

COMMISSION REGULATION (EC) No 1545/1999**of 14 July 1999****amending Regulation (EC) No 1091/94 laying down certain detailed rules for the implementation of Council Regulation (EEC) No 3528/86 on the protection of forests against atmospheric pollution**

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

- (5) Whereas the measures provided for in this Regulation are in accordance with the opinion of the Standing Forestry Committee,

Having regard to the Treaty establishing the European Community,

HAS ADOPTED THIS REGULATION:

Having regard to Council Regulation (EEC) No 3528/86 of 17 November 1986 on the protection of the Community's forests against atmospheric pollution ⁽¹⁾, as last amended by Regulation (EC) No 307/97 ⁽²⁾, and in particular Article 3(2) thereof,

Article 1

Regulation (EC) No 1091/94 is hereby amended as follows:

- (1) Whereas, pursuant to the third indent of Article 2(1) of Regulation (EEC) No 3528/86, the purpose of the Community scheme is to help Member States to conduct intensive and continuous surveillance of forest ecosystems on permanent observation plots;
- (2) Whereas, pursuant to Article 2(2) of Regulation (EEC) No 3528/86 Member States are required to forward to the Commission the data gathered by the network of permanent observation plots for intensive and continuous surveillance;
- (3) Whereas this network has been installed by Member States in accordance with Annex I to Commission Regulation (EC) No 1091/94 ⁽³⁾, as last amended by Regulation (EC) No 1390/97 ⁽⁴⁾; whereas the common methodology and the format for the submission of data for the continuous inventory of the crown condition, the inventory of soil and foliar condition, increment, deposition measurements, meteorological observations and soil solution monitoring have been laid down in Annexes III to X to Regulation (EC) No 1091/94;
- (4) Whereas the results of the ground vegetation assessment are already recorded and the common methodology and the format for the data submission are to be added to Regulation (EC) No 1091/94; whereas the common methodology for measurements of meteorology has to be updated;

1. Article 1(2) is replaced by the following:

‘On the permanent observation plots intensive and continuous surveillance of the forest ecosystems shall be carried out. This contains the continuous inventory on the crown condition, the inventory of soil and foliar condition and measurements on increment changes, deposition rates, meteorology, soil solution sampling and analysis and ground vegetation assessment in accordance with objective sampling methods and analysed in accordance with established methods’.

2. Article 1(4) is replaced by the following:

‘Technical details pertaining to the provisions of this Article are set out in Annexes III to XI’.

3. In Article 2(1) the following indent is added after the last indent:

‘— to carry out the assessment of ground vegetation’.

4. Annex I is replaced by Annex I to this Regulation.
5. Annex II, is replaced by Annex II to this Regulation.
6. Annex VIIa is amended in accordance with Annex III to this Regulation.
7. Annex IX, is replaced by Annex IV to this Regulation.
8. Annex V to this Regulation is added as Annex XI.

Article 2

This Regulation shall enter into force on the third day following its publication in the *Official Journal of the European Communities*.

⁽¹⁾ OJ L 326, 21.11.1986, p. 2.

⁽²⁾ OJ L 51, 21.2.1997, p. 9.

⁽³⁾ OJ L 125, 18.5.1994, p. 1.

⁽⁴⁾ OJ L 190, 19.7.1997, p. 3.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 14 July 1999.

For the Commission
Franz FISCHLER
Member of the Commission

ANNEX I

Annex I to Regulation (EC) No 1091/94 is replaced by the following Annex:

'ANNEX I

COMMON METHODS FOR THE ESTABLISHMENT OF A NETWORK OF PERMANENT OBSERVATION PLOTS FOR INTENSIVE, CONTINUOUS MONITORING**(Article 2(1) of Regulation (EEC) No 3528/86 and its amendments)****I. General remarks**

The purpose of the scheme mentioned in Article 2(1) to Regulation 3528/86 and its amendments is to establish a network of permanent observation plots in the Member States of the Community and to collect data by intensive and continuous surveillance.

The objectives of the scheme are:

- to conduct an intensive and continuous monitoring of forest ecosystems in relation to the damage caused by atmospheric pollution and other factors influencing forest condition,
- to improve the understanding of the causal relationship between changes in forest ecosystem and the factors influencing it especially atmospheric pollution, by concentrating at a single location various measurements and monitoring of forest ecosystems and its components,
- to obtain relevant information on the evolution of a number of forest ecosystems in the Community.

II. Establishment of the network of permanent observation plots**II.1. Selection of plots**

Member States selected by 30 June 1994 a sufficiently large number of permanent observation plots in their country. Since then some Member States have completed their national intensive monitoring programme by additional plots. The maximum number of these plots should be in principle limited for each Member State up to 15 plots, but Member States are allowed to select a larger number of plots under the condition that the number will not exceed 20 % of the number of national plots of the Community's 16 x 16 km gridnet (Regulation (EEC) No 1696/87).

