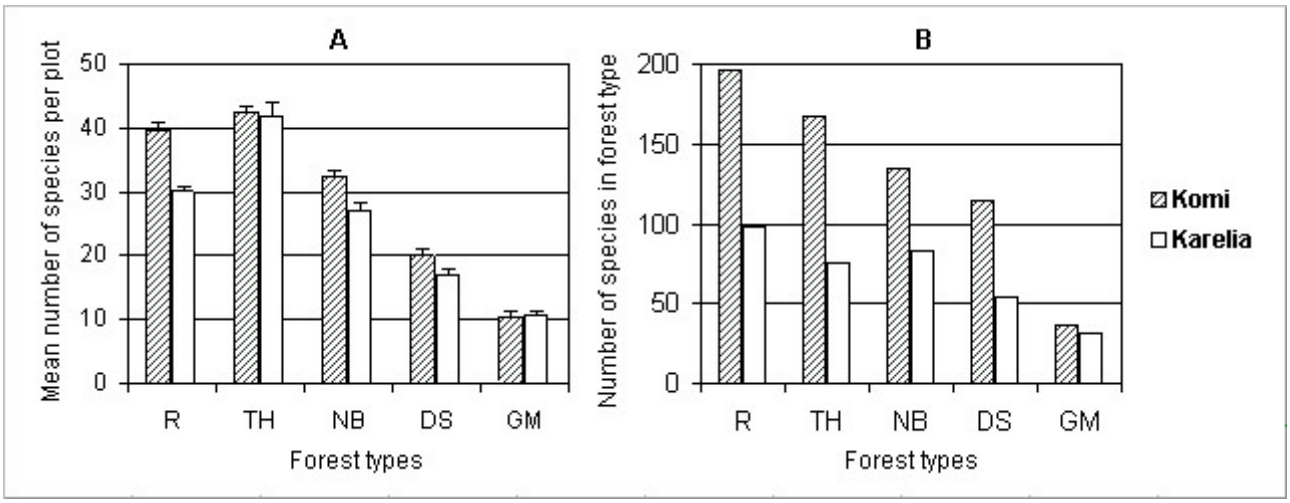

Figure 4.7. Alpha- and gamma-diversity of the forest types marked out in the old-growth spruce forests of the Komi and Karelia republics (Russia, middle and northern taiga). Types of spruce forests: R – tall herb forests at river valleys; TH – tall herb forests at watersheds; NB – forests with domination of nemoral and/or boreal herbs; DS – forests with domination of dwarf shrubs; GM – forests with domination of green mosses.

An example of estimation of species density (A) and species richness (B) is shown in Figure 4.7 for different forest types marked out within the Komi and the Karelia old-growth spruce forests (data taken from Smirnova et al., in print). Comparative analysis show that despite a difference of almost double in species richness between the Komi and the Karelia study areas, species density in the same forest types is similar. Under the regional differences, the same forest types keep the same number of species per sample plot. The richest forest types were R and TH types thru NB and DS types to poorest GM type by decrease of plant diversity.

4.3.4 Structural diversity of vegetation

Structural diversity was estimated by a number of plants of different life forms (e.g. by a number of trees, shrubs, herbs, mosses and lichen) within each forest type and within a study area. Additionally, structural diversity of the herbaceous layer of a forest type was estimated by a number of species, which belong to different ecological-sociological groups. A total species list of a forest type (composing a species richness) is analysed as well as species lists per plots (a species density). In the last case, mean number of species of each ecological-sociological group per plot for a forest type is calculated. Absolute and relative (in %) numbers of species of different ecological-sociological groups are also calculated. Various performance of ecological-sociological structure of ground vegetation allows us to analyse a

composition of species in a plant community. Below you can see a flow chart (Figure 4.8) and example of estimation (Figure 4.9) of the ecological-sociological structure of vegetation.

