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1974

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Data Analysis and Data Synthesis of Forest Ecosystems

Report of
International Woodlands Workshop
International Biological Program
PT Section

September 24 - October 3, 1974
in Göttingen, Fed.Rep.Germany

Organized and compiled by

B. Ulrich
R. Mayer
H. Heller

Sponsored by the Deutsche Forschungsgemeinschaft

Institute of Soil Science and Forest Nutrition of Goettingen
University, D-34 Göttingen, Büsgenweg 2

INSTITUT FÜR BODENKUNDE DER UNIVERSITÄT GÖTTINGEN

The data, results and interpretations compiled in this volume are of preliminary nature. They must not be quoted without permission from the project representative or author concerned.

Objectives and Summary of Results of the IBP International Woodlands Workshop in Göttingen 1973

by B. Ulrich

Following a proposal of the IBP Woodlands Working Group during the meeting in Oak Ridge in August 1972 the German National Committee for IBP and the Deutsche Forschungsgemeinschaft agreed to hold a Workshop on Data Analysis and Data Synthesis of the IBP Woodland Projects in Göttingen in autumn 1973.

The Organizing Committee of the Workshop, consisting of H. ELLENBERG, H. HELLER, R. MAYER and B. ULRICH, worked out Data sheets which were sent out to the representatives of national IBP woodland projects in order to collect the data. The data arriving in Göttingen before opening of the workshop were stored by computer in a data handling system developed at the Institute of Soil Science and Forest Nutrition by D.L. De ANGELIS. Computer outprints of the data were handed out to the participants at the beginning of the workshop.

For the first part of the Workshop (September 24 - September 28), the following working groups have been set up by the Organizing Committee. For each group two of the participants have been asked to act as Coordinators. One Coordinator represents projects and participants taking part in the Oak Ridge Workshop in 1973; the other represents projects and participants joining in the woodlands synthesis activities for the first time at this Workshop.

Working Group	Coordinators
Energy and Water Balance	Murphy Galoux (energy) Lossaint (water)
Biomass	Attiwill
Consumption of Living Organic Matter	Thamdrup, Funke
Decomposition of Dead Organic Matter	Satchell, Domsch
Mineral Cycling	Tamm, Rapp

The following objectives have been assigned to the working groups in the Provisional Program:

1. Report of the participants regarding the state of modelling development and data evaluation.
2. Development of flow diagrams and compartment models of different resolutions.
3. Discussion of methodological questions in relation to precision and variability of data.
4. Discussion of data requirements for models of different resolutions.
5. Description of seasonal variations, in graphical or mathematical form, as far as measurements are available.
6. Drafting - in the form of written reports - of the results achieved in the individual working groups. These written reports will be distributed to the participants after the Workshop.

One additional working group has been planned:

Working Group	Coordinators
General Site Comparison	Ellenberg, Loucks

The objectives suggested for this working group in the Provisional Program are:

1. Discussion of the data necessary for a site comparison of the IBP Projects.
2. Combining of sites with common characteristics within one group.

This working group was intended to prepare the basic guidelines for setting up the ecosystem-oriented working groups acting during the second part of the Workshop.

The objectives of these ecosystem-oriented working groups have been defined as follows:

a) Discussion of the relative importance of process chains in different ecosystem types.
b) Discussion of the utility of compartment models as a basis for comparison of data from different ecosystems with emphasis on finding similarities and differences among different ecosystems.
c) Discussion of the ability of compartment models to illustrate the usefulness of ecosystems to society and the implications of this for the mathematical modelling to be done at the next IBP Woodlands Working Group Workshop in 1974.

The workshop was confronted with some problems, which influenced the work as well as the results achieved to a great extent:

1. Incompleteness of IBP woodland projects represented at the workshop. It was felt that in a world wide synthesis all IBP woodland projects should be included in order to reflect the world's most important forests as well as IBP activities. The working group on General Site Comparison compiled a list of 84 known IBP woodland projects and summarized the site conditions for each project. Furtheron the working group suggested contacting arrangements for completing the list of data sets available for synthesis. As contact persons BULLOCK, CRAGG, ELLENBERG, LOSSAINT, LOUCKS, MALAISSE and REICHLE were nominated (see LOUCKS and ELLENBERG, this volume).

2. Insufficient definitions. In several of the working groups unclear, insufficient definitions of compartment contents, increments and fluxes were found to affect data comparisons to a great extent. Part of the work was in these cases directed towards clarification of definitions (see chapter on data sheets) as well as of the data sets presented at the meeting. According to these activities the data sets represented in this volume are expected to be comparable with the exception of increments (see note proceeding the computer outprints!). The project representatives are kindly

requested to reexamine their data sets, especially the increments, and to inform De ANGELIS of any errors as soon as possible.

3. Incomplete data sets. Especially for the purpose of modelling and the application of systems theory for intersite comparison the incompleteness of data sets was found to be a considerable drawback. The participants felt that a further attempt should be made in order to complete data sets as far as possible. The working groups developed therefore data sheets in order to collect missing data from projects already represented as well as complete data sets from missing projects. The data sheets are part of this volume and the project representatives are kindly requested to fill them out and to send them either to Oak Ridge or to Göttingen.

4. Difficulties in systems comparisons. The working groups put a great deal of work into comparisons of the data available at the workshop. Probably everybody realized the great difficulties encountered in intersite comparisons of ecosystems. The biomass group calculated some parameters listed in table 1 for characterizing the ecosystems. The same principle was followed by the mineral cycling group (see contribution of KHANNA). Comparisons between sites using these parameters did yield useful information but showed also the limitations of such a "classical" approach. It became evident that comparison of forest ecosystems should also be based on systems theory and/or thermodynamic considerations. The state of discussion is represented in this volume by papers of SCHÜTT (proposal for intersite comparison on the ground of systems theory) and GALOUX (entropy flow and entropy production in the oak forest of Virelles).

5. Besides the problems of data comparisons as prerequisite for data synthesis the workshop had to deal with the proposed IBP synthese volumes. The chapter outlines have been discussed in detail and chapter editors selected (cf. REICHLE, this volum

Table 1: Parameters for characterization of ecosystems selected by the biomass working group

1. total leaves
2. fruits, flowers
3. total branches
4. total stems
5. total roots
6. above ground biomass (A.G.B.)
7. total biomass (T.B.)
8. 1 in % of AGB
9. 1 in % of TB
10. 3 in % of AGB
11. 3 in % of TB
12. 4 in % of AGB
13. 4 in % of TB
14. 5 in % of AGB
15. 5 in % of TB
16. annual production (AP)
17. AP/TB
18. AP/AGB
19. leaf area index (LAI)
20. soil top organic (STO)
21. total litterfall (TLF)
22. TLF/(TLF + STO)
23. AP/LAI
24. AP/1
25. increment stems (IS)
26. IS/AP

6. During the workshop the participants had the opportunity to develop mathematical models from their own data using either a general code for ecosystem models as described by De ANGELIS in Göttinger Bodenkundliche Berichte Vol.29 (1973)(where also models of mineral cycling for Na, K, Ca, Mg, Al, N and P developed in the Solling project are described), or the simulation language CSMP (IBM). The reports of PETERSEN and WEIDEMANN in this volume represent these modeling activities. The report of VAN DER PLOEG describes the possibilities of modeling water flow through soil.

7. In continuation of the data handling system developed for the workshop the participants agreed that the data sets are collected on punch cards or magnetic tape and exchanged between Göttingen and Oak Ridge. H. SHUGART from Oak Ridge offered the possibility of statistical data processing on request. Contributors to the synthesis may contact SHUGART for detailed information.

8. Excursions were performed to the Harz mountains (zonation of vegetation and man's influence), to the IBP project in the Solling and to the Austrian IBP project in the Alps near Innsbruck. The last excursion gave also the opportunity of introducing the participants to some widespread vegetation formations in Central Europe as well as of showing some cultural places.

Workshop Participants

* Dr. V.A. Abrashko, Komarov Botanical Institute, Academy of Sciences of the USSR, ul. Prof. Popova 2, Leningrad P-22, USSR, 197022

* Dr. V.A. Alexeev, Komarov Botanical Institute, Academy of Sciences of the USSR, ul. Prof. Popova 2, Leningrad P-22, USSR, 197022

Dr. J.P.E. Anderson, Institut für Bodenbiologie, Forschungsanstalt für Landwirtschaft, D-33 Braunschweig-Völkenrode, Bundesallee 50 (FRG)

Professor Dr. Folke Andersson, Barrskogslandskapets ekologi, Lantbrukshögskolan, Box 7008, S-75007 Uppsala 7, Sweden

Dr. Peter M. Attiwill, Botany School, University of Melbourne, Parkville, Victoria 3052, Australia

Dr. Desh Bandhu, Department of Botany, Swami Shraddhanand College, University of Delhi, Alipur-Delhi 110036, India

Dr. Paul Benecke, Institut für Bodenkunde und Waldernährung, D-34 Göttingen-Weende, Büsgenweg 2, FRG

Dr. Ing. Vladimir Biskupský CSc, VÚLH-VS Bratislava, Drieňova 5, CS-829 74 Bratislava, Czechoslovakia

Dr. John A. Bullock, Department of Zoology, School of Biological Sciences, Adrian Building, University of Leicester, Leicester LEI 7RH, England

Prof. Dr. J.B. Cragg, Environmental Sciences Centre, The University of Calgary, Calgary, Alberta, Canada T2N 1N4

Dr. Donald L. De Angelis, Institut für Bodenkunde und Waldernährung, D-34 Göttingen-Weende, Büsgenweg 2, FRG

---

* Contributors who could not attend the workshop

* Madame S. Denayer, Laboratoire de Botanique Systematique et d'Ecologie, Faculté des Sciences, Université Sibre de Bruxelles, Avenue Paul Heger, 28, B-1050 Bruxelles, Belgium

Prof. Dr. K.H. Domsch, Institut für Bodenbiologie, Forschungsanstalt für Landwirtschaft, D-33 Braunschweig-Völkenrode, Bundesallee 50, FRG

Dr. N. Doniţă, Institutul de Cercetări, Proiectări si Documentare Silvică, Bucuresti, sos. Pipera 46, Rumania

* Prof. Dr. P. Duvigneaud, Laboratoire de Botanique Systematique et d'Ecologie, Faculté des Sciences, Université Libre de Bruxelles, Avenue Paul Heger, 28, B-1050 Bruxelles, Belgium

Prof. Dr. Heinz Ellenberg, Lehrstuhl für Geobotanik, D-34 Göttingen, Untere Karspüle 2, FRG

Doc. Habil. Dr. Janusz Faliński, Stacja Geobotaniczna U.W., Bialowieża, woj. Bialystok, Poland

* Dr. E. Frey, Institute of Zoology and Botany, Estonian Academy of Sciences, Tartu 202400, Anne 34-23 Estonian SSR

Manfred Fuchs, Botanisches Institut II, D87 Würzburg, Mittlerer Dallenbergweg 64, FRG

Prof. Dr. W. Funke, II. Zoologisches Institut, D-34 Göttingen, Berlinerstraße 28, FRG

Prof. Dr. André Galoux, Station de Recherches des Eaux et Forêts, Administration des Eaux et Forêts, Ministere de L'Agriculture, B-1990 Groenendaal-Hoeilaart Belgium

Dr. Richard Genkinger, Lehrstuhl Landschaftsökologie, Westfälische Wilhelms-Universität, Institut für Geographie und Länderkunde, D-44 Münster (Westf.), Robert-Koch-Straße 26, FRG

Dipl. Forstwirt Georg Gietl, Institut für Meteorologie, Forstliche Forschungsanstalt, D-8 München 40, Amalienstraße 52, FRG

* Dr. Alan G. Gordon, Ministry of Natural Resources, Research Branch c/o Forest Biology Laboratory, Post Office Box No. 490, Saulte Ste. Marie, Ontario, Canada

* Dr. Georg Borisovitch Gortinsky, Komarov Botanical Institute, Academy of Sciences of the USSR, ul. Prof. Popova 2, Leningrad P-22, USSR, 197022

Dipl. Biool. Rainer Grimm, II. Zoologisches Institut, D-34 Göttingen, Berlinerstraße 28, FRG

Dipl. Forsting. Herbert Hager, Institut für Meteorologie, Forstliche Forschungsanstalt, D-8 München 40, Amalienstraße 52, FRG

Prof. Dr. Paavo Havas, Botanical Institute, University of Oulu, Torikatu 15, Oulu 10, Finland

Dr. Hans Heller, Lehrstuhl für Geobotanik, D-34 Göttingen, Untere Karspüle 2, FRG

Dr. Hakan Hytteborn, Institute of Ecological Botany, University of Uppsala, Box 559, S-751 22, Uppsala 1, Sweden

* Prof. Dr. Krystyn Izdebski, Instytut Biologii UMCS, Zaklad Ekologii i Ochrony Przyrody, Lublin, ul. Akademicka 19, Poland

* Prof. Dr. Paul Jakucs, Botanical Institute, L. Kossuth University H-4010 Debrecen, Hungary

Dipl. Geogr. Christiane Kayser, Institut für Meteorologie und Klimatologie, D-3 Hannover, Herrenhäuser Str. 2, FRG

* Dr. N.I. Kazimirov, Karelian Branch of the Academy of Sciences of the USSR, Pushkinskaya 11, Petrozavodsk 185610, USSR

Dipl. Landwirt Heribert Kerner, Institut für Forstsamenkunde und Pflanzenzüchtung, Forstliche Forschungsanstalt, D-8 München 40, Amalienstraße 52, FRG

Dr. Partap K. Khanna, Institut für Bodenkunde und Waldernährung, D-34 Göttingen-Weende, Büsgenweg 2, FRG

Dr. Olaf Kiese, Institut für Geographie und Länderkunde, Westfälische Wilhelms-Universität, Lehrstuhl Landschaftsökologie, D-44 Münster (Westf.), Robert-Koch-Str. 26 FRG

Dipl. Biol. Rainer Kindt, II. Botanisches Institut, D-63 Gießen, Senckenbergstr. 17-21, FRG

* Prof. Dr. Tatuo Kira, Department of Biology, Faculty of Science Osaka City University, Osaka 558, Japan

Dr. Yuzo Kitazawa, Department of Biology, Tokyo Metropolitan University, Fukazawa Setagaya-Ku, Tokyo 158, Japan

* Dr. H. Klinge, Max-Planck-Institut für Limnologie, Abt. Tropenökologie, D-232 Plön, Postfach 165, FRG

Doz. Dr. Werner Koch, Forstbotanisches Institut, Forstliche Forschungsanstalt, D-8 München 40, Amalienstraße 52, FRG

* Dr. Ing. Ferdinand Kubícek CSc, Slovac Academy of Sciences, Botanical Institute, Dúbravská 26, CS-809 00 Bratislava, Czechoslovakia

* Dr. Edgar Künstle, Institut für Forstliche Ertragskunde, Universität Freiburg, i.Br., D-78 Freiburg i.Br. Bertoldstr. 17, FRG

* Prof. Dr. G. Lemée, Université de Paris-Sud, Centre d'Orsay, Écologie Végétale, F-91 Orsay, France

Dr. Salvatore Leonardi, Instituto di Botanica, Orto Botanico, Università di Catania, Via Antonino Longo, 19, I-95125 Catania, Italy

* Dr. Adam Lomnicki, Nature Conservation Research Centre, ul. Lubiez 46, Kraków 31-512, Poland

Prof. Dr. Paul Lossaint, Centre d'Etudes Phytosociologiques et Ecologiques, Louis Emberger, Route de Mende, B.P. 5051, F-34033 Montpellier Cedex, France

Dr. Orie L. Loucks, Environmental Management Programs, P.O. Box 7366, Austin, Texas 78712, U.S.A.