The selection of these plots are in the responsibility of the Member States, although the following criteria for the selection should be applied:

- the plots should be located in such a way that the more important forest species and more widespread growing conditions in the respective country are represented,
- the minimum size of a plot shall be 0,25 hectares measured on a horizontal plane,
- to minimise the effects from activities on surrounding areas the plot shall be surrounded by a buffer zone. The actual width of the zone depends on the type and age of the forest. If the area of the plot and its surroundings is uniform with regard to height and age structure, the width of the buffer zone can be restricted to 5 or 10 m. If the forest area in which the plot is located consists of mixed stands, different species or age structure, the buffer zone shall be enlarged to up to five times the potential maximum height of the forest in the plot,
- as the plot will have to be available for long duration monitoring, it is necessary that the corners and/or boundaries are clearly marked and that each sample tree in the plot is numbered in a permanent way,
- the plots should be easily accessible at all times and no restriction with regard to the access and sampling should exist,
- there should be no differences in the management of the plot, its buffer zone and the surrounding forest (e.g. management operations should be comparable), and disturbances caused by the monitoring should be kept to a minimum),
- direct pollution from known local sources should be avoided. Plots should not be located in the immediate vicinity of farms, very close to main roads or in direct vicinity of polluting industries,
- a sufficient number of trees should be available for sampling in or near the plot,
- the plots and the buffer zone should be as uniform as possible regarding, e.g. species or species mixture, age, size, soil and slope,
- the plots should be located sufficiently far away from the forest edge.

It is recommended to select plots which have been monitored in recent years within the framework of Regulation (EEC) No 3528/86 or other programmes. When additional plots have to be selected it is recommended that plots are identical to or located near one of the existing plots of the Community's 16 x 16 km network and that plots are located in such a way that information from other sources (e.g. meteorological stations) can be used.

II.2. *Installation and documentation of the plot*

Member States submitted to the Commission in 1994 the general data and a detailed description of each plot.

The detailed description of the plot includes; the exact location of the plot, a sketch map showing the permanent marking other plot corners and/or boundaries, the number of trees in the plot and any other relevant permanent elements in or near the plot (e.g. access road, rivers). In the future, the exact location of sample sites (e.g. soil pits) shall also be recorded on this map.

II.3. *Definition of a subplot*

In principle all trees in the total plot are to be included in the sample for the tree assessment (e.g. crown inventory, increment assessment). Where the plot has many trees (i.e. dense stands), a subplot may be defined to be used for these surveys. The size of the subplot at the time of the installation of the plot should be large enough to give reliable estimates for these surveys for a minimum of 20 years, preferably throughout the life of the stand. A minimum of at least 20 trees in the subplot should be available in this period.

II.4. *General information on each plot*

The following general information on each permanent observation plot for intensive and continuous monitoring shall be collected during the installation and the first surveys:

Installation	First surveys
— Descriptive code	Country Observation plot number Actual latitude and longitude
— Site data	Altitude Orientation Total plot size Number of trees in plot Subplot (if any) availability of water to the principal species humus type soil unit (estimate)
— Stand data	Mean age of dominant storey, Main tree species Yield (estimate)
— Other observation	History of the plot Other monitoring station situated nearby

Where additional plots are installed in order to complete the national intensive monitoring programme the Member States shall forward to the Commission for each installed plot the information collected during the installation using a datafile (see Annex VIIa, Form 1a) and reports (see Annex VIIa, Form 1b) by the end of the same year in which (re-)installation took place. Important information obtained during the years of monitoring shall be submitted yearly using Forms 1a and 1b (Annex VII). The other information shall be submitted immediately after the first relevant survey has been carried out and will be updated when necessary.

III. **Replacement of destroyed plots**

III.1. *General remarks*

The selection of the plots for intensive monitoring is the responsibility of Member States. For this selection a number of criteria is laid down in this Annex. Most Member States have developed their own strategy for monitoring their national forest ecosystems, aiming at the observation of the more important tree species and growing conditions.

Although the plots were to be selected to be available for long term monitoring a premature destruction of the plot is always possible, due to fire etc. In some cases a number of final samplings can still be carried out before all trees of the plot have disappeared. The next step would be to review the strategy behind the selection criteria and to decide what criteria are to be applied to the selection procedure of the new plot.

III.2. *Closure of a plot*

The opportunity should be taken to make some final measurements/assessments. If still possible before the (final) destruction of the plot, a (destructive) sampling of the monitored trees in the plot can be made. After felling the exact tree length can be measured, stemdisks can be taken and precise foliar sampling can be carried out.

III.3. *Strategy*

The monitoring strategy in most Member States includes aspects on the forest area, forest ecosystem, species and often aspects of soil, meteorology and deposition levels. When a plot needs to be replaced the opportunity should be taken to verify whether the original strategy is still valid and how the gap can best be filled. In this context it should be considered that besides the original surveys (crown condition, soil, foliar and increment) additional surveys have been added to the programme in recent years (deposition, meteorology, soil solution, ground vegetation, remote sensing ⁽¹⁾). It is therefore recommended to take into account the evolution of the intensive monitoring programme when planning the replacement of plots.

In general, however, it might be advisable that the new plots are situated in the same region and have the same soil type, deposition level and tree species as the destroyed plots.