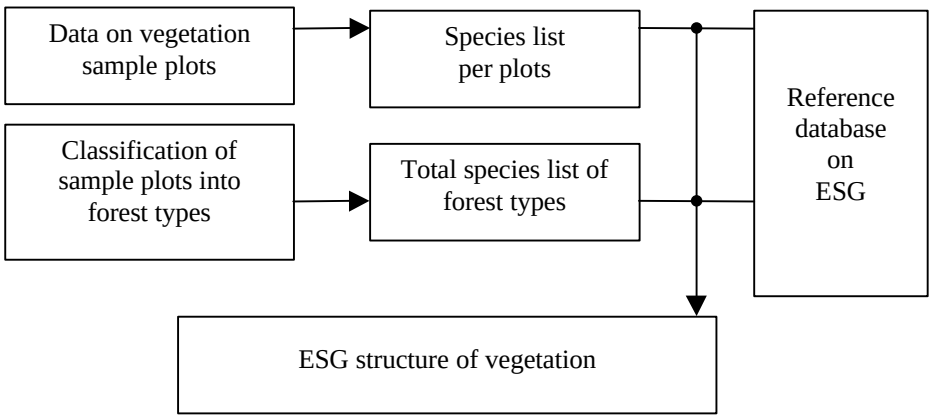

Figure 4.8. Flow chart of estimation of ecological-sociological structure of vegetation.

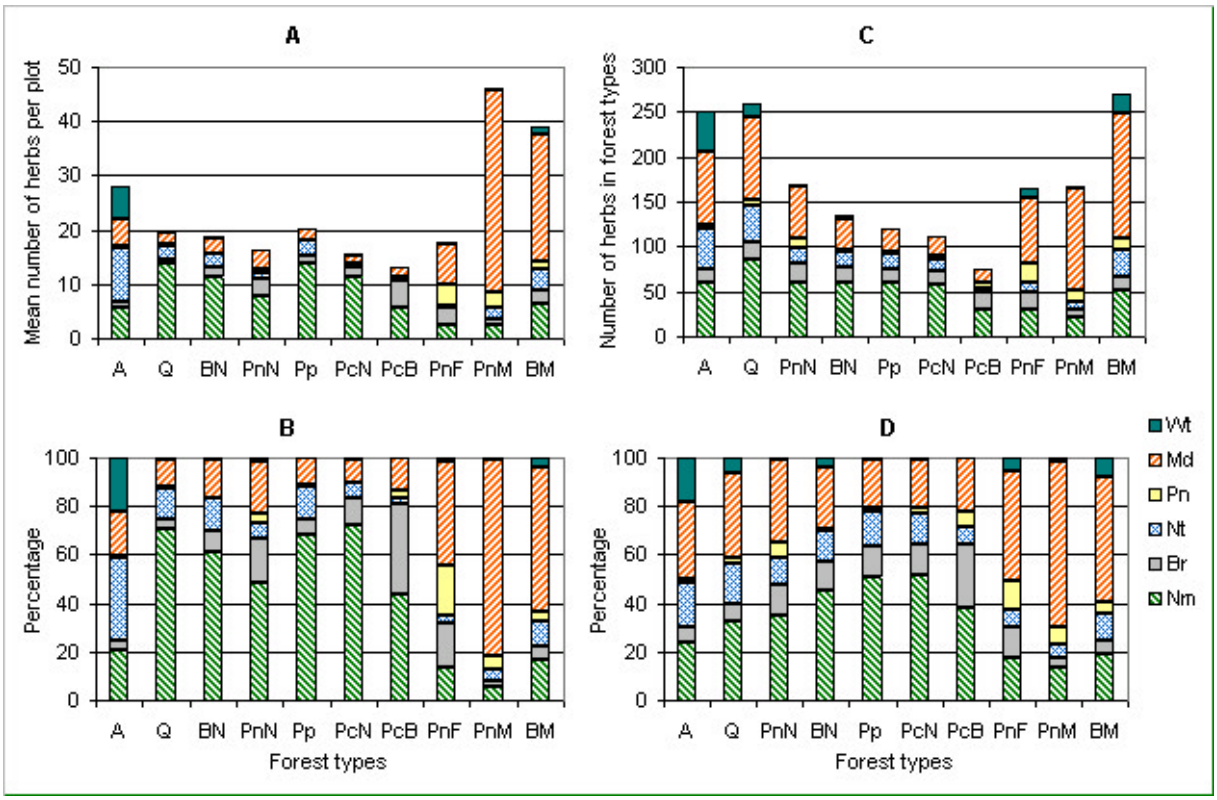

Figure 4.9. Ecological-sociological structure of the herbaceous layer of some forest types of the reserve "Kaluzhskie zaseki" (from Zaugolnova 2000 with modifications): A, B – mean number of species of different ecological-sociological groups per plot by the forest types; C, D – total number of species of different ecological-sociological groups by the forest types.