Dr. Francois Malaisse, Service de Botanique et Climatologie, Faculté des Sciences, Université Nationale du Zaire, P.B. 1825, Lubumbashi, Zaire

Dr. Robert Mayer, Institut für Bodenkunde und Waldernährung, D-34 Göttingen-Weende, Büsgenweg 2, FRG

* Prof. Dr. F.H. Meyer, Institut für Landschaftspflege und Naturschutz, D-3 Hannover, Herrenhäuserstr. 2, FRG

* Prof. Dr. Mitscherlich, Institut für Forstliche Ertragskunde, D-78 Freiburg, Bertoldstr. 17, FRG

* Prof. Dr. A.A. Molchanov, Forest Laboratory, Academy of Sciences of the USSR, Uspenskoye, Moscow District, Odintsov Region, USSR

* Prof. Dr. W.R. Müller-Stoll, DDR-15 Potsdam-Sanssouci, Am Drachenberg 1, DDR

Dr. Charles E. Murphy, Jr., School of Forestry, Duke University, Durham, North Carolina 27706, U.S.A.

Dr. Bengt Nihlgard, Department of Plant Ecology, Ekologihuset, Helgonavägen 5, S-22362 Lund, Sweden

Dr. Miodrag Pavlov, Institut für Forsthydrologie, Hessische Forstliche Versuchsanstalt, D-351 Hann. Münden, Gartenstraße 1, FRG

Dr. Hans Persson, Institute of Ecological Botany, University of Uppsala, Box 559, S-751 22 Uppsala 1, Sweden

Cand. Mag. Henning Petersen, Molslaboratoriet, Strandkaer, Femmøller, DK-8400 Ebeltoft, Denmark

Jürgen Prenzel, Institut für Bodenkunde und Waldernährung D-34 Göttingen, Büsgenweg 2, FRG

* Prof. Dr. N.I. Pyavchenko, Karelian Branch of the Academy of Sciences of the USSR, Pushkinskaya 11, Petrozavodsk-185610, USSR

Dr. Mammu Rapp, Centre d'Etudes Phytosociologiques et Ecologiques, Louis Emberger, Route de Mende, B.P. 5051, F-34033 Montpellier Cedex, France

Dr. David E. Reichle, Environmental Sciences Division, Oak Ridge National Laboratory, Post Office Box X, Oak Ridge, Tennessee 37830, U.S.A.

Prof. Dr. Leonid E. Rodin, Komarov Botanical Institute, Academy of Sciences of the USSR, ul. Prof. Popova 2, Leningrad P-22, USSR 197022

PD Dr. Michael Runge, Lehrstuhl für Geobotanik, D-34 Göttingen, Untere Karspüle 2, FRG

Dr. John E. Satchell, Merlewood Research Station, Grange-over-Sands, Lancashire LA11 6JU, England

Dr. Torgny Schütt, Uppsala University, Teknikum, Villavägen 4, Box 534, S-75121 Uppsala, Sweden

Prof. Dr. Tsunahide Shidei, Faculty of Agriculture, Kyoto University Kyoto 606, Japan

Dr. Henry H. Shugart, Environmental Sciences Division, Oak Ridge National Laboratory, Post Office Box X, Oak Ridge, Tennessee 37830, U.S.A.

Dr. Phillip Sollins, Coniferous Forest Biome, U.S. Analysis of Ecosystems, Peavy Hall, Oregon State University Corvallis, Oregon 97331, U.S.A.

Prof. Dr. Carl Olof Tamm, Department of Forest Ecology, The Royal College of Forestry, S-104 05 Stockholm 50, Sweden

Prof. Dr. H.M. Thamdrup, Zoologisk Institut, Aarhus Universitet, Naturhistorisk Museum, DK-8000 Aarhus C, Denmark

Prof. Dr. Bernhard Ulrich, Institut für Bodenkunde und Waldernährung D-34 Göttingen-Weende, Büsgenweg 2, FRG

Dr. R. Rienk van der Ploeg, Institut für Bodenkunde und Waldernährung, D-34 Göttingen-Weende, Büsgenweg 2, FRG

Dr. G. Weidemann, II. Zoologisches Institut, D-34 Göttingen, Berlinerstraße 28, FRG

Prof. Dr. Harold E. Young, School of Forest Resources, University of Maine, Orono, Maine 04473, U.S.A.

General Site Description

Participant/Author Project Site Forest Type

year: ..... annual averages and sums (one sheet per year)

size of study area: .....

age stand: ..... years

stocking density: ..... stems/ha

stand height: ..... m

basal area: ..... m^2/ha

basal area increment: ..... m^2/ha

standing crop:

aboveground ..... g/m^2

belowground ..... g/m^2

productivity (annual net)-biomass:

aboveground ..... $g/m^2/yr$

belowground ..... $g/m^2/yr$

leaf area index (LAI) .....

Main Species

(overstorey) .....

.....

.....

.....

(substorey) .....

.....

.....

.....

(field layer) .....

.....

.....

(other) .....

.....

.....

latitude: .....° longitude: .....°

altitude: ..... m above sea level

slope: .....° aspect: .....

For mean annual values please state the origin of the given data (check the appropriate line)

☐ measured on the site

☐ near the site (indicate distance and vegetation type)

.....

☐ others (specify the location and distance)

.....

	for study year(s)	mean annual
incident global radiation:	.....	.....(cal/cm^2)
reflected global radiation:	.....	.....(cal/cm^2)
net radiation:	.....	.....(cal/cm^2)
temperature: air:	.....	.....°C
(height ..... m)		
soil:	.....	.....°C
(depth ..... m)		
precipitation:	.....	..... mm
incident global radiation: (growing season)	.....	.....(cal/cm^2)
reflected global radiation: (growing season)	.....	.....(cal/cm^2)
net radiation: (growing season)	.....	.....(cal/cm^2)
temperature		
air (growing season):	.....	.....°C
(height ..... m)		
soil (growing season):	.....	.....°C
(depth ..... m)		
precipitation: (growing season)	.....	..... mm

length of growing season: ..... days

definition of growing season: .....

.....

potential evaporation: ..... mm

method of estimation: .....

.....

throughfall: ..... mm

stemflow: ..... mm

soil type: .....

geology/petrology: .....

soil drainage: .....

depth of rooting zone: ..... cm

depth of chemically investigated rooting zone: ..... cm

soil depth to impermeable layer: ..... cm

soil texture (by horizon, if necessary): .....

.....

bulk density of A horizon: ..... B horizon: ..... (g/cm^3)

organic matter for A horizon: ..... B horizon: ..... (g/cm^3)

exchange capacity for A horizon: .. B horizon: ..... ( )

range of pH values in precipitation (above canopy or in open field):

throughfall: .....

stemflow: .....

range of pH values in

KCl extracts A horizon: ..... B horizon: .....

H_2O extracts A horizon: ..... B horizon: .....

water content (θ) at

PF = 1: .....

PF = 2.5: .....

PF = 4.2: .....

(by horizon if available)

Explanation of Checklist for Methods

Column 1: Enter here all compartment sizes, fluxes, and driving variables used for model construction, but not derived entities such as C/N or turnover rates.

Column 2: Note duration of investigation (years) and frequency of samplings (e.g. monthly; March through October; weekly; continuous, for single measurements date)

Column 3: Give reference(s) as detailed as possible (where appropriate also page and/or chapter).

Column 4: Information is needed here whenever modifications have been made of methods in Col. 3.

Column 5: Note "s.d." for standard deviation or "conf. int." for confidence interval. Note "(s.d.)" or "(conf. int.)", when applicability of calculated statistical parameters may be questioned (e.g., in case of skew distribution).

Columns 6-8: cf. Columns 3-5.

Column 9: Add here or on separate sheet further comments on assumptions made or combinations of methods not covered in previous columns.

Checklist for Methods

1. Measurement	2. Period frequency	Sampling or observation method			Other Methods (Chemical analysis, regression calculations, etc.)			9. Comments on methods
		3. Literature Reference	4. For unpublished meth. or modification, name resp. person	5. Note if confidence interval available	6. Literature reference	7. For unpublished meth. name responsible person	8. Note if conf. interval available	

REPORT FROM WORKING GROUP ON ENERGY AND WATER BALANCE

CLIMATOLOGY: ENERGY, WATER, CARBON DIOXIDE EXCHANGES.*

1. Climatological analysis.

Classification of sites by climate.

Prediction of process rates as affected by climate.

Climatological and meteorological data.

2. Energy and matter exchange processes.

A. Instrumentation, methods, applicability, limitations.

1. Atmospheric water

Rain in the open

Snow

Canopy drip and throughfall

Stem flow

2. Soil water

3. Radiation

4. Heat and vapour

5. Carbon dioxide.

B. Modeling of physical environment.

Assumption

Models of energy, water, carbon dioxide exchanges

Sensitivity analysis

---

* Combined contribution of BENGOUD, P., GALOUX, A., GIEHL, G., HAGER, H., KAYSER, Chr., KERNER, H., KIESE, O., LOUSSAINT, P., MURPHY, C.E.

1. Climatological Analysis.+

I. The classification of sites by climate.

A. Atmospheric climate can be dealt with through the use of four parameters for the climatological scale of resolution:

1. The global radiation as an index of the energy available to the system;
2. Precipitation as an index of the water available to the system;
3. Potential evaporation as an index of water use under the atmospheric climatic regime. Precipitation less potential evaporation could be used to estimate the potential severity and length of water stress;
4. Temperature has a great effect on many physiological processes important to the ecosystem.

B. In order to understand the remaining variability after climatological effects have been taken into account it is necessary to remember that ecosystem dynamics are related to other factors:

1. Mineral nutrition;
2. Plant and ecosystem maturity;
3. Water availability in particular will be influenced by other aspects of the water balance. Only water entering the soil and remaining

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+ Prepared by MURPHY, C.E.

there for a sufficient time is available to the plant.

Therefore the balance between available water and potential evaporation will have much more meaning than the balance between precipitation and potential evaporation.

II. The prediction of process rates as effected by climate.

A. It is theoretically possible to take the compartmental model transfer coefficients and attempt to correlate them with climatic parameters. However, the great number of other parameters which also influence ecosystem dynamics and the small number of data points (< 150) make this approach unlikely to have success.

B. Theoretical or semi-empirical bases for determining relationships between the climate and transfer coefficient may have more immediate success. This approach attempts to reduce the number of unknown parameters by determining quantitative relationships and equation between unknown variables. Effective tools to do this have been through

1. Thermodynamics.
2. Basic physiology.

III. Climatological and meteorological data.+

Following data questionnaires may be used in order to provide data for climatological analysis or for more intensive energy and matter exchange process studies.

+ Prepared by the group "Energy and water balances".

Climatology and meteorology questionaire.

Site: ..... Vegetation Type: .....

Name: .....

Climatic measurements, where taken?

at site

at nearby climatic station

Slope of site (inclination): ..... Exposure: .....

How were measurements made?

Measurement	Time Interval	Methods (Instruments, Placement)
Temperature	.....	.....
Precipitation	.....	.....
Radiation	.....	.....
Wind	.....	.....
Soil Temperature	.....	.....
Micrometeorology		
Radiation	.....	.....
Evaporation	.....	.....
Convection	.....	.....
Storage	.....	.....
Hydrology		
Precipitation	.....	.....
Interception	.....	.....
Runoff	.....	.....
Soil Moisture (Content)	.....	.....
(Potential)	.....	.....
Drainage	.....	.....

Soil	Texture	Depth
Surface Horizon	.....	.....
Subsoil	.....	.....

(1)

Meteorological and Climatological Data List

Project: ..... Site: ..... Longitude: .....° Latitude: .....°

Forest Type:..... Species:..... Age: ..... Height: .....

Structure: ..... stories Altitude: .....

PLEASE add all concentrated data material and publications, which are relevant i
a meteorological and climatological characterisation of your site!

Year: ..... annual averages and sums

Please state origin of the given data (check, appropriate line):

measured on the site

near the site (indicate distance and vegetation, please):

.....

others (specify) .....

Incident global radiation: ..... (..... units)

reflected global radiation: ..... (..... units)

net radiation: ..... (..... units)

temperature air: .....°C height: m

soil: .....°C height: m

precipitation: ..... mm

interception: ..... mm

evapotranspiration: ..... mm (EIT)

potential evapotranspiration: (method: .....) ..... mm

Soil description

type ..... texture: (if necessary by horizon) .....

rooting depth: ..... soil depth: .....

pH of A-horizon: ..... pH of B-horizon: .....

water content (Θ) at

pF = 1: ..... pF = 2.5: ..... pF = 4.2: .....

(if necessary by horizon)

Year: ..... monthly climatological values

PLEASE, indicate, if you give sums or averages (S or A)!

MEASURED PARAMETER	UNIT	INDICATE S or A	HEIGHT OF INSTRUMENT	MONTH I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Incident global radiation															
Reflected global radiation															
Net radiation															
Humidity rel. or absolut															

Year: ..... monthly climatological values

PLEASE, indicate, if you give sums or averages (S or A)!

MEASURED PARAMETER	UNIT	INDICATE S or A	HEIGHT OF INSTRUMENT	MONTH I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Air temperature															
Soil temperature															
Soil moisture suction or water content															

Year: ..... monthly climatological values

PLEASE, indicate, if you give sums or averages (S or A)!

MEASURED PARAMETER	UNIT	INDICATE S or A	HEIGHT OF INSTRUMENT	MONTH I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Precipitation															
Interception															
Evapo-transpiration															
Wind speed															

REMARKS.

2. Energy and matter exchange processes

A. Instrumentation, methods, applicability, limitations

1. Atmospheric water+

Rain in the open

Measuring the rainfall in the open in forest sites requires either a clearing or a tower (pole) extending to the upper region of the canopy. The clearing should be in a close distance to the experimental sites and of sufficient size, i.e. the diameter of the clearing should be at least 5 times as large as the length of the surrounding trees. It is advisable to put the rain gauge into a soil pit in order to have the opening of the gauge in about the level of the surrounding soil surface.

Measuring the rainfall in the open in the upper region of the canopy has the advantage of better comparability with the measurement beneath the canopy (see next chapter) and thus provides more reliable data for determining the interception as the difference between the rainfall above and below the canopy. The gauge should be positioned as deep as possible but in a way, that no branch

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+ Prepared by BERNECKE, F.

or top of a tree enters a funnel shaped region extending from the opening of the gauge with an angle of about 30° upwards (relative to a horizontal plane). Selfrecording gauges are available as well as rain collecting devices, which need to be checked from time to time, depending on the amount of rainfall.

In order to meet freezing temperatures, a heating system may be installed. Energy supply can be provided either by electricity or propan-gas (?), the former being better manageable but requirs a power line. Snow will be melted and not at the same time rate it falls. Heavy snowfall or very low temperatures may probably overcome the heating capacity.

Snow

Snow is principially recorded by pailshaped collectors, which are simply put on the ground under the canopy as well as on the nearby clearing.