III.4. *Reinstallation of the plot*

For the selection of new plots the same criteria apply as for the destroyed plots. After installation of new plots some surveys, which are not repeated quickly should be carried out as soon as possible (i.e. soil and remote sensing). As the crown condition and foliage surveys are done yearly or two-yearly no additional survey of this kind directly after plot installation is necessary. Where the next regular increment survey is scheduled more than three years after plot installation increment measurements should be carried out directly after plot installation.

III.5. *Special attention points*

The reinstalled plots will be given a new number. Member States will submit to the Commission together with the next regular data submission information on the reason for the plot replacement, the results of last observations/measurements made and the criteria applied for the selection of the new plots.'

⁽¹⁾ The technical details for the optional application of aerial photography on intensive monitoring plots are laid down in the Manual on remote sensing applications edited by the European Commission.

ANNEX II

‘ANNEX II

APPLICATION FOR AID FROM THE COMMUNITY IN RESPECT OF THE MEASURES TO BE CARRIED OUT PURSUANT TO ARTICLE 2 OF REGULATION (EEC) No 3528/86 AND ITS AMENDMENTS

Applications for aid must be presented in accordance with Annex A to Commission Regulation (EEC) No 526/87 ⁽¹⁾ together with a summary of the information listed below and the completed table as included in this Annex as form 2a.

For each of the measures to be carried out in accordance to Article 2, information on the following items shall be given:

1. *Brief description of the measures*

2. *Applicant*

Links between the applicant and the measures

3. *Agency responsible for carrying out the measures*

Object and scope of the agency's main activities

4. *Detailed description of the measures*

where:

(a) the measures relate to establishing or extending the network of permanent observation plots for the intensive and continuous surveillance:

1. description of existing situation
2. geographical location and area of the region(s) concerned (plus cartographical document)
3. number of permanent observation plots;

(b) the measures relate to the establishment and execution of an inventory of the crown condition on the permanent observation plots:

1. description of existing situation
2. number of observation plots, which are to be included in the crown condition inventory (form 2a)
3. detailed description of the sampling procedure used at plot level (number of trees, markings, etc.)
4. indication of timetable for the execution of the projected measures (form 2b);

(c) the measures relate to the establishment and execution of an inventory of the soil condition on the permanent observation plots:

1. description of the existing situation
2. Number of permanent observation plots, which are to be included in the soil condition inventory (form 2a)
3. detailed description of the sampling procedures used at plot level (number of single samples, soil profile description, etc.)
4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods
5. indication of the timetable for the execution of the projected measures (form 2b);

(d) the measures relate to the establishment and execution of an inventory of the foliar condition on the permanent observation plots:

1. description of the existing situation
2. number of permanent observation plots, which are to be included in the foliar condition inventory (form 2a)
3. detailed description of the sampling procedures used at plot level (number of single samples, description, etc.)
4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible
5. indication of the timetable for the execution of the projected measures (form 2b);

⁽¹⁾ OJ L 53, 21.2.1987, p. 14.

- (e) the mesures relate to the establishment and execution of the measurements of increment changes on the permanent observation plots:
1. description of the existing situation
 2. number of permanent observation plots, which are to be included for the increment measurements (form 2a)
 3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)
 4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods
 5. indication of the timetable for the execution of the projected measures (form 2b);
- (f) the mesures relate to the establishment and execution of the measurements of deposition rates on the permanent observation plots:
1. description of the existing situation
 2. number of permanent observation plots, which are to be included for the deposition measurements (form 2a)
 3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)
 4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods
 5. indication of the timetable for the execution of the projected measures (form 2b);
- (g) the mesures relate to the establishment and execution of the meteorological measurements on the permanent observation plots:
1. description of the existing situation
 2. number of permanent observation plots, which are to be included for the meteorological measurements (form 2a)
 3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)
 4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods
 5. indication of the timetable for the execution of the projected measures (form 2b);
- (h) the mesures relate to the establishment and execution of the measurements of soil solution on the permanent observation plots:
1. description of the existing situation
 2. number of permanent observation plots, which are to be included for the measurements of soil solution (form 2a)
 3. detailed description of the measurement procedures used at plot level (number of measurements, description, etc.)
 4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible with the results analysed according to the approved methods
 5. indication of the timetable for the execution of the projected measures (form 2b);

- (i) the measures relate to the establishment and execution of an assessment of the ground vegetation on the permanent observation plots:
 - 1. description of the existing situation
 - 2. number of permanent observation plots, which are to be included in the ground vegetation assessment (form 2a)
 - 3. detailed description of the sampling procedures used at plot level (number of sub-samples, description, etc.)
 - 4. detailed description of parameters to be determined and the analysis methods to be applied including a clear description of any calibration, correction, and/or recalculation needed to make the results compatible
 - 5. indication of the timetable for the execution of the projected measures (form 2b).
- 5. Cost of measures under 4(a) to 4(i) (form 2a)
 - 1. Costs for the establishment or extending the network (4a)
 - 1.1. costs per plot
 - 1.2. total costs
 - 1.3. aid applied for from the Community
 - 2. Costs of establishment, observation or sampling for each survey 4(b) to 4(i)
 - 2.1. costs per plot
 - 2.2. total costs
 - 2.3. aid applied for from the Community
 - 3. Costs of analysis and evaluation for each survey 4(b) to 4(i)
 - 3.1. costs per plot
 - 3.2. total costs
 - 3.3. aid applied for from the Community
 - 4. Total project costs (sum of costs for 1.2 (establishment), 2.2 (observations and/or sampling), and 3.2 (analysis and evaluation))
 - 5. Total aid applied for from the Community (sum of costs for 1.3 (establishment), 2.3 (observations and/or sampling), and 3.3 (analysis and evaluation))
- 6. Complete forms 2a and 2b
Date and signature'