Types of forest are the following (see also Figure 4.5):

Q – broadleaved forests composed of *Tilia cordata*, *Fraxinus excelsior*, *Quercus robur*, *Ulmus glabra*, *Acer platanoides*, *A. campestre*;

Pp – aspen forest formed from broadleaved forest by selective cuttings;

PnF – pure pine forests formed by pine planting after ground fires;

PnN – old pine plantation with nemoral herbs growing without fires;

A – black-alder forests situated in valleys of small rivers.

The ecological-sociological analysis of herbaceous layer of these forest types shows the following:

1. Species density of Q and Pp forest types is similar because the mean number of herbaceous species per plot is about 20 (Figure 4.9, A). Ecological-socilogical structure of the plots is similar (Figure 4.9, B): about 70% nemoral species (Nm); 3–6% boreal species (Br); 13% nitrophylous species (Nt); 0.2% pure pine forest species (Pn); 11% meadowy species (Md); and 0.2–0.7% of water-swamp species (Wt). However, the total number of herbaceous species in Q and Pp forest types is significantly different (Figure 4.9, C) – Q is twice as rich. It is mainly a sequence of the diversity of meadowy, water-swamp and nitrophylous species (Figure 4.9, C, D). That is, a structure of herbaceous layer within the plots is similar in Q and Pp forest types, but lists of species in the Q plots are different, and there are more herbs in the Q forest type than in the Pp forest type.
2. The mean number of herbaceous species per plot in PnF and PnN forest types is similar (Figure 4.9, A), but ecological-sociological structure is different (Figure 4.9, A, B): in PnF, percentage of meadowy (43%), pure pine forest (20%) and boreal (18%) species is high; in PnN, nemoral species dominate (48%). The total number of species in PnF and PnN is also similar (Figure 4.9, C), and the ecological-sociological structure of the total species list (Figure 4.9, D) is similar to the mean ecological-sociological structure per plot (Figure 4.9, B). Note, that in PnF forest type, total share of water-swamp species increases to 6%, indicating the existence of waterlogged sites. The latter can appear after multiple fires. On the whole, PnF forest types keep meadowy and pure pine forest species within the area.
3. And finally, the mean number of herbs per plot in the A-type is greatest between considered forest types in the “Kaluzhskie zaseki” reserve (Figure 4.9, A), but plots are similar to each other, and the total number of species in the A forest type is less than in the Q forest type. The ecological-sociological structure of the A-type is quite different: it keeps water-swamp, nitrophylous and meadowy herbaceous species within the study area.

Thus, ecological-sociological estimation of herbaceous layer executed by sample plot data processing on the reference database allows analysis of the structure of ground vegetation in the forest types. The ecological-sociological analysis shows the species composition within the forest type and what are the groups of species to be maintained within the different kinds of forest.

4.3.5 Environmental estimation

Environmental estimations of a forest type derived from species ecological values complement a picture of the forest type. They can be used for interpretation of ordination axes (see 4.3.1) and for explanation of species diversity.

Environmental estimations of a forest type are derived from environmental estimations of correspondent sample plots. Range and average ecological values for each forest type are calculated. The rank value of a plot is calculated as a mean species ecological value weighted to the species abundance. Soil moisture, nutrients, reaction, and light values are typically used for environmental estimations. With regard to the reliability of indicator values, readers are directed to the papers by Zaugolnova and Khanina (1996) and Schaffers and Sykora (2000), and the references cited in these papers. A flow chart of the estimation is presented in Figure 4.10, and an example of the results is presented in Figure 4.11.

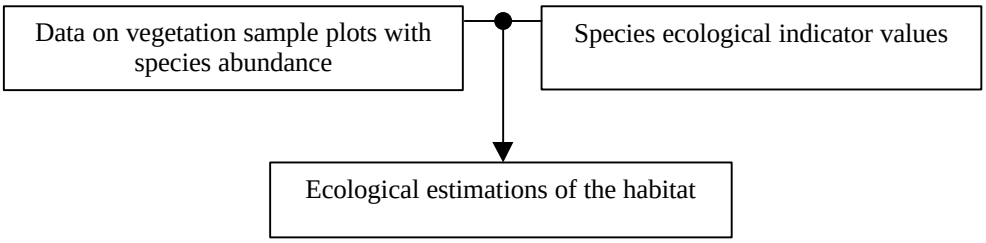

Figure 4.10. Flow chart of ecological estimation.