Furthermore weekly snow samples are taken randomly for weighing by means of a cylindrical pipe which is pushed vertically through the snow to the ground.

Finally the snowfall is recorded by the beatable selfrecording raingauges (see preceding chapter).

Canopy drip and throughfall

Because of the irregular distribution, canopy drip

and throughfall are recorded by 16 m long troughs with 2.5 m^2 open catch. Three such troughs are used parallel, one or too of them being outfitted with selfrecording equipment. Addionally 25-30 small rain gauges are used, which are distributed systematically at 5 m distance. Both methods compare fairly good, though even the relatively big troughs show an unexpected standard deviation, which may run as high as 20 % of the mean value.

Stemflow

Rubber profiles are mounted around the trunks like a helix. At the lower end there are outlets, through which the stemflow water discharges into containers. Some of those containers are equipped with selfrecording devices. All the trees of some area serving as the reference area for the total of the collected stemflow water. There are generally big differences between the rate of stemflow, depending on their size and shape.
Stemflow turned out to be quite high for beech but negligible small for spruce.

2. Soil water+

Water storage, movement and seepage in the soil are principially calculated from tensiometer readings. The tensiometers are placed around some

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+ Prepared by BEHECKE, P.

typical trees in order to take into account the distance from the trunks as a parameter of the distribution of soil moisture.

Measurements are taken in 5 to 6 different depths the deepest level being at 1.80 m. Because of the heterogenity of the distribution of the soil moisture, up to 50 parallel tensiometers are used in each depth thus requiring 200 to 300 tensiometers per site.

Readings are taken 2 to 3 times a week.

A selfrecording tensiometer setup using pressure transducers is under construction.

Tensiometers have a limited scale. At suctions higher than about 800 to 1000 mbar do not work and other methods must be employed. Possibilities are thermocouple psychrometers, aquapots, gypsum blocs etc.

In addition to the drier soils the use of tensiometers is limited in soils with high stone (rock) content.

Water content measurements should be made simultaneous to tensiometer readings mainly to checking if hysteresis phenomena are involved. One may use a neutron moisture probe for this purpose. A high precision method is the use of a double tube gammay ray meter, if used stationary. Continuous selfrecording for instance on punch tapes is

advisable.

In any case one will find it necessary to take soil samples for determining the water content by weighing and drying in the room. This has to be done for calibration and for obtaining a reference water content (to which the change of water content as measured with the gamma ray meter can be calculated).

For calculation of water content, water movement either up- or downwards in different depths furthermore the water characteristic (water suction vs. water content) and the permeability characteristic (permeability vs. water content) must be known. The same is true, if one intends to simulate the changes of moisture content over a certain time period.

5. Radiation.+

Radiation is a most important site factor, as it is recognised as the driving force of all climatological features and of all energy and matter exchange processes in ecosystems. The following table gives for several research objects of growing rate of intensivity, some informations on instrumentation, measurements and limitation, as results of utilisation in several IBP projects.

+ Prepared by Kubler, Chr.

Object 1	Radiation flux 2	Dimension 3	Instrument 4	Limitation 5	Point of measurement (height above soil) 6	Service 7	Time interval of measurement 8
1. Ecological and microclimatical research	Incoming global radiation (0,3 - 3 μ) (on horizontal surface)	cal cm^{-2} day^{-1}	Robitsch Aktinograph (mechanical)	No obstacle on horizon	Without obstacle in the horizon>5° in a distance of 100m. a) above the canopy on tower b) in openarea 1,20m above ground level	Horizontal position, Calibrating 2 times in year with standard thermopile Recording paper for 4 or 7 days, Cleaning of glas protection, Change of drying material.	Continuous recording, Daily values in the period (year).
2. Ecological and Microclimatological research. Total energy balance	a) global radiation (0,3-3μ) b) reflected global radiation (0,3-3μ) c) net radiation balance (0,3-100μ) (on horizontal surface)	cal cm^{-2} h^{-1} cal cm^{-2} h^{-1} cal cm^{-2} h^{-1}	Pyranometer, thermopiles, solarimeters (a, b) Net radiometer (c)	Electrical power	For 2. col(2) a, b, see 1. col(6) a For 2.(2) c, 2 m above canopy and 3 m wide from the tower	Horizontal position, calibr. 1 or times in year with standard thermopile, Cleaning of glas protection, Change of drying material, Change of polyethylene protection (2 or 3 times pro year)	Continuous or max 12 sec recording hourlyand daily values during the period (year)
3. Ecological and microclimatological research Total energy balance Photosynthesis	a) See 2.Col(2)a b) See 2.Col(2)b c) See 2.Col(2)c d) Light (0,3-0,7μ)	cal cm^{-2} h^{-1} cal cm^{-2} h^{-1} cal cm^{-2} h^{-1} lux h^{-1} or ratio lux-calories of global radiation	See 2. Col 4 See 2. Col 4 See 2. Col 4 Luxmeter	See 2.(5)	See 2. Col (6) See 2. Col (6) See 2. Col (6) See 2. Col (6) a,b	See 2. Col (7) See 2. Col (7) See 2. Col (7) See 2. Col (7)	See 2. Col (8) See 2. Col (8) See 2. Col (8) See 2. Col (8)
4. Ecological and microclimatological research Total energy balance Photosynthese Energy balances within canopy and energy fluxes (different levels)	a) See 2. Col(2)a b) See 2.Col (2)b c) See 2. Col(2)c but with separated measurements of incoming and outgoing long waves radiation d) See 3. Col(2)d e)See4.(2) a, b See 4. (2) c See 4. (2) d	See 3 (3) id id id id	See 3 (4) id id id id	See 2.(5) id id	See 2. Col (6) id id id Several heights within canopy in relation to vegetation layers 1 to 2m above herb. layer and soil surface (several or few mobile sensors)	See 2. Col (7) id id id id	See 2. Col (8) Continuous recording or recording periods related with weather types and phenological phases

4. Heat and vapour.+

There are several methods for the determination of heat and vapour fluxes. Aside from the eddy correlation method most of them are variations of the Sverdrup method or the aerodynamic method, which are described below.

4.1 The aerodynamic exchange.

The turbulent exchange of air properties may be described by the exchange coefficient A. Under adiabatic conditions the exchange coefficient A_a is according to Prandtl:

$$A_a = \rho_a \, l^2 \frac{du}{dz} \qquad (1)$$

In this equation ρ_a is the density of the air, $\frac{du}{dz}$ is the vertical gradient of the horizontal wind speed and l is the mixing length; l can be calculated by the formula

$$l = K (z + z_o) \qquad (2)$$

where K is the Karman's constant ($\approx$ 0,4), z is the height and z_o is the roughness length.

The value of z_o is computable from the logarithmic wind profile equation:

$$u = \frac{u*}{K} \ln \frac{z - d + z_o}{z_o} \qquad (3)$$

where u* is the friction velocity, calculable from the measured wind speeds, and $- d + z_o = D$ is according to Lettau the "zero point displacement parameter". Using the Richardson number Ri and the diabatic corrections Ψl for sensible heat and Ψv for latent heat the exchange coeffi-

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+ Prepared by GIETL, K.

cient is applicable for non adiabatic stratifications also.

In this case the fluxes of latent heat V and sensible heat L are determined by

$$V = A_a \cdot \psi_v (Ri) \cdot r \frac{dq}{dz} \qquad (4)$$

$$L = A_a \cdot \psi_l (Ri) \cdot c_p (\frac{dT}{dz} + \gamma a) \quad (5)$$

where the adiabatic temperature gradient γa is very small compared with $\frac{dT}{dz}$ and therefore negligible.

Application:

Using the method of aerodynamic exchange it is possible to calculate the exchange of latent heat and sensible heat over a forest with the following conditions:

It is necessary to determine a district wind profile.

The convective exchange may not be too large compared with the turbulent diffusion.

4.2 The Sverdrup method.

Energy balance equation:

The basic idea of this method is the energy balance equation.

$$Q + B + L + V = 0 \qquad (6)$$

where Q is the net radiation, B is the heat flux into the soil, L is the sensible heat flux and V is the latent heat flux.

If the energy balance equation is applied to a forest, the terms P and K have to be included into the formula, where P is the sensible heat flux into the plant material and K is the chemical fixed energy. In this case the formula of the energy balance equation is extended in the following way:

$$Q + B + L + V + P + K = 0 \qquad (6a)$$

As a reference level for the energy balance of a forest we assume usually a plane at the average upper height of the stand. All fluxes which are directed towards the reference plane are calculated positive, all others, which are averted, are defined negative.

The evaluation of the single terms of the energy balance equation:

Q can be measured directly;

B can be computed from temperature profiles and from the soil density and the specific heat of the soil profile;

P can be evaluated from the tree temperature and from the volume of the stand, which is usually expressed as the height of an homogeneous wood layer and the specific heat of green wood. For an approximation it is possible to substitute instead of tree temperature air temperature of the air within the stand.

K, the chemical fixed energy, is in comparison to the other terms of the energy balance equation very small and is therefore in most cases neglected. But it is possible to determine K over the increment of the forest stand as the energy, which is necessary for the net production.

L and V can be calculated through the use of the turbulent exchange coefficient in the following way:

$$V = A_a \cdot \varphi_v(Ri) \cdot r \left(\frac{dq}{dz}\right) \qquad (4)$$

$$L = A_a \cdot \varphi_l(Ri) \cdot c_p \left(\frac{dT}{dz} + \gamma a\right) \qquad (5)$$

Under the assumption that the exchange coefficient for latent heat is equal to the exchange coefficient for sensible heat one omit the turbulent exchange coefficient by use of the socalled Bowen ratio L/V. From the two previous equations following formula results:

$$\frac{L}{V} = \frac{c_p \left(\frac{dT}{dz}\right)}{r\left(\frac{dq}{dz}\right)} \qquad (7)$$

This equation was used by Sverdrup to solve energy balance equation either for L or for V.

$$L = \frac{Q + B + P}{1 + \frac{r}{c_p}\left[\frac{dq}{dz} \Big/ \frac{dT}{dz}\right]} \qquad (8)$$

$$V = \frac{Q + B + P}{1 + \frac{c_p}{r}\left[\frac{dT}{dz} \Big/ \frac{dq}{dz}\right]} \qquad (9)$$

The factor in these equations are as follows:

r = heat of vaporization of water

c_p = specific heat the air under constant pressure

$\frac{dq}{dz}$ = specific humidity gradient

$\frac{dT}{dz}$ = temperature gradient

Application.

Due to the dependence on gradient measurement, the Sverdrup method is not applicable for strongly turbulent exchange, when the gradients approach zero. Because of this, this method is applicable for high energy exchange but not for nearly indifferent stratification with adiabatic exchange coefficient.
According to Berz the limitation for the application of the Sverdrup method over grass-land including the accuracy of the instruments is $Q + B \geqslant 50$ mcal cm^{-2} min^{-1}.
Under these limitations only half of the time is represented, but more than 90% of the energy energy exchanges.

4.3 The Eddy correlation method.

The principle idea of this method is a follows:
Any properties of the air, for example sensible heat and latent heat, are moved vertically by the eddies.
In this case, the vertical transport of a parameter at a fixed point is the product of the fluctuation of this parameter times the fluctuations of the vertical wind speed, averaged over time.
Accordingly

$$V = \rho \cdot \overline{q' w'} \qquad (10)$$

$$L = \rho \cdot c_p \overline{T' w'} \qquad (11)$$

where ρ is the density of air, c_p is the specific heat of the air, w' is the instantaneous deviation of the vertical wind speed from its mean value and q' and T' are the instantaneous deviations of latent heat and sensible heat of the mean values.

However, by this method the flux of any parameter is measured only at a certain point and the values are not representative for the whole of the stand, because

the surface of a forest is too heterogeneous. Therefore it is adviseable in using this method to measure in an array considering the horizontal heterogenity of the surface.

4.4 Instrumentation.

Micrometeorological instruments are described in detail by Monteith in the IBP handbook Nr 22.

In using the methods described above one should pay attention to the following.

Profile methods (Sverdrup method and method of aerodynamic exchange):

The instruments should be calibrated not only to absolute values but to each other. In this way the systematic error can be minimized. In order to achieve high degree of accuracy one should use values averaged from recordings of very small time intervalls.

Eddy correlation method:

The Evapotron (Dyer and Maher, 1965) and the Fluxatron (Dyer et alii, 1957) were developed especially for this method, to measure the latent heat flux and the sensible heat flux, respectively. When using other instruments one should make certain that all the eddies are registered. Generally sensors with a time resolution less than a second are sufficient.

A factor to be remembered in using this method is the large volume data, which accumulates due to the short time resolution.

5. Carbon dioxide*

To estimate and calculate CO_2 fluxes and CO_2 flux balances of forest stands, one can apply two distinct different monitoring techniques, with specific advantages and drawbacks. There exists no ideal solution to the question which method works best and what technique should be employed under general circumstances. The researcher has to decide from his specific case and from his accuracy and resolution demands what the best applicable method for his study. We should be concerned to describe herein the different methods and give an appropriate instrumentation recommendation and sketch out the assumtions and limitations of the method.

Methods of Measurement.

A. Profile methods.

Common to the profile methods is the measurement of the different meteorological parameters at different heights above and within a forest stand (i. e. radiation, netradiation, temperature, humidity windspeed, concentrations of CO_2, or other atmospheric qualities) and to compute from these data through different approaches the concerned fluxes. The shortcoming of the profile methods in general is the additive behaviour of the random error of measurement when gradients are determined.

a) The Aerodynamic Method.

The turbulent exchange coefficient can be derived from the so called logarithmic windprofile under neutral thermal condition; at a given height (Z_r) it is only dependent upon the ambient windspeed and upon a surface windspeed dependent proportionality factor (f).

$$f = \frac{U^+}{U} = \frac{K}{\ln \frac{Z_r}{Z_o}} \quad (1)$$

Where: Z_r = reduced height
K = 0.4 Von Karman's constant
Z_o = roughness parameter
U^+ = mixing velocity

The turbulent exchange coefficient for a given height above the stand (Z_r) is then:

$$A_a = K.Z_r\ f\ \rho\ U \quad (2)$$

CO_2 - fluxes are then found as the product of the CO_2 gradient over the respective height interval times the turbulent exchange coefficient. Thermal stability or instability corrections can be applied to the turbulent exchange coefficient through the use of Richardson numbers.

One of the basic assumptions for this computation method for CO_2-flux balances is that the turbulent exchange of momentum is assumed to be equal to the turbulent exchange of CO_2.

Shortcoming of the turbulent exchange method are:

that it is only applicable for exchange and CO_2 flux computation under neutral thermic (adiabatic) conditions.

*Prepared by HAGER,H.

And that the turbulence theory has only validity for a certain height interval above the stand.

Computation of CO_2-fluxes within the stand underneath the canopy by the turbulent exchange method are not possible, but there is the possibility of (empirically) calibrated extrapolation into the stand space.

Erroneous results can be obtained from the turbulent exchange methods, despite of the Richardson number correction, when there are low windspeeds and high radiative energy inputs.

b) Sverdrup Method.