Form 2a

COST BREAKDOWN AND PROPOSED FINANCING (*intensive monitoring*)

Measure	Number of intensive monitoring plots	Cost breakdown					Total cost	Non-Community participation				aid requested
		Personnel	Equipment	Materials	Travel	Other		State	Region	Other public funds	Private	
		(¹)	(¹)	(¹)	(¹)	(¹)		(¹)	(¹)	(¹)	(¹)	
To install and maintain plots for intensive monitoring												
To establish and execute an inventory of the crown condition												
To establish and execute an inventory of the forest soil condition												
To establish and execute a survey on the chemical contents in the needles and leaves												
To establishment and execute increment-change measurements												
To establish and execute deposition monitoring												
To establish and execute meteorologic monitoring												
To establish and execute soil solution monitoring												
To establish and execute ground vegetation surveys												
To apply aerial photography techniques (²)												
Integrated data management and data evaluation												

(¹) In national currency.

(²) Reference is made to the manual on Remote sensing applications edited by the European Commission.

Form 2b

FORWARD PLAN FOR THE EXECUTION OF THE PROJECT

to be completed for each project proposal

Measures	Year	200.													200.													200.												
	Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D			
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ANNEX III

In Annex VIIa to Regulation (EC) No 1091/94 the following part is added:

— In paragraph 1 (review of file names per survey) the following words are added:

Assessment	Annex	Frequency	File name(s)
'Ground vegetation	XI	five yearly	XX1996.PLV, XX1996.VEM'

— the last subparagraph is replaced by:

'Each file name consists of a two-letter country code (represented by XX in the list of names), followed by the year of assessment (in the example 1996) or GENER when the information is given once, a dot (.) and in the extension a three-letter code. This three letter code for the plot files consists of the letters PL and the first letter(s) of the assessment soil, foliage increment, deposition, meteorology, soil solution and ground vegetation. The three-letter code for the datafiles consists of two (or one) letters) for soil, foliage, increment, deposition, meteorology, soil solution or ground vegetation and one (or two) letters) to indicate mandatory, optional or the different parts of the increment assessment (evaluation), deposition assessment (air).'

— Form 5b is replaced by form 5b attached,

— forms 8a, 8b, 8c, 8d, 8e and 8f are replaced by forms 8a, 8b and 8c attached,

— the following 2 forms (form 10a and 10b) are added,

— in the 'Code lists for survey data of the permanent observation plots to be forwarded to the Commission' the following amendments are made:

Information with regard to the foliage inventory

Point 26 is deleted.

Information with regard to the meteorological monitoring

points 41 to 46 are replaced by:

'(41) Plot/instrument code

All instruments that are installed in or near the plot are given an observation plot/instrument code. This code consists of the plot number (up to four digits) and a sequential number for all instruments (up to 99). When instruments are replaced or added, new codes are applied. (e.g. the fifth instrument in plot 1234 will thus receive code 1234.05).

(42) Location

The location of the instrument is indicated:

- S: instrument is located on site, i.e. in (the buffer zone) of the plot. This could be under the canopy, above the canopy or in the forest soil
- F: instrument is located in a (nearby) open field in the forest area
- W: instrument is located at a weather station (in general outside the forest area)
- O: instrument is located elsewhere.

(43) Variable

Indication of the variable that is measured with the instrument

- AT= air temperature
- PR= precipitation
- RH= relative humidity
- WS= windspeed
- WD= wind direction

SR= solar radiation
UR= UVb radiation
TF= throughfall
SF = stemflow
ST = soil temperature
MP = matric potential in the soil
WC = water content in the soil
XX = other codes for additional parameters may be used, but should be specified in the DAR.

(44) *Instrument information*

Vertical position

The vertical position (height or depth) of the instruments shall be indicated in metres with a plus (= height above the ground) or a minus sign (depth below the ground) using the format of two digits and two decimals.

Instrument code

The following codes shall be used for the samplers and recording method of data:

10: manual reading and recording on paper
20: mechanical recording (manual reading and recording on paper)
30: direct paper recording
40: digital recording (in stand alone situation)
50: digital recording (integrated datalogger)

Details of the equipment shall be given in the data accompanying report (DAR).

Scanning interval (automatic instruments only)

The interval between two consecutive assessments shall be given stated in seconds.

Storing interval (automatic instruments only)

The interval between two consecutive data storage moments shall be given in minutes

(45) *Parameters to be assessed in the meteorological monitoring*

Precipitation and throughfall

The precipitation will be given as the daily sum, using the format of up to four digits and one decimal.