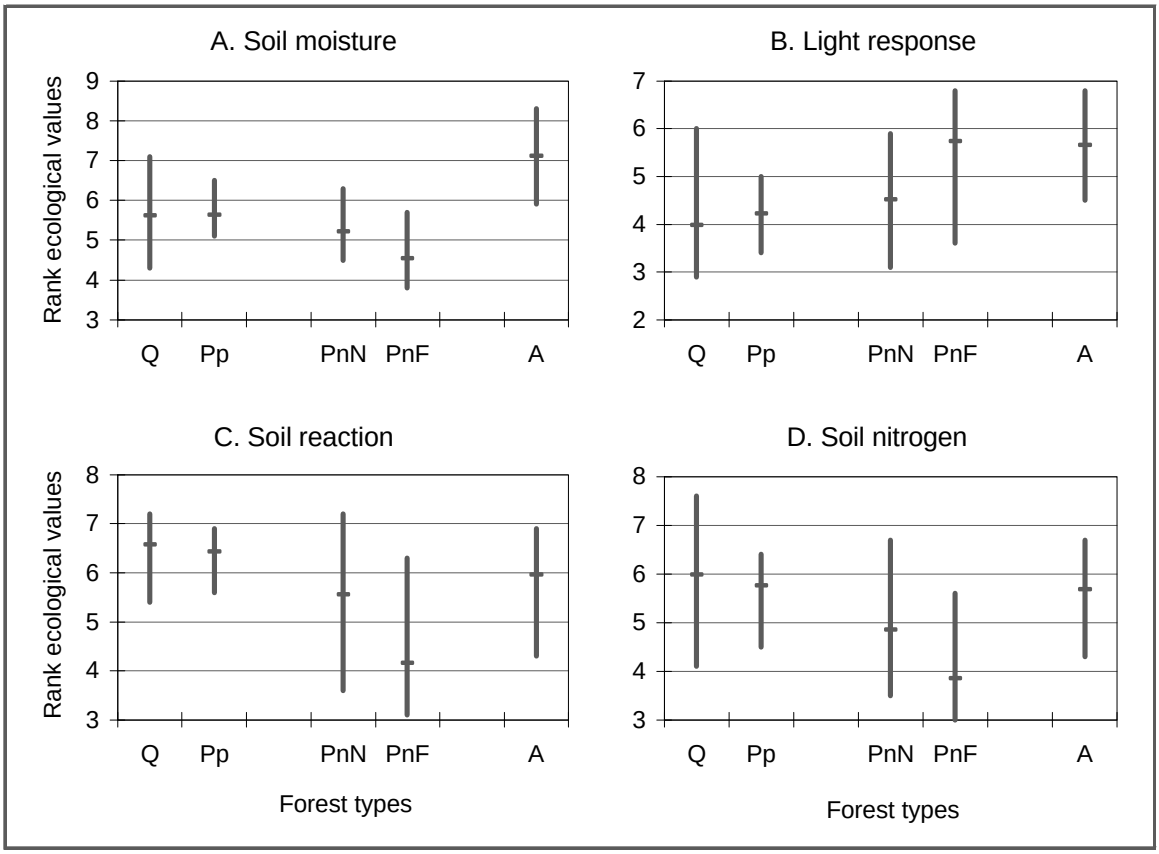

Figure 4.11. Range and average ecological values for some forest types of the reserve "Kaluzhskie zaseki" calculated by the Ellenberg's ecological values. Forest types are the same as in Figures 4.9 and 4.5: Q – broadleaved forests; Pp – aspen forests; PnF – pure pine forests; PnN – old pine plantation with nemoral herbs; A – black-alder forests.

Analysis of environmental estimations shows that the mean values of soil moisture (Figure 4.11, A) in Q, Pp, and PN forest types are similar, but the range of values is greatest in Q. It means that plots in Q-type are more heterogeneous in soil moisture. The driest forest type is PnF-type, where ground fires occur often. The wettest forest type is A-type, situated in valleys of small rivers.

