Evaluation of BioSoil Demonstration Project: FOREST BIODIVERSITY

Analysis of Biodiversity module

Executive Report

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The Biosoil Demonstration Project: Biodiversity module

1 Forest Biodiversity

1.1 Background

The BioSoil demonstration project is one of the studies initiated in response to Article 6 of Regulation (EC) No. 2152/2003 (Forest Focus) to develop the EU forest monitoring scheme by means of studies, experiments, demonstration projects, testing on a pilot basis and establishment of new monitoring activities.

The aim of the BioSoil project is to demonstrate how a large-scale European study can provide harmonised soil and forest biodiversity data and contribute to research and forest related policies.

The project comprised two main modules:
   a) Soil Module;
   b) Biodiversity Module.

Both modules used a common scheme for sampling data, which was also the location in many countries of the existing network of sites for monitoring the forest environment under Forest Focus / International Cooperative Programme on assessment and monitoring air pollution effects on Forests. In this way existing information about the sites could be used to add value to the results of the BioSoil study.

This report presents the results from the Biodiversity module.

Despite being a demonstration project, it has produced a valuable common baseline on forest biodiversity information where changes over time and space can be monitored in the future. This is of particular relevance to the EU biodiversity policy and for the assessment of the new 2020 biodiversity goals.

1.2 Data collection

The following information on several aspects of biodiversity was collected:
   • general plot characteristics;
   • Stand structure and composition including tree species, diameter distribution, height and canopy and number of tree layers on the plot,
   • Deadwood amounts and state of decay;
   • Numbers and distribution of ground vegetation species.

1.3 Timescale and costs of the project

The Biosoil project on forest soil and biodiversity had an allocation of €10 million: €9 million devoted to the soil part and approximately €1 million for biodiversity.

The Biodiversity field survey started in 2006 and finished in 2008. Most of the field work was done in the summer of 2006 and 2007. The submission of data and consequent analysis was closed in 2010.

A total of 3379 plots were assessed by the 19 Member States who participated in the project. These were Austria, Belgium (Flanders only), Cyprus, Czech Republic, Denmark, Finland, France, Germany (9 Länder: Baden-Württemberg, Bavaria, Brandenburg/Berlin, Hessen, Mecklenburg-Vorpommern, Niedersachsen, NRW, Rheinland-Pfalz and Saarland), Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Spain (including Canary Islands), Sweden and United Kingdom.

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2 Operating under the UNECE Convention on Long Range Transboundary Air Pollution
2 Main Results

The main findings regarding the plot characteristics, structural and compositional biodiversity and deadwood are given below.

2.1 General plot characteristics

The general plot characteristics given for the surveyed plots reveal information at European level about the age of the forests, their management and their type:

Two thirds of the plots have been forested for more than 100 years and over a third for more than 300 years. Only 14% of the plots are in new forested areas (forested in the last 25 years).

Half of all the stands originate from natural regeneration. Nevertheless there are clear country differences, with a high proportion of planted stands recorded in the UK, Czech Republic and Poland.

More than half of the plots were described as high forests.

Two thirds of the plots have been managed within the last ten years and only 10% show no evidence of management, mainly in mountainous regions.

In just over half of the plots, deadwood is completely or partly removed from the forest, while the stems and branches are left lying in the forest in over a quarter of the plots.

Nearly half of all the plots were reported as being in an intimate tree mixture, where different tree species are mixed throughout the stand.

The age classes of the plots form a fairly regular distribution with the modal age category reported as between 41 and 60 years. There are important differences between countries: Ireland has the youngest forests and France has the greatest number of plots containing trees over 120 years. Figure 1 shows the distribution of plots according to the age class of the dominant tree storey.

The European Forest Type classification (EEA Technical Report 9/2007: “European forest types - Categories and types for sustainable forest management reporting and policy”) was used to classify the plots. Boreal forests made up the largest class, mostly because of a large number of plots in Finland. France and Germany both reported plots in all but 2 of the 14 forest types.
2.2 Structural Biodiversity

The analysis of structural biodiversity revealed the following main results:

The number of trees per plot was estimated considering a minimum diameter of 7cm.

The average tree density ranged from less than 300 trees per hectare in Cyprus to a tree density in Ireland of more than 1200 trees per hectare (Figure 2).

63% of the plots have a canopy closure of more than 50%. Around 10% of plots have a canopy closure score of 25% or less.