Temperature (air and soil)

The temperature will given in °C, using the format of a plus/minus and two digits plus one decimal. The daily mean, daily minimum and daily maximum are to be submitted.

Relative Humidity

The relative humidity will be given as the daily mean, the minimum and the maximum value reached per day, using the format of two digits and one decimal.

Windspeed

The windspeed will be given as the daily mean and the maximum value reached per day, using the format of two digits and one decimal.

Wind direction

The wind direction will be given as the prevailing wind per day. The wind rose will be split into eight sections of 45° starting from 22,5° onwards (NE (=45°), E (=90°), SE (=135°)... N (=0°). The most frequent wind direction is reported by its middle value.

Solar radiation and UVb radiation

The solar radiation and the UVb radiation will be given as the daily mean value, using the format of up to four digits and one decimal.

Stem flow

The stem flow will be calculated to mm precipitation and will be given as the daily sum, using the format of up to four digits and one decimal.

Matric potential in the soil

The matric potential in the soil will be given in hPa, as the daily mean, the minimum and the maximum value reached per day, using the format of up to four digits and one decimal.

Water content in the soil

The water content in the soil will be given in Vol. % as the daily mean, the minimum and the maximum value reached per day, using the format of up to four digits and one decimal.

(46) Completeness

The completeness is an indicator of the coverage of the scanning and storing procedures and is given in percentages using the format of up to three digits (100 % = complete)

Points 47, 48, 49 and 50 are deleted.

The following points are added to the list:

'Information with regard to the ground vegetation assessment**(61) Plot/survey number**

Each time (day), or situation (inside outside fence), that an assessment of the ground vegetation is made on a given plot, a survey number is given. By combining the plot number with the survey number a unique plot/survey number is created.

(62) Fencing

As the vegetation can be very different inside and outside a fence, it was decided that in principle the ground vegetation is always surveyed outside the fence. When a survey inside the fence is carried out this should be reported as a separate survey and the fencing code indicated:

- 1= Yes, survey within the fence,
2= No, survey was outside fenced area.

(63) Total sampled area

The total sample area shall be given in m² in up to four digits. In the data accompanying report (or DAR-Q) the exact details of the number of repetitions, the location/orientation of the ground vegetation plots and the sizes) of these plots shall be given.

(64) Height and cover of layers

The average height and estimated cover of the total ground vegetation layer, the shrub layer, the herb layer and the moss layer shall be submitted as follows:

	Height (in m)	Cover (in %)
Total ground vegetation layer		×
Shurb layer	×	×
Herb layer	×	×
Moss layer		×

× = to be submitted.

The average height of the layers shall be given in metres in one digit and two decimals. The estimated cover shall be given as a % of the total sampled area.

(65) *Layers*

The following layers are defined.

1 = free layer	}	to be defined in DAR-Q
2 = shrub layer		
3 = herb layer		
4 = moss layer		

(66) *Species code*

A species code is to be applied, which consists of three groups of number codes for the family, genus and species separated by dots (.). Most codes consist of a three-digit number. Unfortunately one genus consists of a three-digit code plus the letters "bis". The species code can be extended with 1 letter to indicate a variety. The total list consists of over 11 000 species. This list will be made available in digital format by the Commission for use by the NFC's.

In cases where the Flora Europaea is not complete enough, a special list of nationally important species could be prepared by the NFC. These national species codes will consist of a new code number (family, genus and species), plus the country code (2 letters) separated by dots (.). The NFC will maintain a complete list with all codes, including relevant details of the species (full name, aliases, etc.) and shall include this list in the DAR.

(67) *Cover of plant species*

Countries are free in the assessment of the abundance/cover of the plant species. The submission of this cover is in % using up to five digits and two decimals (999.99). In the DAR the complete assessment methods, as well as the conversion to % shall be specified.

Contents of file with foliar analysis information (mandatory)

[illegible]

Maximum value (*)

1 - 5	Sequence No (1 to 99 999)				
7 - 10	Observation Plot No (max. 9999)		(2)		
12 - 16	Sample No	Tree species (Code from 1 to 199) and leaves type (0 = current, 1 = current + 1)	(23)	Parameters	(Mandatory file) Units (**)
18 - 23	Date of analysis	Date of analysis (ddmmyy)	(3)	60 - 64	N (mg/g)
25 - 28	Tree No 1	Number of first tree in sample	(24)	66 - 70	S (mg/g)
30 - 33	Tree No 2	Number of second tree in sample	(24)	72 - 75	P (mg/g)
35 - 38	Tree No 3	Number of third tree in sample	(24)	77 - 81	Ca (mg/g)
40 - 43	Tree No 4	Number of fourth tree in sample	(24)	83 - 87	Mg (mg/g)
45 - 48	Tree No 5	Number of fifth tree in sample	(24)	89 - 93	K (mg/g)
50 - 53	Mass of 100 leaves	Mass of 100 current year leaves	(25)	95 - 105	Observation Words
55 - 58	Mass of 1000 needles	Mass of 1000 current year or 1000 current+1 year needles	(25)		Those parameters have to be filled in once for the current needles and leaves and once for the current+1 needles. For <i>Larix</i> sp. and <i>Cedrus</i> sp., samples are taken of the short twigs of the previous year

(*) Maximum values are used when the actually registered value is equal or higher than the maximum value. When the actual registered values is below the minimum value that could be entered, the minimum values shall be used. If no quantity could be measures (i.e. below detection limits) a special code-1 (minus 1) will be used. When no analysis has been carried out for this parameter a zero or blank shall be used.