In this case the exchange coefficient for given heights is calculated by the use of the Bowen ratio (L/V) and by the reversal of the energy balance equation and solution of this equation for the turbulent diffusion coefficient. (3 and 3.1)

$$S_z - B = K_z \left(C_p \rho_a \frac{\partial \theta}{\partial z} + r_w \frac{\partial a}{\partial z}\right) \quad (3)$$

$$K_z = \frac{S_z - B}{C_p \rho_a \frac{\partial \theta}{\partial z} + r_w \frac{\partial a}{\partial z}} \quad (3.1)$$

Where:

S_z = netradiation for a height (z)

B = soil heat flux

K_z = turbulent diffusion coefficient for height (z)

C_p = specific heat of air

r_w = heat of vaporation

ρ_a = mean density of air

$\frac{\partial \theta}{\partial z}$ = temperature gradient

$\frac{\partial a}{\partial z}$ = abs. humidity gradient

The CO_2-flux is determined in an analogous way as for the aerodynamic method after evaluation of the turbulent exchange coefficient.

The basic assumption for the Sverdrup Method is that:

$$K_{CO_2} = K_V = K_L \quad (4)$$

The turbulent diffusion for CO_2 is equal the turbulent diffusion of sensible and latent heat. Advantages of the Sverdrup Method are that it is working throughout the canopy space where the turbulence theory is not valid.

A severe shortcoming of this method is on the other hand that it is not working or gives highly erroneous values in the case when the netradiation approaches zero or when the gradients of sensible and latent heat become very small (i.e. when there is high turbulent mixing, which tends to decrease gradients.)

In many cases best results are obtained when the aerodynamic and the Sverdrup method are combined in a feasable way.

c) Instrumentation for the Profile Methods.

Different micrometeorological elements have to be monitored in and above a homogeneous forest stand in accordance to apply one or both of the two different profile methods.

For the aerodynamic method only profiles of the horizontal windspeed above the zero plane have to be measured with lightweight cupanemometers. If a stability correction with Ri-numbers should employed a temperature profile (which could be taken with Pt-100 or thermistor sensors) should be measured.

If the Sverdrup method should be used a more elaborate instrumentation is necessary. Profiles of netradiation, and of air temperature and humidity have to be measured, which should be done with either psychrometers, or thermistors and dew cells. To determine the soil heat flux (B) one can either employ heat flux plates, or ground thermometers and moisture probes.

For all two methods an adequate method for sampling CO_2 gradients, would be to take CO_2 probes from corresponding heights of measurement, and employ either wet chemical or infrared CO_2 analysis. Since the wet chemical analysis (alkali absorbent for CO_2 containing air probes and titration) is very tedious it is only used for long period CO_2 averages. Continous monitoring of CO_2 concentrations at different heights is only possible with the infrared gas analysis, and an intake, pump and valve switch system, which draws continously air from different heights and switches the probe stream into the gas analyser. Special care has to be taken to eliminate the water vapour error, either by employing bandfilters or a gas-cooler to freeze out H_2O vapour, or by use of a desiccation tower.

B. The Eddy Correlation Method.

The vertical flux (or eddy transport) F of any atmospheric parameter is equal to the fluctuation of the parameter times the fluctuation of the vertical windspeed. (5)

$$F_{CO_2} = \overline{C'_{CO_2} W'} \qquad (5)$$

Where: F_{CO_2} = Instantaneous flux of CO_2

C'_{CO_2} = Fluctuation of CO_2 concentration

$W' = W - \overline{W}$ = Fluctuation of the vertical windspeed.

By this very strong technique it is possible to determin the instantaneous flux of CO_2 and an integration over time yields flux-balances at a certain point.

For this technique it is also quite important to have homogeneity of the stand (unless horizontal measurement arrays are employed), and to have quite long sampling periods to guarantee adequate statistical confidence. It is also very

important to employ instruments whith adequate time resolution.

Instrumentation.

To measure the fluctuation of the windspeed either hot wire or sonic anemometry with fast data acquisition systems has to be used. For the determination of fluctuations of CO_2 concentrations a short path, free beam infrared gas analyser with bandfilters to eliminate the H_2O-vapour influence would be adequate.

Shortcomings of the eddy correlation method are:

that the instrumentation is not too rugged for use in and above forest stands,

that the timeresolution of infrared gas analysis is limited,

that the infrared gas analysis is susceptible against aerosol.

C. Soil Respiration.

The methods, as described under A. and B. are only working for CO_2-fluxes and balances of the stand and the upper boundary. But since the lower boundary of a growing is a clearly defined CO_2 - source it is necessary to measure and evaluate the upward fluxes from the forest floor. For in situ measurements of CO_2 - fluxes from the soil there are only two methods feasable.

The Equilibrium Method, has a glas dome placed on the soil, and a CO_2 equilibrium between soil air and air in the dome will establish. Samples are drawn periodically and analysed.

The Flow-Uptake Method, CO_2 free or air with CO_2 content is streaming into a glas dome which is placed with the open side on the soil. Through an outlet probes are sucked to a gas analyser continously. The difference between inlet and outlet CO_2 concentration represents the CO_2-flux per soil area.

B. Modeling of the Physical Environment.*

I. The physical processes with which we will concern ourselves here are the transfers of energy, water and carbon dioixide between an ecosystem and its environment.

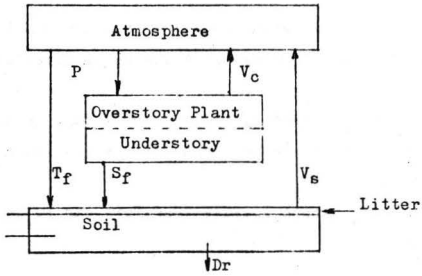
A. Implicit in this development is the assumption that the major exchanges are in a vertical direction. This can be a reasonable assumption when the stand edge is small compared with the stand area and the lower boundary of the stand is shallow enough that the major direction of soil drainage is downward.

B. It is also necessary that the stand is homogeneous enough in the horizont plane(s) to be characterized by average characteristics which vary only in the vertical direction.

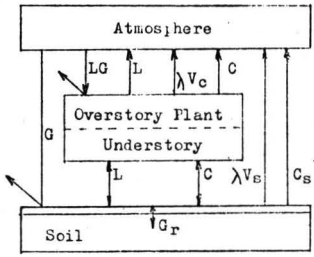
C. Then the water, energy, and carbon dioxide transfers can be illustrated by the following diagrams.

*Prepared by MURPHY,C.E.

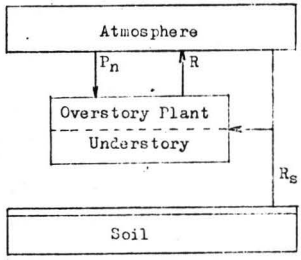
Water



Energy



Carbon dioxide



Definitions for figures.

Water balance

P - precipitation falling on the stand (measured above or in open)

T_f - throughfall reaching the ground surface directly or by drip

S_f - stemflow reaching the ground by running down tree trunks

V_c - water vapor transported from the canopy as transpiration or evaporation of intercepted precipitation

V_s - water vapor flux from the soil and litter

Dr - drainage

Energy balance

G - global radiation above the stand (radiation with wave-length less than 3nm)

I - percent of radiation intercepted by the canopy

L - long-wave flux (wave length > 3 nm)

λ - latent heat of vaporization in air

C - convective flux of sensible heat

G_r- conduction into (out of)the ground

Carbon Dioxide.

P_n - net exchange of CO_2 with photosynthetic organs of plant (photosynthesis - respiration)

R - CO_2 exchange (source) of non-photosynthetic organs (respiration)

R_s - soil CO_2 emission (respiration)

D. Before beginning to analyse and attempt to quantify the flows in this diagram it seems desirable to point to where some of the major interactions between these component processes take place.

1. Both the evaporation and carbon dioxide fluxes enter into the energy balance

   a. The carbon dioxide flux is proportional to the net flux of energy being stored (released) by the plant throughfixation of carbon.

   b. The evaporation is proportional to the latent heat flux caused by the change of state of water at the plant or soil (litter) surface.

2. Fluxes of water vapor and carbon dioxide both have a large source or sink within the plant leaves. Both also can have a soil (litter) component.

II. Some models of the forest energy balance, water balance and carbon dioxide exchange.

A. Penman proposed a combination type of equation for energy balance calculations of evaporation using the principles of heat and mass transfer, and the energy balance. Later this was developed by Monteith to a form suitable for calculations with forests.

1. The basic equation can be written

$$E = \frac{\dfrac{\Delta (R_n - G)}{\rho C_p} + \dfrac{(\rho_{sa} - \rho_a)}{r_a}}{\dfrac{r_a + r_x}{r_a} \quad \dfrac{\lambda \Delta}{\rho C_p}}$$

2. The parameters of this equation are

r_a = aerodynamic resistance from above stand to the average leaf in stand,

r_x = a surface resistance for which the stomatal resistance is a good approximation,

R_n = the net radiation absorbed by the stand ,

G = the heat flux from the soil,

ρ = density of air,

ρ_{sa} = saturation vapor density at air temperature,

ρ_a = vapor density in air,

$\Delta = \frac{d\rho_s}{dT}$, the change in saturation vapor density with temperature,

C_p = specific heat of air at constant temperature

These are constants or imputs to the modeling calculations except for the resistances which must be calculated.

3. The net radiation can be calculated using extinction coefficient absorption in the appropriate wave-length bands for short-wave emission from on effect leaf temperature.

B. The soil water equation of flow has been developped in another section and can be used to model this component of the water balance. However, there are some auxillary relationships which we will develop here.

1. If precipitation is an imput parameter then interception (througfall and stemflow) must be calculated. A number of impirical equations exist.
2. Litter interception can be significant in some stands. Equations similar to these for canopy interception can be developed.
3. The evaporation term can be calculated from the energy balance, given the stomatal resistance.
   a. The stomatal resistance is usually affected by ligth, temperature, and water stress in the leaves of the stand.
   b. The water stress is proportional to the leaf water potential and can be thought of as the sun of the soil water potential (bulk soil) and the potential drop across the plant to the leaf.
   c. The aerodynamic resistance is a function of wind speed and leaf size.
   d. Both resistances are function of leaf area index.
   e. The leaf (stomatal) resistance is the larger and thus controlling resistance, except during interception of precipitation when it is effectively zero.

C. A model for carbon dioxide exchange of the canopy has been developed by Sinclair, Murphy and Knoerr which uses the principles of the Penman - Montheith type of equation for mass flow.

1. The general form of the model is

$$Pn = \frac{C_a - C_{chl}}{s(r_a+r_x) + r_p+r_{cw}}$$

2. The parameters are

   C_a = CO_2 concentration in air,

   C_{chl} = CO_2 concentration in chloroplast,

   s = Solubility of CO_2 in water,

   r_a = aerodynamic resistance,

   r_x = leaf resistance,

   r_{cw} = cell wall resistance,

   r_p = protoplasmic resistance,

3. The concentration at the chloroplast must be def ined as photosynthethic sink term and a respiratory source term.
   a. The respiratory term is usually calculated from a temperature dependent Q_{10} formulation.
   b. The photosynthetic sink is usually formulated to be a function of photosynthetically active radiation absorbed and possibly temperature.

III. A preliminary sensitivity analysis.

A. The energy balance equation shows sensitivity to net radiation input and the diffusion resistances.

a. There is also definite dependance on air vapor density.

b. The diffusion resistances of the stoma can completely control the partitioning of the available energy and thus has special signifigance

c. The model will be somewhat sensitive to leaf area index at low leaf areas.

B. The precipitation is a large driving term, the evaporation can be dominant on some sites while drainage is more important on other site.

Where evaporation is dominant or at least large the stomatal resistance becomes a dominant control in the stand.

C. At low light intensities CO_2 fixation is limited by the sink and source terms; at high light intensity it is limited by the diffusion resistance. Again the diffusion resistance of the stoma dominates under all but ideal conditions.

D. It is worth mentioning that there are several places at which these fluxes interact. The most important are:

1. The radiation balance supplies energy for component in all of these processes.

2. The stomatal resistance is a major control in all cases and needs to be studied in some detail.

Biomass and Mineral Cycling Data

Definitions

Compartment - A division of the ecosystem for which we may measure organic matter in terms of dry weight, or for which we may measure the weight of given bioelements.

Organic Matter - For most biomass (= living matter) compartments and for some others (e.g. standing dead), organic matter normally includes ash. For "F and H" and "soil organic" compartments where soil is incorporated within the layers, organic matter must exclude non-organic matter.

Size - The weight of organic matter or bioelements in a compartment at a given point in time.

Net Annual Increment - The net annual increase in the size of a compartment.

Flux - The annual amount of organic matter or bioelements being transferred (e.g. by litterfall) from one compartment to another.

Overstorey - The trees forming the main canopy. (If epiphytes constitute a significant proportion of the main canopy, include them as an overstorey compartment, but please be sure to note this).

Substorey - The sum of the sub-canopy and shrub layers.

Field Layer - Herbaceous plants, mosses and lichens. Woody plants <50 cm in height may be included here if appropriate. If information is available, please separate into photosynthetic and non-photosynthetic parts.

L Layer - Includes recently fallen plus essentially undecomposed litter.

F and H Layer - The decomposing organic layers on top of the mineral soil.

Soil Organic - Includes all the organic matter (excluding living roots) incorporated in the mineral soil below the F and H layer.

Standing Dead - Dead plants or parts of plants still standing in the forest.

Fallen Trees - Mostly consisting of large material (branches and stems) which has fallen from the compartment "standing dead". (If this is included in the litter layer, please note).

Input Above Trees - Wet - The annual amounts of elements found in the precipitation, usually measured in an open field.

Input Above Trees - Dry - The annual amounts of fallout of elements from the atmosphere, including impaction and sedimentation, into the canopy.

Throughfall - The annual amounts of elements found in the rainwater under the canopy.

Stemflow - The annual amounts of elements found in the rainwater reaching the ground along stems.

Output - The annual amounts of elements found in the soilwater which is transported away from the rooting zone.

Notes on Completing Data Sheets

It is important to remember that our aim is to seek simplicity for the purpose of enabling comparisons among ecosystems to be readily made. If, however, you find there is a compartment or flux which is significant for your forest but is not included in the flow diagram, then please enter the data in the form requested as far as possible, but enter also, with appropriate explanations, other significant details. For example, living trees may fall directly to the forest floor, rather than going through the compartment "standing dead".

On the other hand, you may not have details of the compartments as outlined. For example, you may not have distinguished between "sub-storey" and "field layer". In such cases, bracket the compartments together, as below:

Substorey Photosynthetic parts Non-photosynthetic parts Field layer	106 g/m^2

Increment is the change in the size of a compartment during a year. For example, leaf mass in July 1970 = 812 g/m^2 and in July 1971, leaf mass = 826 g/m^2. The increment is therefore 14 g/m^2/year - note that increment in this case does not include annual litter fall.

Please note the following:

i) Please endeavour to enter data as strictly as possible in the form requested.

ii) Give all data in g/m^2 (for compartment sizes) and $g/m^2/year$ (for increments and fluxes).

iii) Show a value of zero, or a missing value that you consider insignificant, as "o.o".

iv) Show missing values that you consider are significant as "not measured" or "n.m.".

v) If you have measured values of minerals other than N, P, K, Ca and Mg, please use additional forms.

vi) For compartments 3, 4 and 9, state the definitions you used for branch, stem and roots; that is, where you draw the limit between branch and stem, and between stem and root.

vii) For compartments 8 and 9 please indicate your definitions of "large roots" and "small roots" in the spaces provided.

