ForestBIOTA
Forest Biodiversity Test-phase Assessments

Project proposal under Regulation (EC) No 2152/2003 (Forest Focus) for the development of forest biodiversity monitoring (Art 6(2) monitoring test phase)

Abstract

ForestBIOTA aims at the further development of forest condition monitoring activities by conducting a monitoring test phase under Art 6(2) of the Forest Focus regulation. Its objectives are (i) the test wise development and implementation of additional assessments and (ii) correlative studies for compositional, structural and functional key factors of forest biodiversity based on existing Intensive Monitoring (Level II) plots and (iii) recommendations for forest biodiversity indicators that can be applied in the context of existing national forest inventories (collaboration with ENFIN – European Forest Inventory Network).
ForestBIOTA is a joint action of 14 European countries to be carried out on 123 plots. The existing Level II data base and infrastructure will enable a quick start up of the project. Harmonized methodologies for additional assessments in the fields of (a) stand structure, (b) deadwood, (c) forest classification, (d) epiphytic lichens, (e) extended ground vegetation surveys have already been developed by experts of 16 European countries in early 2003. The additional assessments are carried out under transnational coordination of designated experts. There is an integrated multivariate statistical evaluation. Overall coordination, data base management and reporting is carried out by the German Federal Research Centre for Forestry and Forest Products.

1. Introduction

ForestBIOTA is a joint action by 14 countries, 8 of which are EU-15 Member states (see Fig.1 Chapt. 3). The participating EU -15 Member States as well as the accession countries will apply for co-financing of their national contribution within their National Programmes referring to this project proposal and will ad their own financial sheets.

1.1 The policy context

Biodiversity has gained global attention particularly since the UNCED conference in Rio de Janeiro in 1992 and the adoption of the Convention on Biological Diversity. Ten years later the World Summit for Sustainable Development in Johannesburg reinforced the importance and formulated the overall target “to achieve by 2010 a significant reduction in the current rate of loss of biological diversity”. For the European region the Environment for Europe Ministerial Conference in Kiew (ECE/CEP/94/Rev.1) as well as the EU in its 6th environmental action programme (Decision No 1600/2002/EC of 22 July 2002) have formulated the even more ambitious target “to halt the loss of biodiversity until 2010”. At their 4th Ministerial Conference in Vienna, April 2003, the forestry ministers of Europe and the European Community declared the aim to “further maintain, conserve, restore and, as appropriate, enhance forest biological diversity” (Vienna Resolution 4). In December 2003 Regulation (EC) No 2152/2003 (Forest Focus) entered into force aiming *inter alia* at the development of forest biodiversity monitoring in Europe (Art 6 (2)).

1.2 ForestBIOTA and ENFIN

ForestBIOTA cooperates with the ENFIN (European National Forest Inventory Network) project "Comparison and evaluation of methods suitable for monitoring dead wood, vegetation, and epiphytic lichens". ENFIN will submit a separate project proposal. ForestBIOTA and ENFIN proposals complement each other. Both projects have their strengths and main responsibilities:

- Development of monitoring methods: The intensive monitoring plots of the EU and ICP Forests programme offer a good field basis for the development of required monitoring methods in the frame of the ForestBIOTA project.
- Literature reviews and large scale application: ENFIN's application is tackling similar questions mostly based on reviews of literature and NFI methods including harmonisation issues, and thus can put ForestBIOTA results in a wider context.

The adaptation of the ForestBIOTA monitoring methods to large scale monitoring is in the intersection of both projects. This will be carried out with joint forces in the later stages of the projects (see ForestBIOTA work package 3).

2. Objectives of the project

ForestBIOTA aims at the further development of forest condition monitoring activities by conducting a monitoring test phase following Art 6(2) of the Regulation (EC) No 2152/2003 (Forest Focus). Specifically it aims to contribute to forest biodiversity assessments in Europe by

Work package 1: further development and test wise implementation of monitoring methods for different aspects of forest biodiversity at intensive monitoring plots;
Work package 2: correlative studies in order to determine relationships between some compositional, structural and functional key factors of forest biodiversity at the monitoring plots using existing intensive monitoring data as well as newly assessed data.
Work package 3: recommendations for forest biodiversity indicators and surrogates that can be applied in the context of large scale inventories.

