



## Applied botanical research at the Institute for Forestry and Game Management (IBW-IFG, Flanders-Belgium)

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**Abstract.** – *An overview is presented of research activities, related to vegetation sciences and botany, performed at the Institute for Forestry and Game Management. Special attention is given to how this scientific knowledge is implemented in management guidelines and practices. Presented topics are: methodology and results of intensive monitoring of vegetation dynamics in strict forest reserves; genetic and morphological diversity of plant species in water courses and the impact of planting them on the present flora; analysis of silvicultural and floristic data of the Flemish Forest Inventory; inventory and study of autochthonous woody plants and programs for in situ and ex situ conservation; influence of extensive grazing on forest species composition and vegetation structure; comparison of vegetation composition in new forest stands: active vs. spontaneous afforestation.*

**Samenvatting.** – *Toegepast botanisch onderzoek van het Instituut voor Bosbouw en Wildbeheer (IBW). Een overzicht wordt gegeven van de onderzoeksactiviteiten IBW in verband met vegetatiekunde en botanie. Hoe deze wetenschappelijke kennis om te zetten in beheersrichtlijnen en de beheerspraktijk krijgt speciale aandacht. Onderzoekslijnen zijn: methodologie en resultaten van intensieve monitoring van vegetatiedynamiek in strikte bosreservaten; genetische en morfologische diversiteit van plantensoorten in waterlopen en de impact van aanplantingen ervan op de aanwezige flora; analyse van bosbouwkundige en floristische gegevens van de Vlaamse bossen; inventarisatie en studie van autochthone houtachtige planten, en in situ en ex situ beschermingsprogramma's; invloed van extensieve begrazing van bossen op soortensamenstelling en vegetatiestructuur; vergelijking van de vegetatiesamenstelling in nieuwe bosbestanden: actieve versus spontane bosontwikkeling. Vertaald door de redactie.*

**Résumé.** – *Recherche botanique appliquée à l' 'Instituut voor Bosbouw en Wildbeheer' (IBW, Flandre, Belgique). Un aperçu des activités de recherche relatives aux sciences de la végétation et à la botanique poursuivies à l' Institut pour Bosbouw en Wildbeheer ('Institut pour l'Aménagement Forestier et Cynégétique') est présenté. Une attention particulière est accordée à la manière dont cette connaissance scientifique est mise en application dans les directives et les pratiques de l'aménagement. Les sujets présentés sont: méthodologie et résultats de la surveillance intensive de la dynamique végétale dans les réserves forestières intégrales; diversité morphologique et génétique des espèces végétales dans les cours d'eau et influence des plantations sur la*

*flore actuelle; analyse des données floristiques et sylviculturales de l'Inventaire Forestier Flamand; inventaire et étude des plantes ligneuses autochtones et programmes de conservation in situ et ex situ; influence du pâturage extensif sur la composition en espèces forestières et sur la structure de la végétation; comparaison de la composition de la végétation dans les nouvelles stations forestières: reforestation spontanée versus reforestation active.* Traduit par la rédaction.

## 1 Introduction

The Institute for Forestry and Game Management (Instituut voor Bosbouw en Wildbeheer, IBW) (<http://www.ibw.vlaanderen.be>) aims to be the internationally recognized, central institute in Flanders, responsible for scientific research and scientific services, concerning greenery, forests, fauna, fish stock and their management. It was founded by a Flemish Government Decree on March 13rd 1991 as a scientific research institute, incorporating the former Government Poplar Research Station (located in Geraardsbergen) and the former Government Station for Sylvicultural and Hydrobiological Research (located in Groenendaal).

Today's scientific research focuses on forests, inland fish stock and fauna falling under special legislations (angling, hunting). Research topics have been identified in response to questions from forestry, inland fishery, nature conservation and hunting sectors, as well as from other research institutions. Other research is carried out in support of regional and European policy making.

The Institute has access to its own library, nurseries, seed orchards, climatized greenhouses, laboratories for in vitro, pedological, phytopathological, genetic and zoological research, a measuring unit for air pollution, a fish breeding centre, ....

Results of research activities are disseminated through articles in national and international journals, participation in seminars and meetings, organisation of study tours, excursions, advice... as well as through own publications: scientific reports, the annual activity report and the periodical 'Mededelingen'.

## 2 Research activities

### 2.1 Intensive monitoring of forest vegetation dynamics in strict forest reserves in Flanders: methodology and first results

Strict forest reserves in Central and Western Europe are mostly small (10-25 ha). Besides their nature conservation value, they are mainly conceived for the study of spontaneous forest dynamics. They therefore serve as an information-tool for better close-to-nature management of multifunctional forest outside the reserves.

A standard methodology for the monitoring of these stands was developed, based on experience and methods in neighbouring countries, and some own preliminary studies (Vandekerkhove & Van Den Meersschaut 1998, Vandekerkhove 2000). The system is based on permanent plots, combining a grid system with a core area. Every 10 years measurements will be repeated.

The time series of data from the circular plots will provide information on the development of the area as a whole, while as the study of the core area will provide more detailed information on the ecological processes within the stand (Vandekerkhove & al. 2001).

### 2.2 Genetic and morphological diversity of three plant species of water-courses and the impact of planting of these species on the present flora

When (river)banks are artificially planted, the critical question is raised, by directly or indirectly involved parties, whether these measures are soundly based. Particularly whether the present and

possible autochthonous vegetation will become endangered in time. Not in the least the attention has been drawn to the possible negative consequences of the phenomenon of 'genetic pollution'.

To clear this matter up a 'TWOL'-research (Applied Scientific Research in Environment) was started at the Department for Plant Genetics and Breeding (Agricultural Research Centre, CLO), in cooperation with the Institute for Forestry and Game Management and acting upon instructions from the Forests and Green Spaces division (Afdeling Bos & Groen).