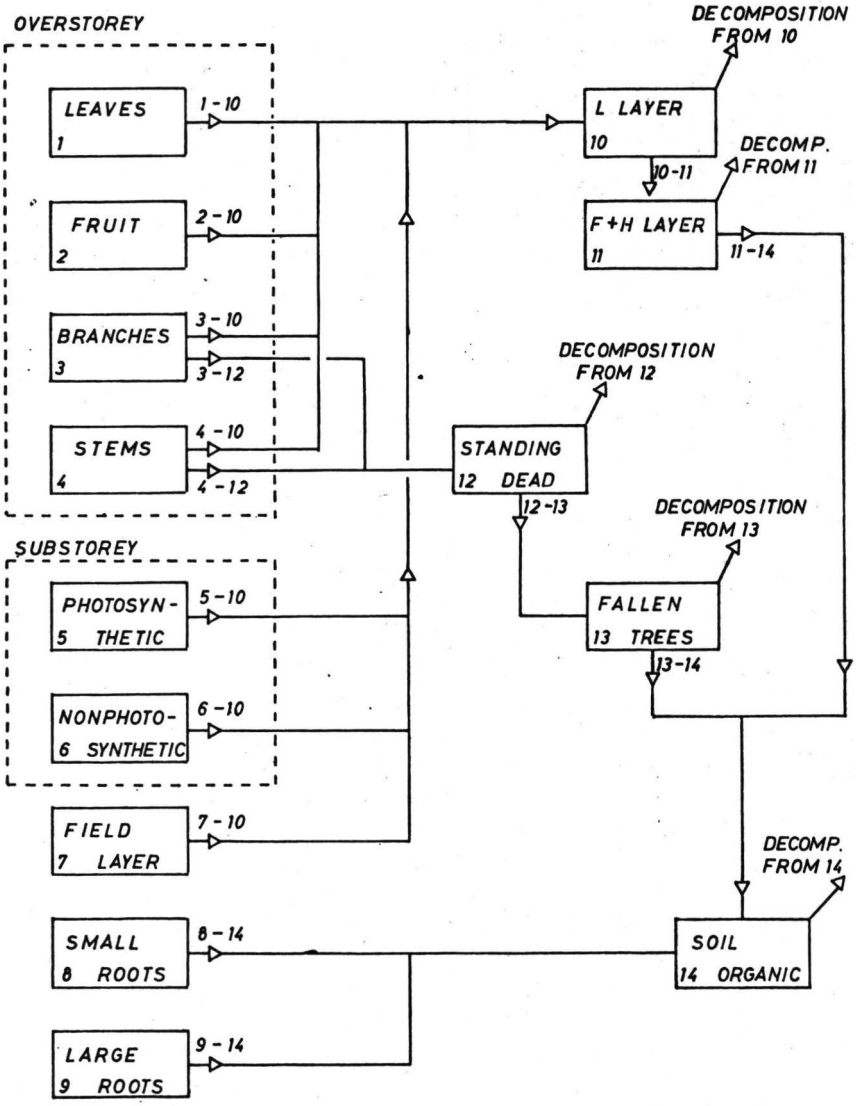
viii) For compartments 10 and 11 give total amounts of elements (e.g. not just exchangeable) for each of the layers.

ix) For compartment 15 you should give <u>total</u> values for N, P (and S) (excluding live roots) and exchangeable values for other elements. Please state the methods used for extraction and analysis. Also state the investigated depth.

x) The accompanying flow chart (Fig. 1) is designed to aid in the identification of compartments and fluxes.

xi) If you have any data indicating a significant loss by consumption or respiration from any compartments, please list below:

BIOMASS DATA FLOW CHART



Biomass Data : Table I - Size and Increment

Compartment		Organic Matter				
Number	Description	Size (g/m^2)	Increment (g/m^2.year)	Energy content (cal/g dry weight)	Carbon content (% dry weight)	Ash content (% dry weight)
	Overstorey					
1	Leaves					
2	Fruits and flowers					
3	Branches					
4	Stem					
	Understorey					
5	Photosynthetic					
6	Non-photosynthetic					
7	Field layer					
8	Small roots (< .... mm)					
9	Large roots (> .... mm)					
10	L Layer					
11	F+H Layer					
12	Standing dead					
13.	Fallen trees					
14	Soil organic					

Bioelement Data: Table I - Size and Increment

Compartment		N		P		K		Ca		Mg	
Number	Description	Size (g/m^2)	Increment ($g/m^2.yr.$)	Size (g/m^2)	Increment ($g/m^2.yr$)	Size (g/m^2)	Increment ($g/m^2.yr.$)	Size (g/m^2)	Increment ($g/m^2.yr.$)	Size (g/m^2)	Increment ($g/m^2.yr.$)
	Overstorey										
1	Leaves										
2	Fruits and flowers										
3	Branches										
4	Stem										
	Understorey										
5	Photosynthetic										
6	Non-photosynthetic										
7	Field layer										
8	Small roots (<....mm)										
9	Large roots (>....mm)										
10	L Layer										
11	F+H Layer										
12	Standing dead										
13	Fallen trees										
14	Soil organic										
15	Mineral Soil										

Biomass Data: Table II - Fluxes

Compartment From	Compartment To	Description	Flux (g/m^2 . year	Energy content (cal/g dry weight)	Carbon content (% dry weight)	Ash content (% dry weight)
		Litterfall				
1	10	Overstorey leaves				
2	10	" fruits and flowers				
3	10	" branches				
4	10	" stem (e.g. bark)				
5	10	Substorey photosynthetic				
6	10	" non photosynthetic				
7	10	Field layer				
	10	All unidentifiable litterfall (e.g. frass)				
		Biomass Death				
3	12	Branches				
4	12	Stems				
12	13	Fall of standing dead				
		Decay of dead organic matter and its incorporation in soil				
10	11	L to F + H layers				
11	14	F + H layer to soil				
13	14	Decaying fallen trees to soil				
		Root death				
8	14	Small roots (< .... mm)				
9	14	Large roots (> .... mm)				

Bioelement Data : Table II - Fluxes

Compartment From	Compartment To	Description	N ($g/m^2.yr.$)	P ($g/m^2.yr.$)	K ($g/m^2.yr.$)	Ca ($g/m^2.yr.$)	Mg ($g/m^2.yr.$)
		Litterfall					
1	10	Overstorey leaves					
2	10	" fruits and flowers					
3	10	" branches					
4	10	" stems (e.g. bark)					
5	10	Substory photosynthetic					
6	10	" non photosynthetic					
7	10	Field layer					
	10	All unidentiflable litterfall(e.g. frass)					
		Input					
	1	Above trees - wet					
	1	Above trees - dry					
	1	Total input					
1	10	Throughfall					
1	10	Stemflow					
		Output					

CARBON AND ENERGY METABOLISM

Basic Concepts:

Gross Primary Production (GPP) = NPP + R_A

Gross primary production is equivalent to the total carbon fixation of photosynthesis.

Autotrophic Respiration (R_A)

Autotrophic respiration is the carbon dioxide lost in respiration by all parts of autotrophic plants.

Net Primary Production (NPD) = GPP - R_A

Net primary production is equivalent to net carbon dioxide fixation and equals photosynthetic fixation minus respiration.

Hetrotrophic Respiration (R_H)

Heterotrophic respiration is the respiratory carbon dioxide losses by all heterotrophic consumer and decomposer organisms.

Ecosystem Respiration (R_E) = $R_A + R_H$

Ecosystem respiration is the sum total of all respiratory losses by the ecosystem and equals autotrophic plus heterotrophic respiration.

Net Ecosystem Production (NEP) = GPP - R_E = NPP - R_H

Net ecosystem production represents the total net gain or loss of carbon by the ecosystem and is the difference between total carbon fixation minus total respiration.

General Information Needed: (See site descriptions)

Forest Type: _____ Location: _____

Latitude: _____ ^{o} Longitude: _____ ^{o}

Total Annual Radiation: _____ $Kcal/m^2$

Growing Season Radiation: _____ $Kcal/m^2$.

Total Annual Precipitation: _____ mm.

Growing Season Precipitation: _____ mm.

Mean Annual Temperature: _____ ^{o}C

Growing Season Temperature: _____ ^{o}C

Length of Growing Season: _____ days

Total Biomass: _____ kg dry wt/ha

Leaf Area Index: _____ m^2/m^2

Data Requirements:

Gross Primary Production (GPP)

Autotrophic Respiration (R_A)

A) CO_2 Respiration by Specific Components:

Tree Foliage (dark respiration) : _____ $gCO_2/m^2/yr$

Herbaceous (dark respiration): _____ $gCO_2/m^2/yr$

Above-Ground Woody: _____ $gCO_2/m^2/yr$

Below-Ground Woody (roots): _____ $gCO_2/m^2/yr$

B) CO_2 Respiration Rates:

Tree Foliage (dark respiration): _____ gCO_2/g dry wt/hr

Herbaceous (dark respiration): _____ gCO_2/g dry wt/hr

Above-Ground Woody: _____ gCO_2/g dry wt/hr

Below-Ground Woody (roots): _____ gCO_2/g dry wt/hr

Give also amounts for above:

Tree Foliage Biomass: _____ g dry wt/m^2

Herbaceous Biomass: _____ g dry wt/m^2

Above-Ground Woody: _____ g dry wt/m^2

Below-Ground Woody (roots): _____ g dry wt/m^2

Give also temperatures at which respiration rates were determined:

Tree Foliage Biomass: _____ ^oC

Herbaceous Biomass: _____ ^oC

Above-Ground Woody: _____ ^oC

Below-Ground Woody (roots): _____ ^oC

Net Primary Production (NPP)

A) Net Carbon Dioxide Fixation:

Trees (foliage): _____ $gCO_2/m^2/yr$

Herbaceous: _____ $gCO_2/m^2/yr$

B) Rates of Carbon Dioxide Fixation:

Tree Foliage: _____ gCO_2/g dry wt /hr

B) Rates of Carbon Dioxide Fixation (continued):

Herbaceous: _____ g CO_2/g dry wt/hr

Give also amounts of above:

Tree Foliage Biomass: _____ g /dry wt/m^2

Herbaceous Biomass: _____ g /dry wt/m^2

Give also temperatures at which above respiration rates were determined:

Foliage: _____ ^oC

Herbaceous: _____ ^oC

C) Net Primary Production (annual increment + consumer losses):

Foliage: _____ g dry wt/m^2/yr

Branches: _____ g dry wt/m^2/yr

Boles: _____ g dry wt/m^2/yr

Below-Ground Woody (roots): _____ g dry wt/m^2/yr

Heterotrophic Respiration (R_H)

A) CO_2 Evolution from the Forest Floor:

Inverted Boxes (with litter): _____ gCO_2/m^2/yr

Inverted Boxes (without litter): _____ gCO_2/m^2/yr

State which technique was used:

_____ alkali absorption method

_____ infrared CO_2 analysis

B) CO_2 Respiration by Specific Components:

Above-Ground Litter: _____ gCO_2/g dry wt/hr

Soil (with or without roots): _____ g CO_2/g dry wt/hr

Roots (living): _____ g CO_2/g dry wt/hr

Give also amounts of above:

Above-Ground Litter: _____ g dry wt/m^2

Soil Organic Matter: _____ g dry wt/m^2

Roots (living): _____ g dry wt/m^2

Give also temperatures at which respiration rates were determined:

Above-Ground Litter: _____ ^oC

Soil: _____ ^oC

Roots: _____ ^oC

Heterotrophic Respiration (continued)

C) Loss of weight by Organic Litter:

Above-Ground Litter: _____ g dry wt/m^2/yr

Soil Organic Matter: _____ g dry wt/m^2/yr

Roots (dead): _____ g dry wt/m^2/yr

Give also amounts of above:

Above-Ground Litter: _____ g dry wt/m^2

Soil Organic Matter: _____ g dry wt/m^2

Roots (dead): _____ g dry wt/m^2

D) Respiration by Consumers of Living Organic Matter:

Foliage Feeders (including predators): _____ $gCO_2/m^2/yr$

Wood Feeders (including predators): _____ $gCO_2/m^2/yr$

Root Feeders (including predators): _____ $gCO_2/m^2/yr$

Give also biomass of above:

Herbivores (including predators): _____ g dry wt/m^2/yr

Xylophages (including predators): _____ g dry wt/m^2/yr

Root Feeders (including predators): _____ g dry wt/m^2/yr

Give also data on specific respiration rates and respective temperatures for different groups:

Group of Aminals	Respiration Rate gCO_2/g dry wt/hr	Temperature °C

Specific Data Needed on Chemical Composition:

Ecosystem Component	Carbon Content (% dry wt)	Calorie Content (calories/g dry wt)	Ash Content (% dry wt)
Foliage			
Trees			
Herbaceous			

Specific Data Needed on Chemical Composition: (continued)

Ecosystem Component	Carbon Content (% dry wt)	Calorie Content (calories/g dry wt)	Ash Content (% dry wt)
Woody			
Branches	_____	_____	_____
Bole	_____	_____	_____
Roots	_____	_____	_____
Litter			
Above-Ground	_____	_____	_____
Soil Organic Matter	_____	_____	_____
Consumers			
Foliage Consumers	_____	_____	_____
Decomposer Animals	_____	_____	_____
Fungi	_____	_____	_____

REPORT FROM WORKING GROUP
on
SECONDARY PRODUCTION BY ANIMALS.

This item has been considered by a group consisting of W. Funke, R. Grimm, Y. Kitazawa, H. Petersen, H.M. Thamdrup and G. Weidemann, Funke and Thamdrup being coordinators.

The group has worked out a proposal for a section of the chapter on Basic Processes of the Forest Ecosystem. The proposal has been discussed with other groups especially the Decomposition group (J. Satchell, F. Malaisse) and the result is presented here.

It will be necessary to get more detailed information on the themes involved than is as yet present in the data sheets. In this connection the group has formulated a letter including a draft questionaire for data collection to be distributed during autumn 1973 to a number of persons known or supposed to be coordinators of investigations on secondary production by animals in the context of woodland ecosystem research. The letter will be followed up by the distribution during spring 1974 of a final questionaire with adhering explanations and definitions.

All answers to questionaires are asked to be sent to
cand. mag. Henning Petersen,
Molslaboratoriet, Femmøller
DK-8400 Ebeltoft, Danmark.

The Molslaboratory has been chosen as site for the secretariat of this group, being responsible for the collection and working up of the material for the synthesis section concerning secondary production by animals. Among the participants of the Göttingen meeting Funke, Petersen, Thamdrup, Grimm, and Weidemann will take part in this work. Others may join the group which intends to meet in September 1974 at the Molslaboratory to make the final preparation of manuscript for the publication. In the meantime several persons will be contacted and asked for contributions to the publication. Kitazawa and Malaisse have already promised to take part.

I.B.P. - PT Woodland biome
synthesis of information
on secondary production by animals.

Dear colleague.

The International Biological Programme is now in its phase of comparison and synthesis. International groups have been appointed with the task to collect and compare the information obtained in the many IBP research projects from all over the world. The result of this work is planned to be published during 1974-76 as a series of international synthesis volumes.

At a meeting at the University of Göttingen, W. Germany, 24.Sept. - 3.Oct. 1973, the woodland projects were considered in view of these synthesis volumes to be published. Dr. D.E. Reichle, Oak Ridge National Laboratories, Tennessee, U.S.A., has been appointed cheaf editor of the woodland volumes.