3. The work packages

Work package 1: Development and implementation of monitoring methods

The project is foreseen to be carried out on 123 Intensive Monitoring Plots, being mainly existing Level II plots of the EU and ICP Forests forest condition monitoring programme. Plots are mostly 0,25 ha and a wealth of data is already existing for most of the plots (e.g. general site and plot information, ground vegetation assessments, forest growth data, meteorological information). The standard assessments in these fields are continuing independently from the project. The use of existing infrastructures and the availability of rather extensive data sets is an important asset and will enable a rather quick start up.

In order to enable a wider perspective on the biological diversity of the plots a number of additional assessments are foreseen to be carried out. These assessments cover the fields of

1. Stand structure
2. Deadwood
3. Forest classification
4. Epiphytic lichens
5. Extended ground vegetation surveys

Common methods for these five additional assessments have already been agreed upon during a workshop in Sabaudia, Italy, in 2003. At this workshop experts from 16 European countries were participating.

The assessment of additional species groups, going beyond ground vegetation and epiphytic lichens would be very desirable as other species groups react differently to changing environment and forest structure. An inclusion at later stages might be discussed but would overload the project partners at present. However, additional species groups are assessed in other projects with which there is a co-operation (e.g. BioAssess) and on Level II plots in some countries (e.g. fungi in France, soil fauna in Switzerland, soil fauna and humus forms in Italy and probably from 2004 onwards in Germany, naturalness and landscape diversity in Italy). This national know-how and the results are taken into consideration.

WP 1.1 Stand structure

Rationale: In many studies, the structure of forest stands is regarded as a basic parameter related to the diversity of organisms (e.g. Ferris and Humphrey 1999, Neumann and Starlinger 2001, Newton and Kapos 2002, Larsson 2001). As stand structure is comparatively easy to assess, its potential as a general indicator for forest biological diversity is emphasized. The existing standard Level II data set enables the calculation of some stand structural indices (De Vries et al. 1999). The project aims to calculate additional distant dependant indices in two steps. Firstly a pilot study will be conducted on one or two plots of each major forest type (see WP 1.3) based on measured coordinates of all trees. Such coordinates already exist for at least 36 of the 123 plots. The pilot studies will produce distant dependent indicators and will allow determining sample sizes for cheaper so-called "structural group of four" inventories to be conducted on a bigger number of project plots. A final decision on the implementation of the "structural group of four" inventories can only be taken after finalization of the pilot studies.
Responsibilities, workflow and expected results: The "structural group of four" inventories will be carried out by the countries under the coordination of the Forest Research Institute of Lower Saxony (NFV) and the Federal Research Centre for Forestry and Forest Products (BFH). The data will be submitted to the BFH and will be evaluated by the NFV also taking into account the existing standard Level II data sets. The evaluations will result in a small number of stand structural key figures per plot as well as a work report on the main results and experiences of the stand structure assessments jointly written by the NFV and the BFH and reviewed by the countries.
Full methodology: http://www.forestbiota.org/docs/struct1.doc

WP 1.2 Deadwood

Rationale: Deadwood is an essential feature for the determination of the biodiversity status of forests as a large number of species groups depend on it. The parameter is not yet explicitly included in the standard Level II data sets. The project's assessment method combines full callipering for larger dimensions with line intersect sampling for lying dead wood with smaller diameters. Species and decay stage are assessed as well. Like in European forests in general, deadwood management on the monitoring plots differs between countries. In some countries it is rather consequently removed from the plots in order to not endanger and hinder the deposition monitoring activities. In other countries deadwood remains on the plots as far as possible. These changing pre-conditions will be taken into account when evaluating the data. They will enable the development of deadwood monitoring methods applicable under varying management regimes.
Responsibilities, workflow and expected results: Deadwood data will be assessed by the countries, submitted to the BFH and centrally evaluated by the Italian Academy of Forest (IAFS) overview report jointly written by the IAFS and BFH and reviewed by the countries.
Full methodology: http://www.forestbiota.org/docs/protocol_deadw_09-03.doc

WP 1.3 Forest classification

Rationale: Relationships between environmental factors are to a large extent forest type specific. For the collection and interpretation of forest plot information from a multitude of Level II plots throughout Europe, the need of an ecologically oriented categorization of the plots becomes obvious.