(**) By reference at 105 °C dried material.

Form 8b

XX1996.MEM

Contents of data file with meteorologic measurements

1-- 6					8----- 14					16- 17		19----- 24					26- 31					33- 38					40- 45					47- 49				51- 62																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Sequence No					Observation plot/ instrument					Variable code		Date D D M M Y Y					Mean/ Sum					Minimum					Maximum					Complete ness (%)				Observation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Maximum value (*)

1 - 6	Sequence No	Sequence number of samples (1 to 99999)	
8 - 14	Observation plot/instrument code	Corresponding plot/instrument number (max. 99990.99)	(41)
16 - 17	Variable code	The code of a parameter (PR, AT, RH, WS, WD or SR)	(43)
19 - 24	Date	Date (in DDMMYY)	(40)
26 - 31	Daily mean (e.g. temperature) or sum (precipitation) values		(45)
33 - 38	Daily minimum value		(45)
40 - 45	Daily maximum value		(45)
47 - 49	Completeness of measurements over the day (in % of measurements that should have been recorded)		(46)
51 - 62	Observations (words)		

Parameters (*)		Units	Mean	Sum	Minimum	Maximum	Remarks
PR	Precipitation	(mm)		X			Total precipitation (including snow, etc.)
AT	Air temperature	(°C)	X		X	X	Air temperature
RH	Relative humidity	(%)	X		X	X	Relative humidity
WS	Windspeed	(m/s)	X			X	Windspeed
WD	Wind direction	(°)	X				Prevailing wind direction (0°=North, 45°=Northeast)
SR	Solar radiation	(W/m²)	X				Solar radiation

(*) Methods and recomputations that have been used shall be described in detail in an annex to the data accompanying report on meteorology.

(*) Maximum values are used when the actually registered values is equal or higher than the maximum value. When the actual registered value is below the minimum value that could be entered, the minimum value shall be used (e.g. - 999.9).
When no analysis has been carried out for this parameter a blank shall be used.

Form 8c

XX1996.MEO

Contents of datafile with meteorological measurements

[illegible]

Maximum value (*)

- | | | | |
|---------|---|--|------|
| 1 - 6 | Sequence No | Sequence No of samples (1 to 999999) | |
| 8 - 14 | Observation plot/instrument code | Corresponding plot/instrument number (maximum 9999,99) | (2) |
| 16 - 17 | Variable code | The code of a parameter (UR, TF, SF, ST, MP or WC) | (43) |
| 19 - 24 | Date | Date (in DDMMYY) | (40) |
| 26 - 31 | Daily mean (e.g. temperature) or sum (precipitation) values | | |
| 33 - 38 | Daily minimum value | | |
| 40 - 45 | Daily maximum value | | |
| 47 - 49 | Completeness of measurements over the day (in %) | | |
| 51 - 62 | Observation (words) | | |

Parameters (*)		Units	Mean	Sum	Minimum	Maximum	Remarks
UR	UV-b Radiation	(W/M ²)	X				sum of daily values to be recalculated from litres into mm
TF	Throughfall	(mm)		X			
SF	Stemflow	(mm)		X			
ST	Soil Temperature	(°C)	X		X	X	
MP	Matric potential in Soil	(hPa)	X		X	X	to be specified in data accompanying report
WC	Water content in Soil	(Vol %)	X		X	X	
XX	Others						

x = to be submitted.

(*) Methods and recomputations that have been used shall be described in detail in an Annex to the data Accompanying report on meteorology.

(*) Maximum values are used when the actually registered values is equal or higher than the maximum value. When the actual registered values is below the minimum value that could be entered, the minimum value shall be used (- 999.9).
When no analysis has been carried out for this parameter a blank shall be used.

ANNEX IV

Annex IX to Regulation (EC) No 1091/94 shall be replaced by the following:

‘ANNEX IX

COMMON METHODS FOR MEASUREMENTS OF METEOROLOGY ON THE PERMANENT OBSERVATION PLOTS

I. General remarks

The measurement of meteorology is to be carried out on at least 10 % of permanent observation plots. It is recommended to monitor meteorology on plots where deposition is also monitored. The installation of the equipment for the meteorologic measurements shall be completed by 30 June 1999.

This Annex is based on technical recommendations of the *ad hoc* expert group on meteorology (EU/ICP Forests). Reference is made to the submanual (1996/1997) prepared by this expert group.