The basal area per plot was calculated for all live trees over 7cm in diameter. In 50% of the plots the average basal area was between 10 and 30 m²/ha. Only 10% of the plots have a basal area of more than 50 m²/ha.

The project also provided information on the tree layers. In almost two thirds of the plots there is only a single dominant tree layer, followed by 27% having two layers and 9% with three or more layers.
2.3 Compositional biodiversity

The species composition of both the main tree species and the ground vegetation was assessed.

The forest plots are more or less evenly populated with conifer and broadleaf species. Around 40% were composed entirely or mainly by conifers. The same proportions were seen for broadleaves, with the remaining 20% of plots of mixed composition.

The measurement of tree species richness revealed that the number of species found in the plots varied from 1 to 13 with nearly half of the plots recording only one or two tree species.

<table>
<thead>
<tr>
<th>NUMBER OF TREE SPECIES IN PLOT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plots</td>
<td>745</td>
<td>760</td>
<td>696</td>
<td>463</td>
<td>305</td>
<td>135</td>
<td>76</td>
<td>21</td>
<td>16</td>
<td>7</td>
</tr>
</tbody>
</table>

Slovenia, France and some of the German Länder had the highest average scores for tree species biodiversity.

2302 vascular ground species were recorded across Europe, with an average of 24 species per plot, although the distribution is skewed. 54% of the plots recorded 1 to 20 species and 35% 21 to 40 species, which covers almost 90% of all the plots (Figure 5).

One quarter of all the vascular species found were recorded only once in the entire survey, but the most commonly recorded species – *Vaccinium myrtillus* (bilberry) – was recorded in 16 of the 19 countries and in all of the European Forest Type classes except Broadleaved evergreen forests.

The greatest average numbers of ground vegetation species were found in plots in Thermophilous deciduous forests and Alpine coniferous forests.
2.4 Deadwood

Coarse woody debris (pieces with a mid-diameter of at least 10cm) was measured over an area of 400m². The total volume of deadwood in each plot was estimated by the sum of the volumes of all pieces of lying and standing deadwood.

The assessment of deadwood revealed that two thirds of the plots contained less than 10 m³/ha of deadwood, of which 10% contained no deadwood at all. On the other hand, extremely large volumes of deadwood (>100m³/ha) were recorded at some plots (Figure 6).

Figure 6: Total estimated deadwood volume per plot expressed in m³/ha

The average deadwood volume varies between countries. The highest mean values were found in some of the German Länder and Austria. The lowest volumes were found in Cyprus and Spain.

There was a relationship between the 14 European Forest types and the amount of deadwood found in the plots. Alpine coniferous forests and Mountainous beech forests contained, on average, the most deadwood (25 m³/ha). Broadleaved evergreen forest contained the lowest amounts (2m³/ha), although this forest type is relatively rare.

Standing and lying dead trees were also taken into consideration when calculating plot deadwood volumes. They contributed approximately 20% of the calculated volume of deadwood. This is probably an underestimate due to difficulties in making an accurate estimate of dead tree volumes.

3. Summary

As a test of practical indicators of forest biodiversity the project was successful, and the main aims of the programme were achieved: to demonstrate that it is possible to collect harmonized biodiversity information at European extent; to present the European forest type classification in a practical application, and to establish an improved common baseline of forest biodiversity information where changes over time and space can be monitored in the future.

However, a number of recommendations can be made regarding the simplification and streamlining of procedures for future similar surveys; in particular for the accurate assessment of deadwood.
Abstract
The BioSoil demonstration Project was initiated under the Forest Focus-Scheme (Regulation (EC) Nr. 2152/2003) concerning the monitoring of forests and environmental interactions in the Community, and aimed to broaden the scope of previous forest monitoring activities (on atmospheric pollution and forest fires) to the fields of soil characteristics and biodiversity indicators. The results presented here are from the Biodiversity module in which various aspects of forest biodiversity, including species composition, structural elements and deadwood, were assessed over 3379 plots in Europe. As a test of practical indicators of forest biodiversity the project was successful, and the project has produced a common baseline on forest biodiversity information where changes over time and space can be monitored in the future. This is of particular relevance to the EU biodiversity policy and for the assessment of the new 2020 biodiversity goals. A number of recommendations can be made regarding the simplification and streamlining of procedures for future similar surveys.
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