Mean values of light response (Figure 4.11, B) in Q and Pp forest types are similar to each other, they are forests with little light in the ground floor. Mean value of this factor in PnN-type is close to them. The lightest forests are PnF and A. Ranges of light response values are large in all forest types, except Pp-type.

Mean values of soil reaction and soil nitrogen (Figure 4.11, C, D) decrease in the same order from Q, Pp, A to PnN and PnF forest types. There is low pH in the soil in pine forests, especially in PnF. Ranges of these values are large in pine forests and black-alder forests, but ranges of soil reaction values are small in Q and Pp forests.

The narrowest range of all ecological values is observed in aspen forests (Pp). This indicates stationary environmental conditions and an absence of microsite diversity in this forest type. Note, that species richness is small in Pp-type (Figure 4.11, C) despite mild environmental conditions. On the whole, ecological estimation of forest types is according to ecological-sociological structure of herbaceous layer (Figure 4.11).

4.3.6 Estimation of losses of potential flora

We propose that the potential flora of forest types and the 'losses' from the potential flora should be estimated. We define the potential flora of a particular site as the list of species from the regional flora, which could potentially grow at that site according to the environmental conditions (Zaugolnova et al. 1995, Khanina 1996). This notion corresponds to the idea of the regional species pool (Pärtel et al. 1996, Zobel 1997). The list of potential flora is obtained by using species ecological indicator values (Ellenberg values, for example). Losses from the potential flora are defined as the difference between the potential and actual species pools (Figure 4.12).

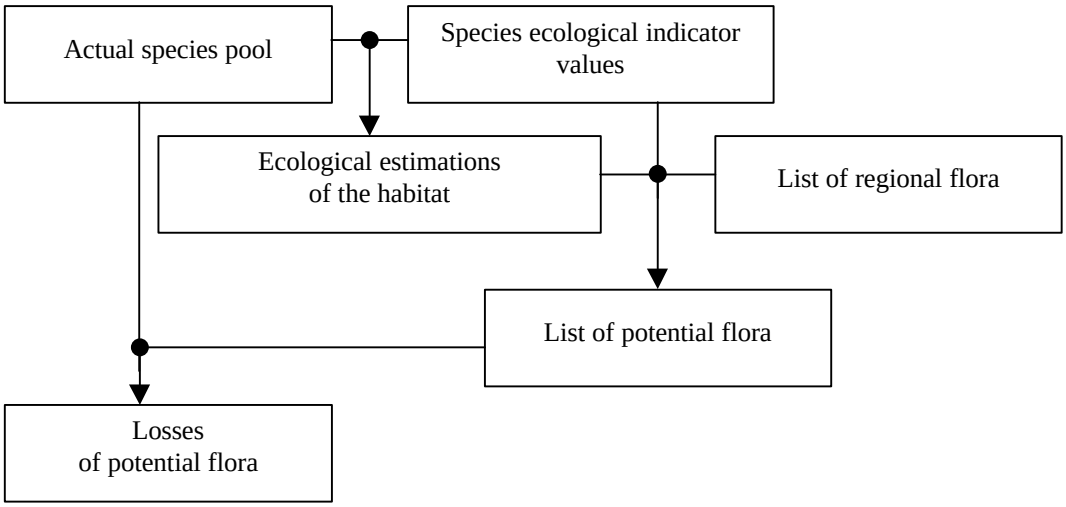

Figure 4.12. Flow chart of accounting for potential flora losses.

There are theoretical biological problems around the potential flora and regional species pool notions (e.g. Zaugolnova 2000, Herben 2000). Nevertheless, our applications show that an estimation of potential flora losses instigates the causal analysis of the current level of plant diversity (Smirnova et al. 1997, Zaugolnova 2000). Besides, forestry managers can consider the list of losses from the potential flora as a list of candidates for introduction.

4.3.7 Estimation of forest succession stage by analysis of ontogenetic structure of tree populations

We propose the inclusion of the estimation of succession stage of forest communities in biodiversity assessment of forest areas. For this purpose, we use an earlier developed method based on analysis of ontogenetic structure of tree populations (Smirnova et al. 1990, 1991, 2001; Smirnova 1994).

Trees are a driving force of forest formation, and the main agents of establishing and modifying forest structure. They can be considered as keystone species (*sensu* Farina 1998), or as edificator species (*sensu* Sukachev 1972; Smirnova 1998) of forest ecosystems. Temporal and spatial parameters of tree populations define temporal and spatial parameters of the forest developing freely (natural forest, *sensu* Aird 1994).