II. Inventory methodology

II.1. Location of sampling equipment

To represent the specific climatic conditions of woodlands the measurements should be carried out inside the forest area concerned. In general the measurements (with the exception of soil temperatures, soil moisture and stand precipitation) may be taken either above the forest stand canopy at the plot or at an open field station within the forest area in close proximity (in general not more than 2 km distance) to the stand of the plot. The distance from the measuring point at open field stations to the surrounding stands or other obstacles shall be at least two times the height of a mature tree/obstacle. Soil temperature, soil moisture and stand precipitation are to be measured inside the stand of the permanent observation plot

Whenever possible a combination with the equipment for deposition should be made. To avoid disturbances to the roots and soil situation, the equipment should be placed so that it can be reached and maintained without actually passing through the plot.

II.2. Methods to measure the actual meteorologic situation in or close to the plot

By installation of a meteorological station in an open area close to the plot or the installation of a tower in the stand near the plot, the weather situation should be monitored continuously. The technical equipment, sensors and their placement are to be in accordance with the international World Meteorological Organisation standard and should also be compatible with national weather service networks. The following variables are to be obtained.

Mandatory	Optional
Precipitation	UVb radiation
Air temperature	Soil temperatures
Air humidity	Soil moisture
Wind speed (*)	(matric potential, water content)
Wind direction (*)	Stand precipitation
Solar radiation (*)	(quantity of throughfall and stemflow)

(*) If there are local technical problems at the permanent observation plots wind speed, wind direction and solar radiation may be omitted at these plots.

Automatic stations with quasi-continuous (≈ 1 s) sensing variables and electronic storage of aggregated values for periods of one hour or parts of it are recommended.

II.3. Collection, aggregation, storage and submission of information

Data are to be aggregated to daily values (sum or average/mean, minimum and maximum respectively) before submission.

The following plot information shall be collected and submitted:

- plot No,
- exact details of the used equipment,
- location of the plots (longitude, latitude, altitude) and of equipment (relative to the plot),
- start and end dates of the measurements,
- frequency (number of periods).

The information on the variables is submitted on a daily basis.

LIST OF PARAMETERS

Parameter	Units	Mean	Sum	Minimum	Maximum	Remarks
Precipitation	(mm)		×			Total precipitation including snow, etc.)
Air temperature	(°C)	×		×	×	Prevailing wind direction
Relative humidity	(%)	×		×	×	
Wind speed	(m/s)	×			×	
Wind direction	(°)	×				
Solar radiation	(W/m ²)	×				
UVb radiation	(W/m ²)	×				
Soil temperature	(°C)	×		×	×	
Soil moisture (matric pot. Water content)	(hPa)	×		×	×	
Stand precipitation	(mm)		×			
Others						To be specified in the data accompanying Report

× = to be submitted.

For each plot where the measurements are executed a summary of the collected measurements shall be compiled and submitted to the Commission on a yearly basis, using the forms XX1996.PLM, XX1996.MEM and XX1996.MEO (forms 8a, 8b, 8c).

ANNEX V

Regulation (EC) No 1091/94 Annex XI is added:

'ANNEX XI

COMMON METHODS FOR GROUND VEGETATION ASSESSMENT IN PERMANENT OBSERVATION PLOTS**I. General remarks**

The ground vegetation assessment is to be carried out on at least 10 % of the permanent observation plots. The first common assessment shall be completed before the autumn of 1999. The objectives of the ground vegetation assessment are two fold:

- characterisation of the current state of the forest ecosystems on the basis of their composition,
- monitoring of vegetation changes due to natural and anthropogenic environmental factors.

Ground vegetation data, which were collected and analysed before 1997 can also be used if the methods as described below have been applied.

This Annex is based on technical recommendations of the *ad-hoc* expert group on ground vegetation assessment (EU/ICP Forests). Reference is made to the submanual (1997) prepared by this group.

II. Inventory methodology**II.1. Selection of sample location**

The ground vegetation assessment will be carried out on the permanent observation plots. The area selected for the ground vegetation assessment must be representative of the plot. Several sampling units can be used in order to obtain statistical replication. Member States are free to select the number and shape of the sampling units. If the plot has been fenced, the sampling units are to be located outside the fence. In addition sampling units inside the fence can also be assessed. Disturbed areas are to be avoided (e.g. soil pits, soil solution monitoring areas, tracks). The location of the sampling units has to be marked in a permanent way. The precise method of marking is left to the Member States, but the material used should be inert to avoid contamination.

II.2. General background information

The following general information shall be collected:

- plot number
- date of sampling and analysis
- fencing
- total area sampled
- information on the total ground vegetation layer (cover), the shrub and herbs layer (cover and average height) and the moss layer (cover).

II.3. Measurement of species abundance or cover

Member States are free to apply in the assessment their own scaling system as long as it can be directly converted into percentage cover ranking from 0,01 % (very rare) to 100 % (complete cover).

II.4. Species

All phanerogams, vascular cryptogams and the major species of terricolous mosses (bryophytes) are to be included in the assessment. It is recommended to include terricolous lichens. Non-terricolous species and fungi may be noted on an optional basis. The nomenclature shall follow the *Flora Europaea*. In situations where the *Flora Europaea* is not valid, where more accurate taxonomic identification is available, an extension of this standard species list may be elaborated by the NFC involved. The Commission shall be kept informed of these extended species lists.