A group consisting of W. Funke, R. Grimm and G. Weidemann (Germany), Y. Kitazawa (Japan) and H.Petersen and H.M. Thamdrup (Denmark) was asked to be responsible for the collection of information concerning secondary production by animals and for editing a chapter covering this theme.

Although a considerable amount of information had been submitted to the board of the Göttingen meeting from several woodland projects, it was obvious, that in respect of secondary production, this material is not sufficient for the preparation of a synthesis chapter. However, we are convinced that much more information is available within this field or will be so in the course of the next half year. In accordance with the general view on the synthesis work it is not our intension to restrict ourselves to information obtained within IBP projects. We are aiming at a synthesis reflecting our whole present knowledge on the animals as part of woodland ecosystems.

Having the impression that you are leading or coordinating faunal investigations as part of woodland ecosystem research we have approached you with this letter as we assume that you might be able to contribute to the synthesis work with published or still unpublished information from the project(s) in which you are involved. We have the hope that you will be willing to cooperate with us and put your information at our disposal. In this way you will ensure the full benefit of your results in view of the aim of IBP by having them considered in the synthesis work.

Our working group on secondary production by animals has planned an editorial meeting at the Molslaboratory in September 1974. Drafts of all subchapters must be ready before this meeting. Therefore it will be necessary to have all informations from the contributing projects before the 1st of May 1974. About the 1st of March 1974 we will distribute a set of data sheets in which we will specify the kind of data considered most important for the present purpose. A proposal for this set of data sheets is enclosed.

We most sincerely hope that you will reply this letter as soon as possible (before the 1st of December 1973) by

1) indicating whether or not you will be able to contribute with information within the 1st of May 1974
2) outlining which kind of information you will be able to contribute, and from which kind of woodland ecosystem
3) commenting on the set of data sheets enclosed, and your possibilities to fill in data during spring 1974
4) commenting on the draft of the chapter outline (enclosed) e.g. by proposing subchapter authors
5) adding persons and addresses to the list enclosed if you think we have overlooked important potential contributors (mainly coordinators of secondary production projects).

Looking forward to have your comments and hoping that you will assist us in our effort to synthesize the information on secondary production by animals in woodland ecosystems we thank you in advance on behalf of our working group.

Yours sincerely

W. Funke H.M. Thamdrup

coordinators.

Address to which answers are asked to be sent:

cand.mag. Henning Petersen,
Molslaboratoriet, Femmøller
DK-8400 Ebeltoft, Danmark.

DATA COLLECTION
with a view to
IBP WOODLAND BIOME SYNTHESIS
SECONDARY PRODUCTION BY ANIMALS.

Content:

A: Definitions and comments to diagram and data sheets.

B: Diagram: Consumer compartments and fluxes for data aquisition.

C: Data sheets for information on taxa.

1: Taxa present at the site

2: Methods for population and biomass estimation

3: Density (Numbers per m^2)

4: Biomass (Kg dry wt ha^{-1})

5: Consumption/Assimilation. Kg dry weight $ha^{-1} month^{-1}$

6: Respiration. l O_2 ha^{-1} $month^{-1}$ or/Kcal ha^{-1} $month^{-1}$

7: Production. Kg dry weight ha^{-1} $month^{-1}$

8: Additional information

D: Data sheet for site description

Woodland synthesis

Secondary production by animals.

A: DEFINITIONS AND COMMENTS

If you have information on more than one site please give each on separate set of data sheets. You are welcome to ask for more copies from the Molslaboratory.
All parameters (e.g. B.P.C.A.) are used and should be used as in IBP Handbook No.13 (Petrusewicz and Macfadyen: Productivity of terrestrial animals, 1970).

B: Diagram. This sheet gives a general scheme of consumer compartments and fluxes between them for orientation, when filling data sheets. A compartment is a division of the ecosystem for which we may estimate organic matter in terms of dry weight, content of bio-elements, or energycontent. The size of a compartment means the weight of organic matter or bioelements, or energy content at a given point of time.

Compartments:
- 01: living green material (leaves of trees and shrubs, herbs of all strata;
- 02: Wood of living trees (stems, branches, roots)
- 03: roots (< 2-5 mm, please specify according to your data!)
- 04: phyllophages: all animals feeding on 01 (e.g. lepidoptera larvae, weevils,deer)
- 05: juice suckers (including root suckers; e.g. aphids, cicadas)
- 06: xylophages: feeding on living wood and living parts of bark (e.g. Scolitids, Siricidae l.)
- 07: rhizophages: feeding on living roots (e.g. weevil larvae)
- 08: microphytophages: feeding on microfungi,bacteria and soil algae as well as saprophages:feeding on dead organic matter (e.g. Collembola often feed on a mixture of the food mentioned; substrate feeders like earthworms - the typical soil fauna;)
- 09: zoophages: predators and parasites
- 10: consumers the food relations of which are either unknown, or which depend on mixed food, i.e.pantophages:
- 11: dead organic matter: all kinds of litter (dead leaves, bud scales, twigs) as well as standing dead, faeces, cadavers, exuviae.

Fluxes: the amount of matter or energy transfered from one compartment to an other during a specified time interval. Fluxes from 01,02, and 03 to 04,05, 06, and 07 represent primary consumption.
Fluxes from 04,05,06,07,08, and 10 to 09 represent predation.

Fluxes to 11 from all other compartments include all dead organic matter:litter fall,frass,faeces,cadavers,exuvias etc.
All fluxes from consumer compartments (04-10) to the environment (00) represent respiration.

C.

Data sheet 1:

Upper part: Make a list of the taxa investigated at your site,i.e. the taxa for which information is given in some of the following data sheets.Use on these following sheets the number given in the left column instead of the full name of the taxon.

Taxon: A species - or multispecies population according to your own definition.(Examples: Phyllobius argentatus;Aves;Curculionidae + Lepidoptera larvae;Collembola ÷ Sminthuridae)

Compartment,Trophic position: e.g. according to the diagram: (Examples:05; carpophages)

Dominant species or species group: within the taxa.

Lower part: Make a list including all animal groups of some importance in your site,which have not been investigated i.e. are not included in the list above, and give if possible some indication of the level of magnitude of density and biomass.

Data sheet 2:

Method for estimation of population density: (Examples:High gradient funnel extraction; Mark-recapture)

Strata sampled: (Examples:Crown 10-20 m;Litter + soil 0-10 cm)

Dimensions of sampleunit: (Example: 10 cm^2 x 10 cm)

Method for estimation of biomass: (Examples:Direct weighing; from body length/dry weight regressions (according to Edwards 1967)).

Data sheet 3:

Give monthly or seasonal values covering only one annuum. If you have information covering more than one annuum please give it on separate sheets.

In column remarks please indicate whether the information is published (P), final but not published (F) or partly derived from literature(L)

Data sheet 4 See comments to sheet 3.

Data sheet 5 See comments to sheet 3. Give also remarks on methods

Data sheet 6 See comments to sheet 3 and 5

Data sheet 7. See comments to sheet 3 and 5.

Data sheet 8.

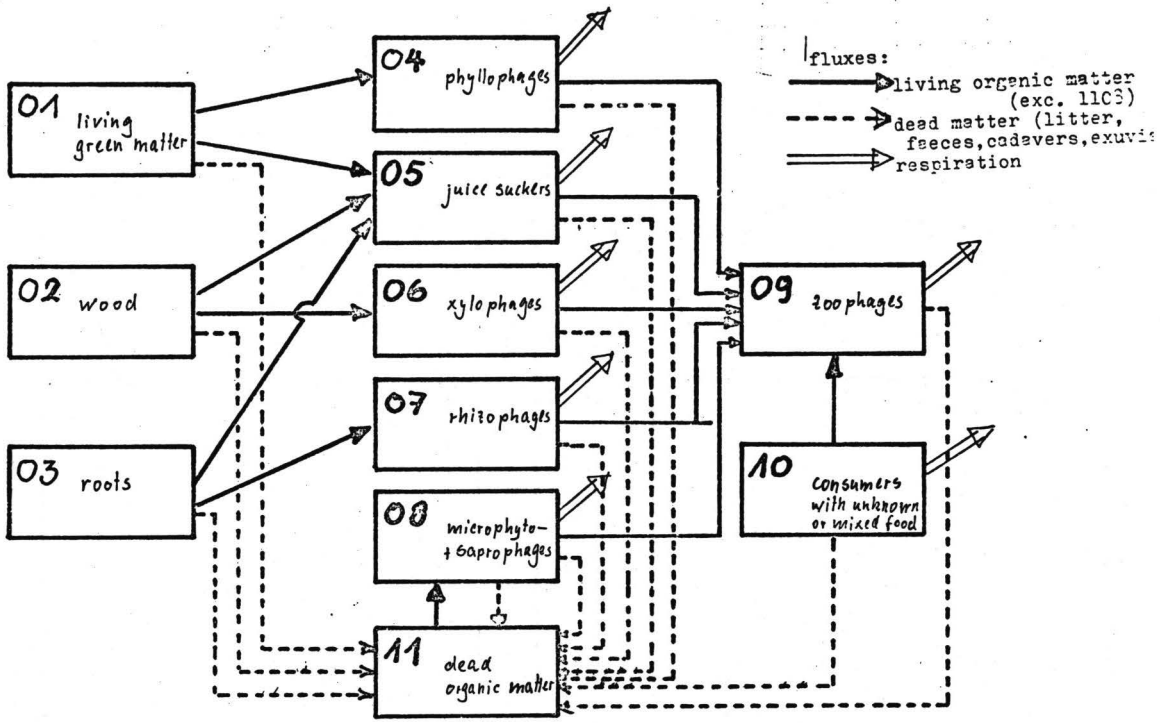
Specification of food items: Give for example names of special food plants or prey animals.

D: Data sheet for site description.

If description of your site(s) has already been sent to the board of the woodland synthesis work it is enough to make a remark on this.

Woodland Synthesis. Secondary Production by Animals.

B. Diagram: Consumer compartments and fluxes for data acquisition.



Woodland synthesis
Secondary production by animals.

Site: _____
Investigator(s): _____

Data sheet 1: Taxa present at the site.

Taxon number	Taxa (investigated)	Compartment trophic position	Dominant species or species-groups
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

	Taxa (not investigated)	Compartment trophic position	Approx. density	Approx. biomass

Woodland synthesis

Secondary production by animals

Site:

Investigator(s):

Data sheet 2: Methods for population and biomass estimation.

Taxon number	Method for estimation of population density	Strata sampled	Dimensions of sample unit	Number of units per sample	Method for estimation of biomass
1					
2					
3					
4					
5					
6					
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18					
19					
20					

Woodland synthesis
Secondary production by animals

Site:
Investigator(s):

Data sheet 3: Density (Numbers per m^2).

Tax numb \ month date	year: J	F	Mc	Ap	M	Jn	Jl	A	S	O	N	D	year: J	F	Mc	Ap	M	Jn	Jl	Annual mean	remarks
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					
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15																					
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19																					
20																					

Woodland synthesis

Secondary production by animals

Data sheet 4: Biomass (Kg dry wt ha^{-1}).

Site: _____

Investigator(s): _____

Tax numb \ month / date	year: J	F	Mc	Ap	M	Jn	Jl	A	S	O	N	D	year: J	F	Mc	Ap	M	Jn	Jl	Annual mean	remarks
1																					
2																					
3																					
4																					
5																					
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17																					
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Woodland synthesis

Secondary production by animals

Site:

Investigator(s):

Data sheet 5: Consumption/Assimilation. Kg dry weight $ha^{-1} month^{-1}$ (cross out non valid term)

Tax numb \ month / date	year:												year:							Annual sum	kind of food	remarks
	J	F	Mc	Ap	M	Jn	Jl	A	S	O	N	D	J	F	Mc	Ap	M	Jn	Jl			
1																						
2																						
3																						
4																						
5																						
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12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						

Woodland synthesis

Secondary production by animals

site:

investigator(s):

Data sheet 6: Respiration. 1 O_2 $ha^{-1}month^{-1}$ or/Kcal ha^{-1} $month^{-1}$ (cross out non valid dimension)

month / date	year:												year:							Ann. sum	Oxycalo ric equiva lent	remarks methods
	J	F	Mc	Ap	M	Jn	Jl	A	S	O	N	D	J	F	Mc	Ap	M	Jn	Jl			
1																						
2																						
3																						
4																						
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16																						
17																						
18																						
19																						
20																						

Woodland synthesis

Secondary production by animals.

site: _____

investigator(s) _____

Data sheet 7: Production. Kg dry weight ha^{-1} $month^{-1}$

Tax numb \ month date	year: J	F	Mc	Ap	M	Jn	Jl	A	S	O	N	D	year: J	F	Mc	Ap	M	Jn	Jl	Ann. sum	remarks methods
1																					
2																					
3																					
4																					
5																					
6																					
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Woodland synthesis

Secondary production by animals

Site: _____

Investigator(s): _____

Data sheet 8: Additional information

Tax number	Calorific content(animals) Kcal/g dry wt	Kcal/g ashfree dr.wt.	Specification of food items	Cal.content of food	Production of food(ann.sum)	Assimilation efficiency
1						
2						
3						
4						
5						
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20						

Decomposition

Form and units: As appropriate for daily time-step seasonal dry matter models. Measured values with dates are requested if available in preference to seasonal curves or curve-derived estimates.

Data are requested where available for individual plant species and components e.g. separate size categories of branches. If species were not separated, e.g. in estimating seasonal changes in the litter layer, please present data as collected.

Compartments (state variables): Please indicate if dry matter or ash free, - or give both.

1. Standing dead wood (Dead trees & shrubs and dead parts of living trees & shrubs)
   1.1 Seasonal data
   1.2 Annual increment data
   1.3 Method of estimation
2. Dead wood lying on the ground (Wood litter)
   2.1 seasonal data
   2.2 Annual increment data
   2.3 Method of estimation
3. Leaf litter (Dead leaves on the ground)
   - Separately, as available, by horizon -
   - Separately, as available, by year -
   3.1 Seasonal data
   3.2 Annual increment
   3.3 Method of estimation
4. Dead roots
   4.1 Seasonal data
   4.2 Annual increment data
   4.3 Methods of estimation

5. Degraded organic matter
   Litter not recognisably structured (to the naked eye) but still decomposing. It can be derived arbitrarily as litter which has lost, say, 80 % weight (but please state the definition applicable to your own data!).

6. Stable organic matter
   This represents material with a mean residence time of some tens to hundreds of years.

   7.1 Mass of stable organic matter
   7.2 Increment of stable organic matter

   5 & 6 If not available separately as 5 and 6 please give total soil organic matter and define how you distinguished it from litter and if your data are for total S.O.M., carbon or ash free dry matter.