Based on EUNIS (European Union Nature Information Scheme) and the BEAR project (Larsson, 2001), the Italian Academy of Forest Science (IAFS) has already developed a system to classify Europe into 28 general forest types.
Responsibilities, workflow and expected results: A first application of the system has already been carried out by the countries within the ForestBIOTA project. Improvement and revision of the classification system is still ongoing. The project will adopt a revised scheme given that it will be available until autumn 2004. A work report jointly written by the IAFS and BFH and reviewed by the countries will present the experiences with the new system and give recommendations for improvement.
Full methodology: http://www.forestbiota.org/docs/classification1.doc

WP 1.4 Epiphytic lichens

Rationale: The epiphytic lichen monitoring method adopts the main features of the BioAssess approach (Scheidegger et al. 2002, Asta et al. 2002) but modifies it specifically for Level II plots. On each plot, 12 trees are selected proportionally according to dimension and bark types occurring on the plot. In order to specifically detect seldom lichen species, additional trees will be sampled. The lichen frequency is assessed in 20 grids of 100 cm^2 per tree.
Responsibilities, workflow and expected results: Already in 2003 some countries have tested the newly developed lichen assessment methods on their plots (Switzerland and Italy), others are comparing or intend to compare existing results based on previous methods with expected results based on the harmonized methods (Spain, Germany). In this sense, harmonization has already become reality on a small scale but needs reinforcement through application on a lager number of plots in 2004. The lichen data will be submitted to the BFH, and will be pre-evaluated by the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), resulting in a small number of lichen diversity indices per plot as well as a work report jointly written by WSL and BFH and reviewed by the countries.
Full methodology: http://www.forestbiota.org/docs/lichensICP.doc

WP 1.5 Extended ground vegetation surveys

Rationale: Ground vegetation information is a key parameter for biodiversity which is already available for almost all Level II plots. The assessments are mandatory on a 400 m^2 area. Within ForestBIOTA, additional assessments are foreseen in order to produce complete species lists for the 2500m^2 plot. This seems necessary in order to take into account the diversity in ground vegetation specifically on the Mediterranean plots. In addition, species area relations provide diversity information and can be evaluated as soon as information on species numbers is available for different sampling area sizes.
Responsibilities, workflow and expected results: Ground vegetation data will be assessed by the countries, submitted to the BFH and will be centrally evaluated by the BFH, resulting in a small number of diversity indices per plot as well as a work report on the main results and experiences of the ground vegetation assessments.
Full methodology: http://www.forestbiota.org/docs/veg-draft.doc

Work package 2: Correlative studies

Rationale: Through its comparatively wide geographic range and the large number of plots, the data of the test-phase assessments in combination with the existing Level II data base can be used for correlative studies between some compositional, structural and functional key parameters of forest biodiversity at the monitoring plots.
Köhl and Päivinen (1996) defined indicators as an "attribute that characterises another attribute, which is not directly assessed or available". The expected ForestBIOTA results can statistically underpin the relations between such "attributes" and may thus serve as valuable input for the ongoing indicator development on the pan-European level.
However, ForestBIOTA only includes test-phase assessments for a very limited number of taxonomic groups and results of correlative studies are naturally confined to these.
Table 1 gives an overview on the hypotheses to be examined within ForestBIOTA and the planned evaluations related to these.

Table 1: Hypotheses and related evaluations.