So, if we would like to define a forest successional stage, or make a forecast of a forest developing freely, we have to estimate the conditions of tree populations – proportion of old, mature and young individuals of different tree species. Usually, researchers analyse basal area distribution, tree diameter class or age class distribution to estimate successional stage and/or dynamics of natural forests (e.g. Hyyeborn et al. 1991; Bernadzki et al. 1998; Kuuluvainen et al. 1998). We also intend to analyse a range of tree individuals, which are at different ontogenetic (developmental) stages.

The ontogenetic stage of tree individuals can be assessed simply and quickly, and it does not require special measurements of trees. At the same time, analysis of distribution of individuals at different ontogenetic stages allows comparison of structure of tree populations of different size classes, with different life spans. This analysis also allows for all individuals in a population, including weakly developed specimen in the understorey, to be accounted for.

We distinguish juvenile (j), immature (im), virgin (v), reproductive or generative (g), and senile (s) ontogenetic stages. The reproductive stage is subdivided as follows: young (g1), middle (g2), and old (g3) individuals (see Figure 4.13). For a detailed description of the features of each ontogenetic stage, see Gatsuk et al. (1980), Smirnova et al. (1999), and review by Chertov et al. (1999). Ontogenetic stages of individuals are defined by biomorphological characters (Smirnova et al. 1999) developed according to Serebryakov's morphological approach (Serebryakov 1962).

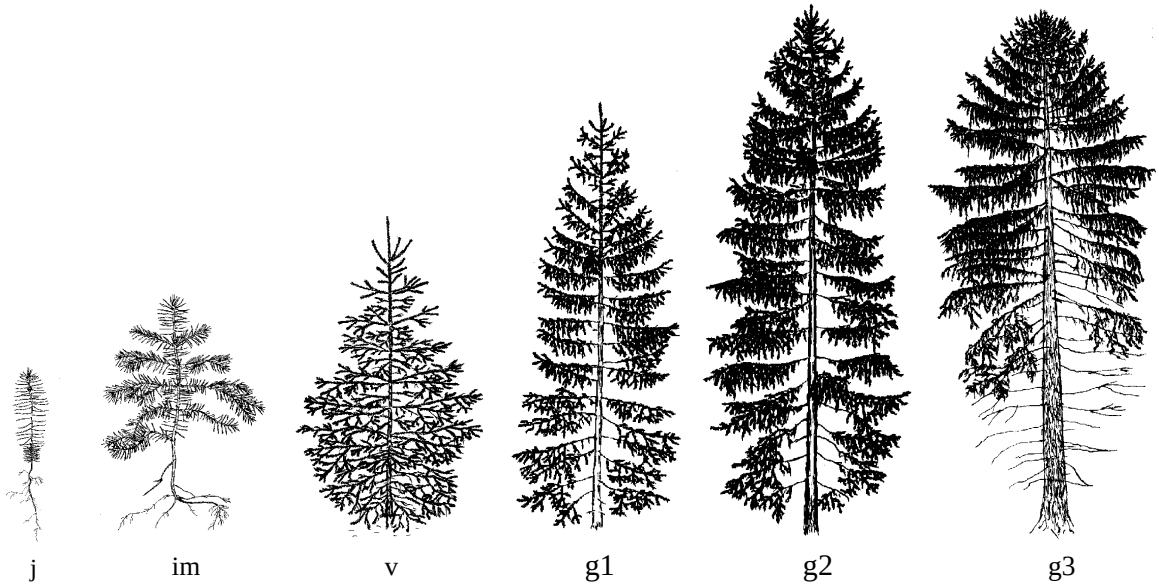

Figure 4.13. Ontogeny of Norway spruce (*Picea abies*) (Smirnova et al. 1999).

The following main types of ontogenetic structure of populations are separated: normal (and conditional normal), fragmentary, invasion and regressive types (see Zaugolnova 2000). Using the ontogenetic stage distribution of different species, it is possible to identify which species hold a stable position in the plant community, which species are intrusive, and which species are in decline (Figure 4.14).