The research has to lead to provide knowledge in the use of ecologically reliable basic material. In time it is desirable that plants will be available on the market, which cover certain, still to be made, 'ecological standards'.

Three plant species (*Phragmites australis*, *Typha latifolia*, *Iris pseudacorus*) have been selected for research on their morphological and genetic diversity.

*Phragmites* plants from different locations were placed in uniform growth conditions to measure morphological characteristics and to be compared with plants in natural vegetation.

Clonal plant populations are often supposed to consist of only few genotypes. Results for *Iris pseudacorus* have shown that within the studied locations in Flanders still a large potential of genetic diversity is present (Lamote & al. 2001b). It is also suggested that clonal and sexual reproduction both occur in *Phragmites australis* populations in the estuary of the Schelde River (Lamote & al. 2001a).

### 2.3 Analysis of silvicultural and floristic data from the Flemish Forest Inventory

To conduct an efficient forest policy, accurate and recent data concerning the basic characteristics of the forest are needed. That is why during the period of 1997-2000 the first Flemish Forest Inventory was completed.

After a first processing of the data the most important results were published in a final report (Afdeling Bos & Groen 2001). Further statistical analysis and scientific processing has been done at the Institute for Forestry and Game Management.

An important contribution of the forest inventory data was made to the 'authenticity index', developed by Van Den Meersschaut & al. (2001). The main aim of this project was to produce a standardised and practical methodology for the monitoring of some important aspects of biodiversity in forests. A scoring system for stand structure, species composition of herbal and woody layer and dead wood was developed, based on the forest inventory dataset.

The results proved the index to be sensitive to changes due to management and to be reflecting the actual diversity (structural and compositional) of forests.

The index values for all of the sample plots of the forest inventory varie mostly between 20-50/100. Particularly low values are calculated for dead wood and woody layer. Nevertheless some plots can reach the maximum for one aspect of the authenticity index.

Through the direct link with the forest inventory, the index is a useful and practical tool for the monitoring of the overall performance of management measures and policies on some important aspects of forest diversity (Vandekerkhove & al. 2001, Van Loy & Vandekerkhove 2001).

### 2.4 Inventory and study of autochthonous woody plants and programs for *in situ* and *ex situ* conservation

Many trees and shrubs are planted for reasons of nature conservation and landscape design. It is therefore important to carefully watch over the use of autochthonous planting material.

An autochthonous tree or shrub has regenerated only spontaneously since the last ice age or has been propagated by man using local original plant material. Strictly spoken, native woody plants that are imported from a different climatic zone or geological area are not autochthonous.

The growth sites of autochthonous trees and shrubs in Flanders and their quality have drastically been reduced over the last decades. Obvious reasons are the process of intensive forest-use and deforestation in the past centuries and more recently the agricultural scale enlargement.

Less known is the import of seeds from native species, but of foreign origin. Forest reproductive material is often grown from seeds that originate from East and South Europe, where cheap labour is at hand. These woody plants are less adapted to the Flemish growth conditions because of their remote origin. They can flower too early, grow too fast, be more sensitive to diseases,... By the spread of foreign genes, they can influence the genetic constitution of local autochthonous populations of the same species.

Inventory of autochthonous trees and shrubs in Flanders is a first step towards their conservation and use. The inventory opens possibilities to in situ and ex situ conservation of autochthonous gene resources. The Flemish Community invests in the harvesting of autochthonous seeds, to create autochthonous plant material, and in scientific research on genetic diversity of autochthonous populations (Coart & al. 1998, Vander Mijnsbrugge 2001).

### **2.5 Influence of extensive grazing on forest species composition and vegetation structure**

The aims of this research is to study the effects of extensive grazing on species composition and vegetation structure in relation to forests, through monitoring of a number of small case-studies. Permanent quadrats (PQ's) and circular nested plots are marked out to follow the changes in vegetation over time, both in composition and structure, with special attention to forest regeneration and forest structure. Three distinct case-studies are monitored up to now:

- in the forest reserve 'Grootbroek' (Kinrooi) a primarily open area of 20 ha (of which 5 ha of forest) is grazed in the summer-season by cattle (3-4 animals);
- at the military domain 'Kamp van Beverlo' (Leopoldsburg), 100 ha of mostly homogeneous pineforest is grazed in summer by cattle (6 animals);
- in nature reserve 'Altembroek' (St-Martens-Voeren), on 70 ha consisting of abandoned arable land, meadows and patches of ancient woodland, the effects of year-round grazing (8 animals) are monitored, with special attention to ancient woodland indicator plant species.

### **2.6 Comparison of vegetation composition in new forest stands on formerly intensive agricultural lands: active vs. spontaneous afforestation**

When farmland is converted into forest, most of the time artificial afforestation is preferred over spontaneous forest development. This causes a lot of controversy and discussion among nature and forest managers. From a nature conservation point of view the advantages and disadvantages of spontaneous afforestation have been insufficiently documented with Flemish research.

The goal of this project is to find out the differences between spontaneously forested and artificially afforested farmland with regard to vegetation structure and species composition of the herbaceous layer. The method consists of selecting a number of representative sites, where both a spontaneous and an artificial afforestation on former farmland are found, under the same growth conditions. A distinct is made between several soil types. For each of these soil types at least one case study has been elaborated. The vegetation in the sites is inventoried in permanent sample plots. Measurements on stand structure and amount of light are performed. Also a mixed soil sample is taken in every sample plot.

Besides the comparing research, a GIS-database is built with all known spontaneous afforestations in Flanders (Verstraeten & al. 2001).

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