Hypothesis	Evaluations foreseen
1. Complex stand structural indices are statistically related to more simple estimates for stand structure that can more easily be carried out on a larger number of plots.	Explore statistical relations between complex stand structural indices and simple estimates for stand structure.
2. Results of comprehensive deadwood assessments are statistically related to more simple measurements for deadwood that can more easily be carried out on a larger number of plots.	Explore statistical relations between results of complex deadwood assessments and more simple measurements.
3. Mainly through its influence on light conditions, stand structure is related to the diversity of vascular plants, bryophytes and lichens in the ground vegetation. Also site conditions have to be taken into account. Expected relations are forest type specific.	Carry out multiple regression analyses in order to determine the dependency of ground vegetation diversity from stand structure and additional variables like site characteristics, meteorology and deposition.
4. Stand structure and air pollution are both related to epiphytic lichen diversity. Expected relations are forest type specific.	Carry out multiple regression analyses in order to determine the dependency of epiphytic lichen diversity from stand structure, deposition and other variables like site characteristics and meteorology.
5. Structured stands are the basis for richer functional diversity. They provide the more active humus forms and a better nutrient status of soil and trees.	Carry out multiple regression analyses in order to determine the dependency of humus forms and nutrient status of soil and trees from stand structure and other variables like site characteristics, meteorology and deposition.
6. Depending on their specific ecological requirements the occurrence and diversity of various taxonomic groups is only partly related.	Explore statistical relations between diversity indices for vascular plants, bryophytes and lichens in the ground vegetation as well as epiphytic lichens.

As the Level II plots are in many cases situated in managed forests the occurrence of deadwood is assumed to be mainly driven by man. Also, there are no direct assessments of species groups living on deadwood. Therefore there is no significant statistical relation to be expected between deadwood occurrence and the other assessed species groups. Deadwood assessments in the ForestBIOTA project are mainly following objective 1: "development and implementation of monitoring methods".

Responsibilities, workflow and expected results: The existing Level II data as well as work package 1 will provide input for the correlative studies. The evaluations will be carried out at the Finish Forest Research Institute (METLA – hypothesis no 3 and 6) and BFH (hypothesis no 1,2,4,5). A work report on the main outcomes will be written by METLA and BFH. The report will include a detailed description of the statistical relationships determined, as they will be a basis for work package 3.