Rates of transfers between components (fluxes)

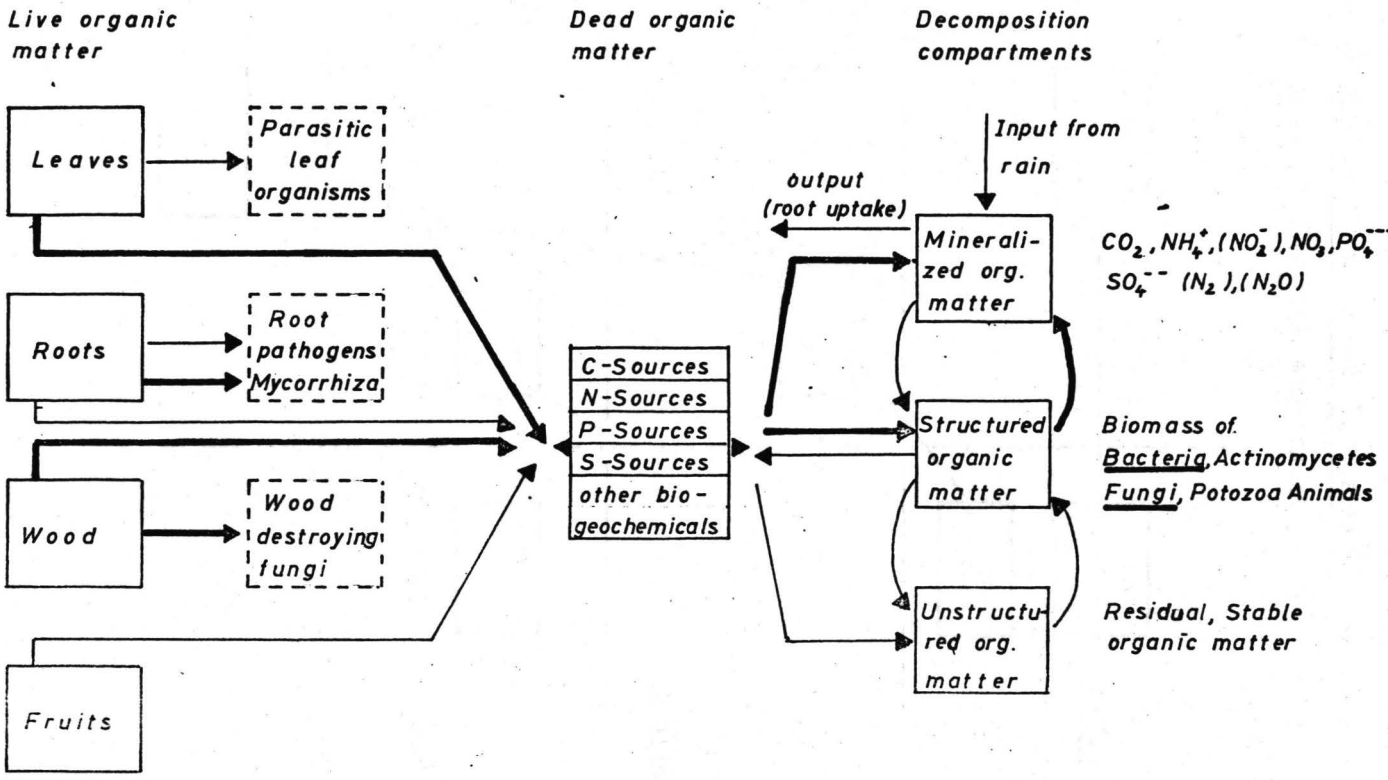
7. Production of standing dead wood
8. Decomposition of dead wood on the ground
   Data on densities of live and dead wood
   Data on tree heart rot
9. Tree fall, branch fall, twig fall (or combined)
10. Decomposition of dead wood on the ground
    Seasonal weight loss and/or respiration data
11. Seasonal leaf litter fall
    Please indicate each data of collection and weights collected separately by species. For herbs please give net primary production if litter fall data are not available and state if herb layer is approximately in steady state.

12. Other litter fractions
    e.g. insect faeces, as for 11.
13. Decomposition of leaf litter on the soil surface
    Data on weight loss, removal from litter bags etc., litter respiration, litter leaching
14. Export from the litter layer
    Removal by wind, burial by earthworms, termite etc.
15. Root death
    All possible data on any kind or size class of roots of woodland species
16. Root decomposition
    Weight loss and/or respiration and/or leaching data.
17. Substrate decomposition
    Decomposition of cellulose, cotton strips, wood blocks filter paper, etc.
18. Soil respiration
    Total soil respiration and data and methods of separating into faunal, microbial and live root respiration
19. Soil organic matter accumulation
    e.g. in plantations of known age on formerly arable land
20. Soil organic matter stabilization
    Data on rates of conversion of litter to humic substances

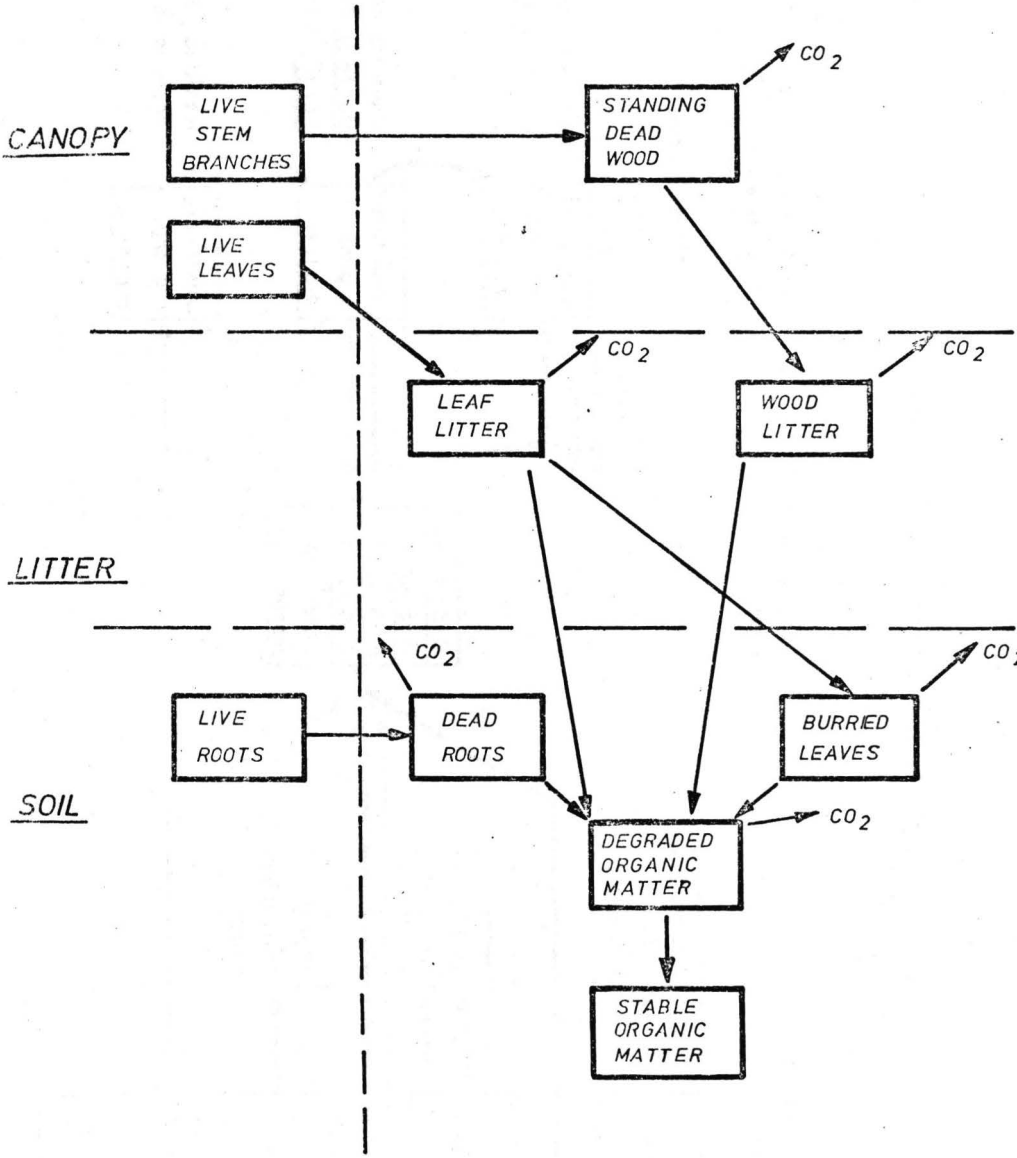
Controlling factors (driving variables)

21. Seasonal patterns of soil, litter, air temperature, moisture, snow cover, ground wind speed etc. as appropriate to your site. Chemical composition of fresh litter, decomposed litter, decomposed litter of known age, including wood, leaves, roots etc.
    Organic constituents of litter as cellulose, hemicellulose lignin, waxes, tannins with method of determination.
    Data on human impacts e.g. fire, clear felling, slash-burning, trampling, grazing.

Fig.1 Generalised mineralization model



Provisional basis for developing a seasonal model of temperate deciduous forest litter decompositio



LIST OF IBP WOODLAND SITES

(° = Pre-IBP site () = still more smaller sites) ("Plantation")

Country	Nr.	site	start	vegetation	Age	Responsible	(Nr. in diesem Band)
AUS	1°	Mt. Disappointment	1955-72	Broadleaf-evergreen (Eucal. obliqua)	51	Attiwill	(57)
	2°	"	"	"	56	"	
	3°	"	"	"	45	"	
	4	Queensland		Subtrop. rainforest		Webb	
	5	New South Wales		Eucal. pilularis		Floyd	
	6	Canberra		"Pin. radiata"		Obington	
B	1	Virelles-Blaimont	1963-69	Mixed Oakforest	80	Duvigneaud, Galoux	(6)
	2	Ferage		Querco-Coryletum		" "	
	3	Mesnil-Eglise		" "		" "	
	4	Mirwart		Fag.sylvatica, Quercus petraea		"	
	5	Wavreille		Querco-Fraxinetum		"	
BR	1	Manaus	1970-	Tropical rainforest (terra firma)		Klinge, Rodrigues	(55)
CDN	1	Montmorency	1970-	Boreal fir forest		Bernier	
	2°	New Brunswik	1967-73	Balsam fir forest	65	Baskerville	
	(3)	Ontario		Acer, Picea		Gordon	
CI	1°	Lamto	1962-	Savanna arbust.		Lamotte	
	2	Banco	1969	Tropical forest	mature	Lemée	
	3	Yapo		" "		"	
CS	1	Bab	1967-72	Fago-Quercetum (Carp.bet.,Quercus	50/70	Biskupsky	(10)
	2	Lednice	1967-72	Quercus petr., Fraxinus excelsior	85	Vyskot	
	3	Rajec	1971-72	Picea abies, Abies alba	100	"	
	4	Zelivka	1971-73	"Picea abies"	80	"	
	5°	Olomucany	1957-70	Abies alba		"	
D	1	Solling B1	1966-	Luzulo-Fagetum (Fagus sylv.)	119	Ellenberg	(12)
	2	" B3	"	"	77	"	(13)
	3	" B4	"	"	56	"	(14)
	4	" F1	"	"Picea abies"	84	"	(29)
	5	" F2	"	"	112	"	(30)
	6	" F3	"	"	31	"	(31)
	7°	Eglharting/Ebersberg	1964-72	"	80	Baumgartner, Hager	(28)
DK	1	Hestehave	1967-	Temperate decid. (Fagus sylvatica)	85-95	Thamdrup	(15)
	2	Lovenholm		" "		"	

ESP	1	San Juan	1971-	Pinus silv., Ilex aquifol.	50-60	Puigdefábregas	
	2	Boalar de Jaca	1971-	" "			
F	1	Rouquet	1965-72	Mediterr.evergreen(Quercus ilex,Qu.coccif.)	150	Lossaint, Rapp	(4)
	2	La Madeleine	1965-72	" "	100?	" "	(5)
	3	Fontainebleau	1965-	Querco-Fagetum	300?	Lemée	
GB	1	Meathop Wood	1967-72	Mixed decid. (Oak, Fraxinus, Betula)	1-	Satchell	(3)
H	1	Sikfökut	1972-	Oakwood (Qu.petraea, Qu.cerris)	60-65	Jakucs	(9)
I	1	Cesurni	1969	"Populus hybr."	12	Tarsia	
	2	Terminillo		Fag.sylv.		Giacomini	
	3	Castel porziano	1968	Quercus ilex		"	
	4	Mt. Minardo-Etua	1970-	Quercus ilex		Poli	
IND	1	Chakia	1971-	Tropical dry deciduous (Shorea)	60	Bandhu,Misra	(56)
IRL	1	Glenamoy	1969	"Pin. cont., Pic. sitch."	10	Moore	
J	1	Minamata		Warm temp.evergreen(Castanop.cusp.,Qu.gilva)	70	Hosokawa	(27)
	2	Shigayama	1968-72	Conif.subalp.(Tsuga diversif.,Ab.mariesii)	290	Kitazawa	
	3	Ashiu	1966	Beechforest		Shidei	
	4	Koiwai		"Larix jap."		"	
	(5)	Kochi		Warm temp.conif.forest		"	
N	1	Hardangervidda-Maurseth		Betula tort. (tundra)	40-50	Dahl	
NL	1	Meerdink	1967-	Oakwood (Qu.petraea)	140	v.d.Drift	
PA	1			Tropical Rain Forest		Golley	
PL	1	Bialowieza	1966-70	Querco-Carpinetum(Carp.bet.,Tilia,Pic.ab.)	120-210	Falinski	(11)
	2	Ispina	1968-	Quercus rob., Carp.bet.	80-100	Medwecka-Kornaś	
	3	Ojców	1964-	Fagetum carpaticum	70	"	
	4	Niepolomice	1968-	Tilio-Carpinetum		"	
PTM	(1)	Pasoh	1971-72	Equat.lowland Dipterocarpus forest	mature	Bullock,Kira	(53)

R	1°	Babadag 1	1960-	Submed.decid.forest (Quercus pub.)	37	Donita	(7)
	2°	Babadag 2	1960-	Subcont.decid.forest (Quercus rob.)	37	"	(8)
	3	Sinaia 1	1967-70	Beech-fir forest	1-450	Bindiu	(21)
	4	" 2	1968-70	Fir forest (Ab. alba)		"	(22)
RA	1	Vaquerias	1972	Evergreen scleroph.forest (Lithraea moll.)		Luti	
S	1	Linnebjer	1964-68	Quercus rob., Corylus avell.	12-190	Andersson	(18)
	2	Kongalund 1	1966-69	Fagus sylv. (Stellaria-Lamium)	45-130	Nihlgard	(17)
	3	" 2	1966-69	"Picea abies" (Oxalis)	60	"	(32)
	4	Langarod	1966-69	Fagus silv. (Deschampsia)	100	Lindgren,Nihlgard	(16)
	5	Oved	1966-69	Fagus silv. (Mercurialis)	80-100	" "	(20)
	6	Renningstorp	1965-69	"Picea abies"	18-27	Tamm	
	7	Andersby 3	1968-72	Temp.decid. (Quercus,Betula,Corylus)	1-	Hytteborn,Persson	(19)
SF	1	Oulu-Kuusamo		Picea abies (Hylocomium-myrtillus)	260	Havas	(52)
	2	Kevo 1	1968-	Pinus silv. (tundra)	90-100	Kallio	
	3	Kevo 2	1968-	Betula tort. (tundra)		"	
	4	Hyytiälä 1	1969-	Picea abies	60	Leikola	
	5	" 2	1970-	Pin. silv.		"	
SU	1		1965-69	Pic.-ab.cladinosum	37	Kazimirov	(35)
	2		"	" vacc.vit.id.	45	"	(36)
	3		"	" myrtillosum	39	"	(37)
	4		"	" oxal.-myrt.	43	"	(38)
	5		"	" oxalidosum	38	"	(39)
	6		"	" polytrichosum	42	"	(40)
	7		"	" ulig.-herb.	41	"	(41)
	8		"	" myrtillosum	22	"	(42)
	9		"	" "	37	"	(43)
	10		"	" "	45	"	(44)
	11		"	" "	54	"	(45)
	12		"	" "	68	"	(46)
	13		"	" "	82	"	(47)
	14		"	" "	98	"	(48)
	15		"	" "	109	"	(49)
	16		"	" "	126	"	(50)
	17		"	" "	138	"	(51)
	18	South taiga	1967-73	" oxal.-myrt.	110	Karpov-Rodin	(34)
	19	Koinas	1965	" junip.-hyloc.(northern taiga)	125	Rudneva	(33)