II.5. *Frequency and assessment time*

Every five years, vegetation studies must be undertaken on all plots. It is recommended to do the ground vegetation assessment on an annual basis on a limited number of plots (e.g. 10 %). In the case of a seasonally complex vegetation composition, a second assessment during the year may be needed to assess the full vegetation cover. The subsequent ground vegetation assessments shall be carried out around the same date of the year.

II.6. *Analysis and submission*

The assessed information on sampling units shall be aggregated to plot level. Where sampling units have been assessed inside and outside the fences two aggregations shall be made. The results of the ground vegetation assessment shall be submitted on a yearly basis to the Commission in a standardised format, as indicated in forms 10a and 10b. (file specification XX1996.PLV and XX1996.VEM).

The submission of the ground vegetation assessment results shall include on plot level: the plot/survey number, the coordinates of the plot, fencing, and the information on the main layers. Information on assessment level shall include; the plot/survey number, the standard code of the species, using the eight-letter abbreviation as given in attached list, or as extended list for additional species, as well as the cover indicator expressed in a percentage on plot level.

III. **Data accompanying information**

III.1. *Data accompanying information on applied methods (DAR-Q)*

In a separate document details shall be given of:

- sampling lay-out of the sampling units (number and area of the subplots)
- definition of layers applied (moss, herbs, shrubs, tree)
- scales applied and conversion of these scales to percentages
- information on deviations from the standard species list and their codes
- aggregation methods applied to arrive at plot level information.

It is recommended to submit this information to the Commission by using the DAR-questionnaires referred to in Annex C.

III.2. *Data accompanying report on deviations from standard methods (DAR)*

Any important deviation from the standards which may have influenced the assessment and any relevant disturbances, which may have occurred shall be recorded and reported separately.

III.3. *Data accompanying information on evaluation and interpretation (annual progress report)*

Information on evaluations and interpretation of ground vegetation data (whether or not in combination with other data) shall be reported to the Commission in the annual progress report.'

Form 10a

XX1996.PLV

Contents of reduced plot file
to be used in combination with the survey of ground vegetation (see Annex XI)

1-4			6-7		9-12			14-15		17-22				24-30				32-38				40-41		43		45-48		50-52		54-57		59-61		63-66		68-70		72-74		76-86	
Sequence			Country		Observation plot No			Survey No		Date (D D M M Y Y)				Latitude Coordinate (+ D D M M S S)				Longitude coordinate (± D D M M S S)				Altitude		Fence		Total area (m ²)		Ground. vegetation		Shrub layer height cover		Herb layer height cover		Mosses cover		Observations					
		1																																							
		2																																							
		3																																							
		4																																							
		5																																							
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	1	3																																							
	1	4																																							
	1	5																																							
	1	6																																							

See explanatory notes

Column

1 - 4 Sequence No of plots (1 to 9999)
 6 - 7 Country code (France = 01, Belgium = 02, etc.)
 9-12 Plot No (maximum 9 999)
 14-15 Survey No (maximum 99)
 17-22 Date of sampling in DDMMYY (e.g. 220690)
 24-30 Latitude in + DDMMSS (e.g. + 505852)
 32-38 Longitude in (+ or -) DDMMSS (e.g. + 03 55 31)
 40-41 Altitude (in 50 meter classes from 1 to 51)
 43 Fence (Yes = 1, No = 2)
 45-48 Total sampled area (in m²)
 50-52 Ground vegetation cover (in % of total area)

(1)
(2)
(61)
(3)
(4)
(4)
(5)
(62)
(63)
(64)
(64)

Column

54-57 Shrub layer height (in m)
 59-61 Shrub layer cover (in % of total area)
 63-66 Herb layer height (in m)
 68-70 Herb layer cover (in % of total area)
 72-74 Mosses cover (in % of total area)
 In the last column a remark on the plot can be included:
 76-86 Other observations (word)

(64)
(64)
(64)
(64)
(99)

For 8b

XX1996.VEM

Contents of datafile with ground vegetation assessments

1-5					7-10					12-13					15-32												34	36-41					43-53				
Sequence					Observation plot					Survey number					Species code												Layer	Cover (%)					Observations				
				1																																	
				2																																	
				3																																	
				4																																	
				5																																	
				6																																	
				7																																	
				8																																	
				9																																	
			1	0																																	
			1	1																																	
			1	2																																	
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			1	8																																	
			1	9																																	
			2	0																																	
			2	1																																	
			2	2																																	
			2	3																																	
			2	4																																	

See explanatory notes

Column

1 - 5 Sequence No of plots (1 to 99 999)

7-10 Plot No (maximum 90 999)

12-13 Survey No

15-32 Species code (see list in *Flora europaea*)

The species code exists of the code for the family (999), the code for the genus (999) or (999 bis), the code for the species (999) or (999a) and possibly a code for the country (AA)

34 Layer (1 = tree, 2 = shrubs, 3 = herbs, 4 = mosses)

36-41 Cover (in percentage)

In the last column a remark on the plot can be included:

43-53 Other observations (word)

(2)

(61)

(66)

(65)

(67)

(99)