Work package 3: Indicator development for large scale monitoring

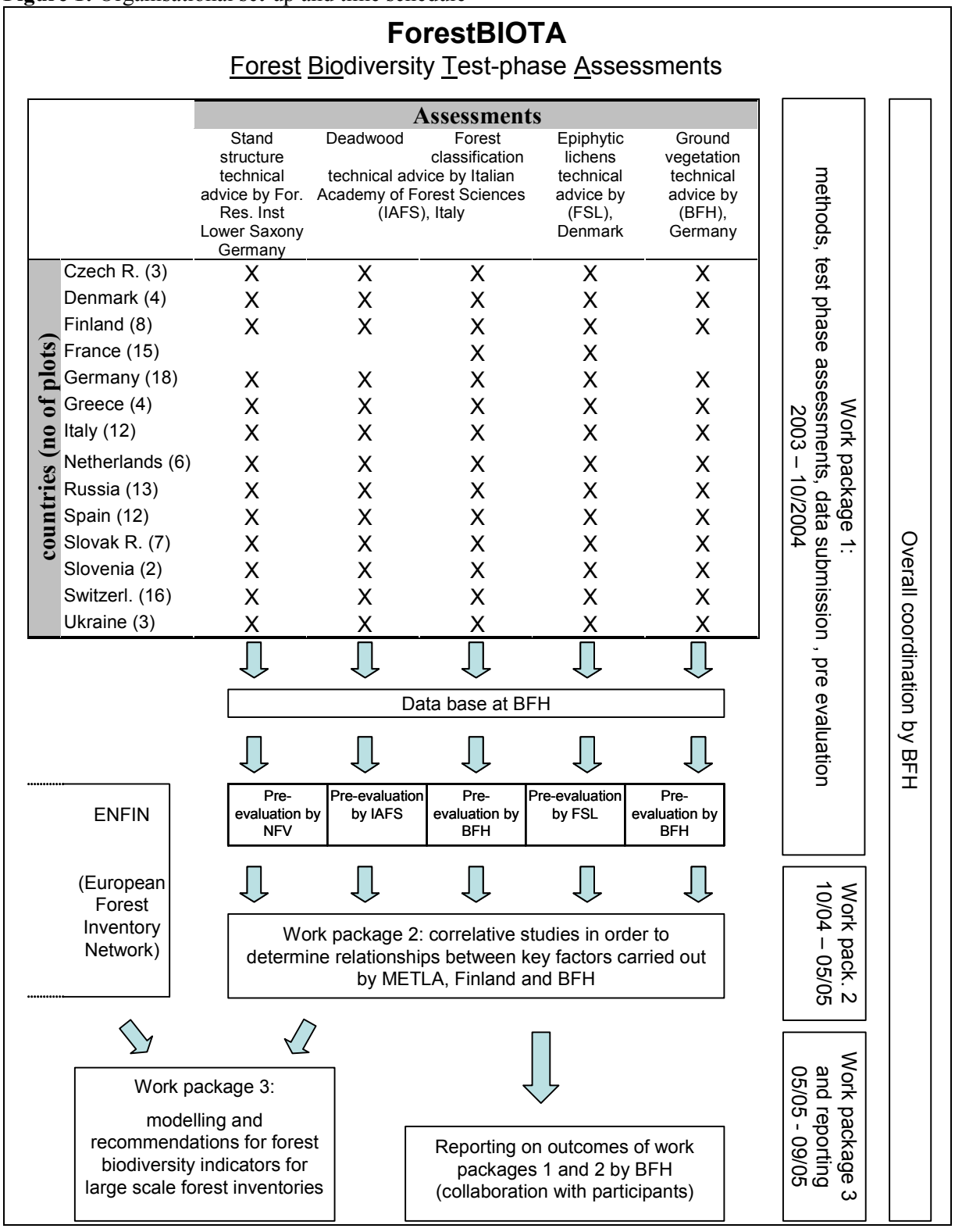
(cooperation with ENFIN)

Rationale: ForestBIOTA establishes statistical relationships between different components of forest ecosystems (work package 2). The set up of such relationships will require rather complex and detailed data as provided by the existing Level II data base and by work package 1. Given the case that the derived statistical relationships are robust and statistically significant, work package 3 will establish statistical models that depict these relationships and that can be run by data that are already available from e.g. national forest inventories in at least some countries or that can be assessed comparatively easy by large scale forest inventories in the future. Based on this, recommendations for harmonized biodiversity related assessments within large scale forest inventories will be given jointly by ENFIN and ForestBIOTA. The works are foreseen to be carried out in the later stages of the projects, the approach will be further elaborated in 2004.

3. Organisational set-up and time schedule

The organisational set-up and time schedule is indicated in Figure 1.

Figure 1: Organisational set-up and time schedule



4. Participants

Czech Republic

Forestry and Game Management Research Institute (VULHM), Jiloviste-Strnady 136, CZ-15604 Praha 516, Zbraslav. Mr. Václav Buriánek (burianek@vulhm.cz).

Denmark

Danish Forest and Landscape Research Institute (FSL), Hoersholm Kongevej 11, DK-2970 Hoersholm. Mrs. Annemarie Bastrup-Birk (ab@kvl.dk).

Finland

Finnish Forest Research Institute (METLA), Parkano Research Station, Kaironiementie 54, FIN-39700 Parkano. Mr. Hannu Raitio (hannu.raitio@metla.fi).

France

- Office National des Fôrets (ONF), Boulevard de Constance; F – 77300. Mr. Erwin Ulrich (Erwin.Ulrich@onf.fr).
- Observatoire Mycologique, Néronde, F - 71 250 Mazille. Mr .Ollivier Daillant (Olivier.daillant@skynet.be)

Germany (overall coordination)

Federal Research Centre for Forestry and Forest Products (BFH), Leuschnerstr. 91, D-21031 Hamburg. Mr. Richard Fischer (fischer@holz.uni-hamburg.de).