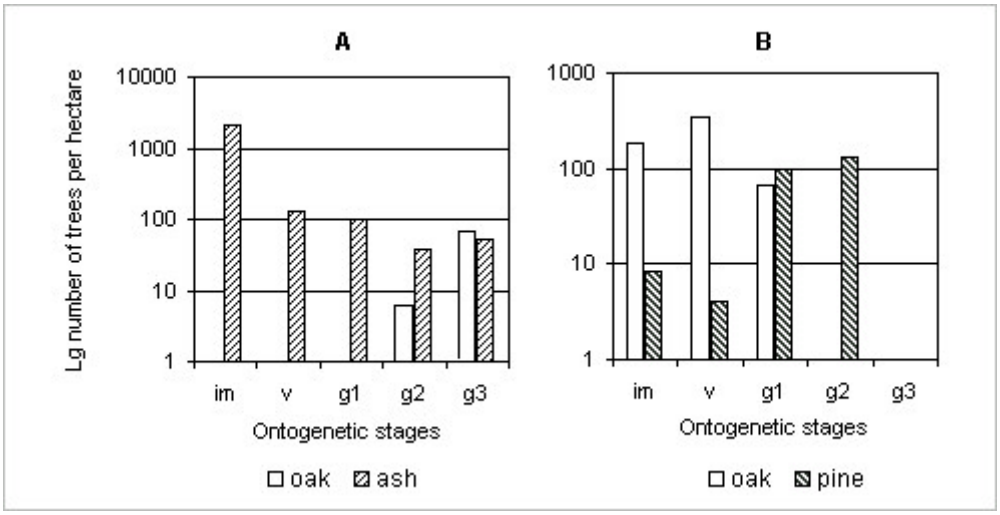

Figure 4.14. Distributon of dominant tree species in different forest types of the “Kaluzhskie zaseki” reserve by ontogenetic stage (from Zaugolnova 2000 with modifications): A – broadleaved forest (Q-type according to Figure 4.3); B – pine forest with nemoral herbs (PnN-type according to Figure 4.5).

Figure 4.14A shows that the oak (*Quercus robur*) population in this forest is represented by middle and old generative individuals only; the population is in decline. The ash (*Fraxinus excelsior)* population is represented by all ontogenetic stages, and young individuals predominate; the population is stable. This situation is typical for freely developing broadleaved forests in Central Russia (Smirnova and Bobrovsky, in print). Oak leaves closed broadleaved forests.

However, sustainable undergrowth of oak can be found in light pioneer forests – for example, in pine forests situated in broadleaved surroundings (Smirnova and Shaposhnikov 1999; Zaugolnova 2000). In Figure 4.14B, an example of the ontogentic structure of pine and oak populations in such a forest in the "Kaluzhskie zaseki" reserve is presented. The pine (*Pinus sylvestris*) population is predominantly represented by generative individuals, the number of young individuals is small, and regeneration is not sustainable. In the oak population, young individuals dominate, and individuals of g2 and older are absent; the population is invasive. Thus, we observe a successional process of transformation from pine to oak forest.

Analysis of the ontogenetic structure of all tree populations in a study area allows estimation of successional processes within a forest stand as well as within a forest type. It also allows forecasting of the natural development of vegetation at the landscape level. With regard to the IAS, it can be done by use of GIS (see Zaugolnova 2000). Note that more precise prognosis of forest state in different temporal spans could be done by means of forest growth simulation (Chumachenko 1998, Chertov et al. 1999).

4.3.8 Reconstruction of forest history

In addition to the assessment of current diversity of ecosystems and plant species, we propose reconstruction of a forest history for optimization of ways and methods of ecosystem restoration in order to forecast forest development (Smirnova et al. 2001).

Reconstruction of forest history is accepted as a real task of natural forest area studies (Smout 1994, Motzkin 1998, 1999), and it is a permanent problem of Russian forest investigation. Almost all forests in the European Russia are forests that have evolved as a natural succession, but are still demonstrating anthropogenic influences (Smirnova and Shaposhnikov 1999, Yaroshenko 1999). Distinction of anthropogenic influences in composition and structure of unmanaged forests is also necessary for understanding the basic problems of forest ecosystem functioning.

We propose reconstruction of a history of the forest development using the structure of the plant forest community. It is possible to assess the deviation of the structure of a particular forest from the structure of the natural forest, which would have developed given a long period without catastrophic exogenous impacts (over a period of several generations of trees). A deviation of the study forest structure from the natural forest structure is a result of some exogenous impacts, and then the structural deviation could be considered as a marker of this impact (see also Smirnova 1994; Smirnova and Shaposhnikov 1999).

To specify forest history in frame of the IAS, we propose the use of the following information from the tree sampling database:

- proportion of pioneer and shade-tolerant tree species in a canopy and understory;
- comparison of age and ontogenetic structure of tree populations;
- ratio between trees of seed origin and vegetative origin.

A method and results of its application are presented in the literature (Smirnova et al. 1990, 1991, Smirnova and Shaposhnikov 1999, Zaugolnova 2000).

In addition, we propose use of soil macro-morphological analysis to specify a forest history as well to specify forest management operations for ecosystem restoration (Smirnova et al. 1990, Ofman et al. 1998, Smirnova and Bobrovsky 2001).

Specification of forest history using soil morphological patterns is also possible because of good conservation of ecosystem history traces in a soil. We can distinct the traces of tree uprootings, animal activities in the soil, former cuttings, land cultivation, fires and grazing (Smirnova and Shaposhnikov 1999). Reconstruction of a sequence of events is also possible by pattern of morphone groups (Smirnova and Shaposhnikov 1999). Soil macromorphological analysis shows the structural features of soil, and this helps assessment of the need for management operations improving forest ecosystem quality – what tree species should be planted? coniferous or decidious? should the species have shallow or deep root systems? etc.

4.4 INFERENCE

The IAS approach allows a detailed analysis of composition and structure of the forest plant community by the method of express-estimation. Assessment of current biodiversity, forecast of forest development and reconstruction of a plant community history are carried out by analysis of composition and structure of vegetation. Prognosis of vegetation biodiversity under different silvicultural management operations is possible.

IAS could potentially allow:

- improvement of methods of monitoring, conservation and restoration of biodiversity;
- estimation of the current level of plant species and ecosystem diversity in study area;
- a prognosis of vegetation dynamics;
- reconstruction of the history of vegetation communities;
- proposal of various forest management operations for maintenance and restoration of ecosystem and vegetation biodiversity.

5. CONCLUSION

Our report consists of two main parts: a review of recent projects on forest biodiversity investigations in Europe, and a description of the original Russian method of assessment of plant diversity at the landscape, forest type and forest stand levels.

According to the first part, we have collected information on 547 projects into the database, of which 54 were international projects and 493 national European projects. Altogether 193 projects were Russian. Information presented in the Internet in English or in Russian was taken as a base for data collection. Information on national Russian projects was collected from different sources and it is presented for the first time in English. A classification of the projects was elaborated, and a distribution of the main parameters of collected data was analysed.

In consequence of collected information (presented in English or in Russian in the Internet), results of our analysis does not refer to all biodiversity investigations in Europe, although a review of the results corresponds mainly with expectations. The collected information reflects the main features in distribution of attentions and resources in Europe within the biodiversity issues.

Presentation of all collected information as an Internet-database would be useful. It would allow online update and correction of information from projects' authors as well as from the designers. It would also be useful to create an information system with spatial visualization and hypertext capabilities for presentation and analysis of information on biodiversity investigations.

The second part of the review embraces a description of the method of plant diversity assessment. The method uses the computer information-analytical system consisting of a set of databases, application programmes including special tools for analysis of vegetation data, linked to GIS with a module of spatial data processing. Suggestions for improvements of the method are welcomed.

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ANNEX: LIST OF THE INTERNET SITES USED FOR DATA EXTRACTION

All-European Web-sites:
http://dbs.cordis.lu/
http://www.ceh.ac.uk/subsites/connect/
http://ifff.boku.ac.at/efern/
http://europa.eu.int/comm/
http://www.esf.org/life/life.htm
http://www.ecnc.nl/

National European Web-sites:
http://www.svek.slu.se/defaulte.htm
http://www.snf.ch/Projektframeset_e.html
http://www.nwo.nl/english/nwo/
http://www.br.fgov.be/BIODIV/index.html
http://www.metla.fi/projects/
http://www.metla.fi/hanke/eindex.htm
http://www-db.helsinki.fi/tuhti/en/
http://fibre.utu.fi/proj/index.htm
http://www.sussex.ac.uk/Units/gec/
http://www.environment-agency.gov.uk/envinfo/
http://www.rfbr.ru
http://www.ecoprojects.ru