- Forschungsanstalt für Waldökologie und Forstwirtschaft Rheinland-Pfalz, D-67705 Trippstadt. Mr. Ulrich Matthes, Mr. Block (ulrich.matthes@wald-rlp.de, joachim.block@wald-rlp.de).
- Hessen Forst, Prof.-Oelkers-Str. 6, D-34346 Hann.Münden. Mr. Marcus Schmidt (SchmidtMa@forst.hessen.de).
- Niedersächsische Forstliche Versuchsanstalt, Grätzelstrasse 2, D-37079 Göttingen. Mr. Henning Meesenburg (henning.meesenburg@nfv.gwdg.de), Mr. Peter Mayer (Peter.Meyer@nfv.gwdg.de).
- Landesforstpräsidium, Bonnewitzer Str. 34, D-01796 Pirna OT Graupa. Mr. Gerhard Raben (gerhard.raben@laf.smul.sachsen.de).
- Ökologie-Zentrum, Olshausenstraße 75, D-24118 Kiel. Mr. Claus Schimming (claus-s@ecology.uni-kiel.de).
- Landesforstanstalt Eberswalde, Alfred-Möller-Str. 1, D-16225 Eberswalde. Ms. Angela Steinmayer (Angela.Steinmeyer@lfe-e.brandenburg.de).
- Landesanstalt für Ökologie, Bodenordnung und Forsten – LÖBF, Leibnizstr. 10, D-45659 Recklinghausen. Mr. Lutz Genssler (Lutz.Genssler@loebf.nrw.de).

Greece

Institute of Mediterranean Forest Ecosystems, Terma Alkmanos, GR-11528 Athens-Ilissia. Mr. George Baloutsos (mpag@fria.gr).

Italy

- Ministry for Agriculture and Forestry Policies, Conecofor Service, Via Sallustiana 10, I-00187 Roma. Mr. Bruno Petriccione (conecofor@corpoforestale.it).
- Italian Academy of Forestry Science (IAFS), Via San Bonaventura, 13, IT- 0145 Firenze. Mr. Marco Marchetti, Mr. Gherardo Chirici (marchetti@mclink.it, gherardo.chirici@unifi.it).

The Netherlands

- Ministry of Agriculture, Nature Management & Fisheries, Marijke wag 24, NL-6700 AA Wageningen. Mr. Gerard Grimberg (g.t.m.grimberg@eclnv.agro.nl).
- ALTERRA, P.O. Box 47, NL-6700 AA Wageningen. Mr. Han van Dobben (h.f.vanDobben@Alterra.wag-ur.nl).

Russia, Leningrad region

Forest Technical Academy, 194021,Sankt-Petersburg, Institutsky per.,5. Russia Mr.Alexander S.Alekseev (Alekseev@AA2996.spb.edu)

Spain

Dirección General de Conservación de la Naturaleza (DGCN), Gran Vía de San Francisco, 4, E-28005 Madrid. Mr. Gerardo Sanchez Peña (gsanchez@mma.es).

Slovak Republic

Forest Research Institute Zvolen, T.G. Masaryka 22, 96092 Zvolen. Mr. Thomas Bucha, Jozef Vladovic, Roman Longauer, Jozef Istona (Tomas.Bucha@fris.sk, vladovic@fris.sk, longauer@fris.sk)

Slovenia

Slovenian Forestry Institute, Vecna pot 2, SLO-1000 Ljubljana. Mr. Marko Kovac (marko.kovac@gozdis.si).

Switzerland

Swiss Federal Institute for Forest, Snow and Landscape Research, Zürcherstr. 111, CH-8903 Birmensdorf. Mr. Norbert Kräuchi (kraeuchi@wsl.ch), Ms. Silvia Stofer, (silvia.stofer@wsl.ch) Mr. Christoph Scheidegger

Ukraine

Monitoring and Certification Laboratory of Ukrainian Forest Research Institute, Pushkinska 86, UKR-61024 Kharkiv. Mr. Igor Buksha (buksha@uriffm.com.ua).

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