SU-EST	20	Vooremaa 1		Picea abies		Frey		
	21	" 2		"		"		
	22	" 3		"		"		
	23	Venevere		"		"		
	24	Mihkli 1	1970-	"	84	Reintam		
	25	" 2		Oakforest		"		
	26	Mooste		Pin.silv.		"		
	27	Reola		Picea abies		Frey		
T	1	Sakaerat	1971-	Tropical dry evergreen woodland		Sabhasri		
	2	Lampang	1971-	Teak forest		Komkris		
USA	1	Oak Ridge	1968-72	Liriodendron, Quercus, Carya	48	Reichle,Shugart	(1)	
	2	Coweeta Oak		Quercus, Carya		Monk		
	3	" Pine		"Pinus"		"		
	4	" Coppice		Quercus		"		
	5	Duke Forest	1968-	"Pinus taeda"	16	Murphy	(25)	
	6	Triangle-EDFB	1972	"Pinus taeda"	15	"	(26)	
	7°	Noe Woods (Wingra)	1952-72	Quercus alba,Qu.velutina	140	Loucks	(2)	
	8°	Nakoma urban(Wingra)	1952-72	Qu.alba, Qu.velutina	140	"		
	9°	Thompson(Seattle,Cedar riv.)	1961-73	Pseudotsuga menziesii	36	Sollins	(24)	
	10	H.J.Andrews Exp.Forest	1972	Pseudotsuga menziesii	450	Grier	(23)	
	11	Hawaii	1971-73	Trop. rainforest		Mueller-Dombois		
	12°	Brookhaven		Quercus illicif.,Pinus rigida		Woodwell		
	(13)°	Puerto Rico (ElVerde)	1962-65	Trop. rainforest		Odum		
	14	Alaska 1		Alder	5	Viereck		
	15	" 2		"	10	"		
	16	" 3		"	15	"		
	17	" 4		Black spruce	48	"		
	18	" 5		" "	55	"		
ZR	1	Kasapa	1968-72	Miombo dècid.woodland(Brachystegia ut.)	120	Malaisse	(54)	
	2	Luiswishi 1	1968-	" (Br.julbern.)		"		
	3	Kisange 1		" (Br.microphylla)		"		
	4	Luiswishi 2	1968-	Muhulu dry evergreen (Marquesia macr.)	mature	"		
	5	" 3		Derived savanna		"		
	6	Kisange 2	1969-71	Mushitu riparian forest (Garcinia,Syzygium)		"		

List of addresses of persons responsible for IBP Woodland sites
(see also list of workshop participants)

Dr. G.L. Baskerville, Forestry Branch Dep. Fisheries and Forestry, Fricericton N.B., Canada
Prof.Dr.A.Baumgartner,D-8 München 13,Amalienstr.52,Meteor.Inst.d.Forstl.Forschungsanstalt,FRGermany
Dr. Bernier, Universitet Laval, Quebec, Canada
Prof. Bindiu, I.C.S.P.S.,Sos Pipera 46, Bucuresti, Romania
Prof.Dr.E.Dahl, Botan. Inst. Norwegian Agric.College, Vollebekk, Norway
Dr.A.G. Floyd, Forestry Commission of New South Wales, Coff's Harbour, Australia
Prof. Dr.T.Hosokawa, Dep.Biology Fac.Sc.Kyushu Univ., Fukuoka, Japan
Prof.Dr.P.Kallio, Dep. Botany Univ. of Turku, Turku 2, Finland
Dr.V.G.Karpov, Komarov Bot.Inst.USSR Ac.Sc., Leningrad P-22, USSR 197022
Dean Thim Komkris, XX Appl.Sc.Research Corp.Thailand, Bankhen, Bangkok, Thailand
Prof.Dr.Lamotte, Lab. Zoologie ENS, 46, Rue d'Ulm, Paris, France
Prof.Dr.Matti Leikola, Forest Res. Inst., Unioninkatu 40A, SF-00170 Helsinki 17, Finland
Prof.Dr. G. Lemée, Lab. Ecologie vég. Univ. de Paris XI, Centre d'Orsay, France
Dr. R. Luti, Cat.Geobotanica Fac.Cienc.Ex.Fis.y Nat., Av.Velez Sarsfield 299, Cordoba, Argentina
Prof.Dr.Medwecka-Kornaś, Nat.Conservation Res.Center PAS, Krakow, Poland
Prof.Dr. R.Misra, Dep.Botany Banares Hindu University, Varanasi 5, India
Dr. C.D. Monk, Dep. Botany Univ. of Georgia, Athens, Georgia 30601, USA
Rev. J.J. Moore S.J., Dep. of Botany Univ. College, Belfield, Dublin 4, Ireland
Prof. Dr. D. Mueller-Dombois, Botany Dep., 3190 Maile way, Honolulu, Hawaii 96822, USA
Prof. Dr. H.T. Odum, Dep. Envir.Eng.Sc.Univ.Florida, Gainesville, Florida 32601, USA
Prof. Dr. Ovington, Dep. Forestry Austr. Nat. Univ. Canberra, Australia
Dr. E. Poli, Ist. Botanica Univ., Via A. Longo 19, Catania, Italy
Dr. J.T. Puigdefabregas, Centro pirenaico de biol.exp., Apartado, ESP-64 Jaca (Huesca), Spain
Prof.Dr.L.Reintam,Chair Soil Sc.and Agron.Chemistry Est.Agric.Acad.,12 Riia Str.,Tartu,Estonian SSR(SU)
Dr.W.A.Rodrigues, Inst.Nac.Amazonico Centro Pesquis.Florest., Manaus Amazonas, Brazil
Dr. Rudneva, Komarov Bot.Inst.USSR Ac.Sc, Leningrad P-22, USSR 197022
Dr.Sgna Sabhasri, Sakaerat Exp.Station Appl.Sc.Res.Corp.Thailand,Bankhen,Bangkok,Thailand
Prof.Dr.T.Shidei,Dep.Forestry Fac.Agriculture Kyoto Univ.,Sakyo-ku, Kyoto 606, Japan
Dr. N.Tarsia, Centr.Sperimaz.Agr.e.For., P.O.Box 9079, Roma, Italy
Dr.L.A.Viereck, Inst.Northern Forestry For.Sc.Lab., College, Alaska 99701, USA
Prof. Dr.Vyskot, Dep.Silviculture, Brno Univ.of Agriculture, Brno, Czechoslovakia
Dr. L.J.Webb, CSIRO Rainforest Ecol. Unit Div., Brisbane, Australia
Dr. G.M. Woodwell, Biol.Dep.Brookhaven Nat.Lab., Upton, New York-11973, USA

Dr. J.V.d.Drift, Res.Inst.Nat.Management, Kemperbergerweg 11, Arnhem, Netherlands
Prof. Dr.V.Giacomini, Inst.Botan.Univ., Città Universitaria, Roma, Italy
Dr. F.B. Golley, Inst. of Ecology Univ. Georgia, Athens, Georgia 30601, USA

REICHLE - OCT. 16, 1973

WOODLANDS SYNTHESIS VOLUMES

		Number of Words	Chapter Editor
0.1	Preface	800	(Chief Editor)
0.2	Foreward	1,200	(Cragg)
1.0	THE FOREST ECOSYSTEM	25,000	
1.1	What is the Forest Ecosystem	6,000	Duvigneaud
1.2	Forest Ecosystems of the World	19,000	Ellenberg
2.0	ENVIRONMENT, STRUCTURE AND PHENOLOGY OF THE FOREST SITES	120,000	(Bullock)
2.1	Equatorial	16,000	Bullock
2.2	Tropical	16,000	Malaisse
2.3	Mediterranean	16,000	Lossaint
2.4	Temperate Deciduous	24,000	Duvigneaud
2.5	Temperate Coniferous	24,000	Kira
2.6	Boreal	16,000	Havas/Rodin
2.7	Summary	8,000	Ellenberg
3.0	BASIC PROCESSES OF THE FOREST ECOSYSTEM	165,000	
3.1	Energy, Water, and CO_2 Balances	30,000	Galoux
3.2	Primary Production	40,000	Attiwill
3.3	Consumer Heterotrophs	30,000	Thamdrup
3.4	Decomposition	35,000	Satchell
3.5	Soil Processes	30,000	Ulrich
4.0	ECOSYSTEM DYNAMICS	115,000	(Reichle)
4.1	Growth, Aging, and Succession	35,000	Loucks
4.2	Carbon and Energy Metabolism	18,000	Reichle
4.3	Chemical Cycling in the Ecosystem	35,000	Rapp
4.4	Water Relations and Hydrologic Cycles	27,000	Waring
5.0	SYSTEMS ANALYSIS OF FOREST ECOSYSTEMS	35,000	(Shugart)
5.1	Statistical Analysis of Dynamic Parameters		Shutt
5.2	Analysis of Linear Woodland Models		O'Neill
5.3	Behavior of Generalized Forest Models		Shugart
5.4	Data Requirements and Behavior of Complex Ecosystem Models		Sollins

5.0	HUMAN AND TECHNOLOGICAL IMPACT OF FORESTS	40,000	(Tamm)
	6.1 Forest Influences on the Environment		Molchanov
	6.2 Modifications for Improving Yield of Products		Tamm
	6.3 Management Practices other than Silviculture		Andersson
	6.4 Impact of Modern Technology on Forests		Olson
7.0	CHALLENGES OF THE FUTURE -- PROBLEMS AND APPLICATIONS	10,000	(Editorial Board)
8.0	APPENDIX -- DATA BASES AND SITE DESCRIPTIONS	15,000	(DeAngelis)

3 volumes at approximately 400 pages each, with 400 words per printed page

October 16, 1973

Woodlands Editorial Board

J. A. Bullock
P. Lossaint
D. E. Reichle, Chief Editor
C. O. Tamm
B. Ulrich

	Number of Words
1.1 What is the Forest Ecosystem (Duvigneaud)?	6,000

	Number of Words
1.2 Forest Ecosystems of the World (Ellenberg)	19,000

1.2.1 Environmental factors controlling natural forest ecosystems

- 1.2.1.1 Temperature and its variations with time (with 2 world maps)
- 1.2.1.2 Water supply and its seasonal variations (with 2 world maps)
- 1.2.1.3 Nutrient supply
- 1.2.1.4 Photosynthetically active radiation (with 1 world map)

1.2.2 A functional classification of natural forest ecosystems (with a world map in bigger scale)

- 1.2.2.1 Equatorial and tropical evergreen forests[a]
- 1.2.2.2 Tropical and warm-temperate deciduous forests[a]
- 1.2.2.3 Warm-temperate evergreen forests[a] (mediterranean type)
- 1.2.2.4 Temperate deciduous forests[a]
- 1.2.2.5 Temperate and boreal evergreen forests[a]

1.2.3 Human impact modifying forest ecosystems

- 1.2.3.1 Management for timber and other plant products
- 1.2.3.2 Introduction of exotic species
- 1.2.3.3 Burning and shifting cultivation
- 1.2.3.4 Overstocking with game animals
- 1.2.3.5 Grazing of domestic animals
- 1.2.3.6 Air pollution, etc.

1.2.4 Actual distribution of forest and related ecosystems (mainly a map)

1.2.5 IBP forest sites (mainly a table referring to a Koppen Map with numbered points)

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[a]Including altitudinal variations.

Number
of Words

2.1 Equatorial (Bullock)

2.1.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.1.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.1.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.1.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.1.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.1.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.1.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.1.8 Contrasts between sites within the biome type

	Number of Words
2.2 Tropical (Malaisse)	**16,000**

2.2.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.2.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.2.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.2.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.2.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.2.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.2.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.2.8 Contrasts between sites within the biome type

	Number of Words
2.3 Mediterranean (Lossaint)	**16,000**

2.3.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.3.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.3.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.3.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.3.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.3.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.3.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.3.8 Contrasts between sites within the biome type

	Number of Words
2.4 Temperate Deciduous (Duvigneaud)	**24,000**

2.4.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.4.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.4.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.4.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.4.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.4.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.4.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.4.8 Contrasts between sites within the biome type

	Number of Words
2.5 Temperate Coniferous (Kira)	24,000

2.5.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.5.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.5.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.5.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.5.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.5.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.5.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.5.8 Contrasts between sites within the biome type

	Number of Words
2.6 Boreal (Havas/Rodin)	16,000

2.6.1 Study sites. Location of the sites, areas, status (i.e., whether plantation, regenerated forest, or mature), history of site

2.6.2 Climate. Temperature, precipitation, relative humidity, global radiation receipt, potential evaporation, and air movement regimes, day length variation

2.6.3 Soils. Parent materials, soil profiles, depth and rooting zone mechanical and chemical analyses, organic content, and distribution, litter layer

2.6.4 Topography and drainage. Land form, drainage pattern, water table, water balance

2.6.5 Composition and structure. Species composition, species list and abundances, or major taxa, profile structure, canopy projection, size class distribution, shrub and herb layer

2.6.6 Fauna. Major faunistic components, principally consumers, roles in forest maintenance and modification

2.6.7 Phenology and biomass. Phenology of flowering, fruiting and leaf replacement, distribution of biomass and chemical nutrients in the biota, factors disrupting production (e.g., tree death, wind throw, drought, defoliation)

2.6.8 Contrasts between sites within the biome type

2.7 Summary (Ellenberg)	8,000

	Number of Words
3.1 Energy, Water, and CO_2 Balances (Galoux)	30,000
3.1.1 Generalities on exchanges (Galoux)	6,000
3.1.1.1 Radiant energy (short and long waves, geographical variation)	
3.1.1.2 Heat energy (sensible and latent heat)	
3.1.1.3 Chemical energy	
3.1.1.4 Matter (carbon dioxide and water)	
3.1.2 Instrumentation, methods, applicability, limitations	
3.1.2.1 Radiation (Damann/Kiese/Kayser)	2,500
3.1.2.2 Temperature } (Baumgartner/Gietl)	2,500
3.1.2.3 Vapour density }	
3.1.2.4 Carbon dioxide (Baumgartner/Hager)	2,500
3.1.2.5 Atmospheric water (rain, snow, canopy drip, throughfall, stem flow) (Benecke)	2,500
3.1.2.6 Soil water (Benecke)	
3.1.2.6.1 Surface and subsurface runoff	
3.1.2.6.2 Subsurface movement and storage	
3.1.3 Modeling of the physical environment (Murphy)	3,000
3.1.3.1 Assumptions	
3.1.3.2 Models of energy, water, carbon dioxide exchanges	
3.1.3.3 Sensitivity analysis	
3.1.4 Results of direct determinations of exchanges on forest sites	11,000
Balances, geographical variations	
3.1.4.1 Radiation } (Baumgartner/Gietl, Damann/Kayser, Galoux)	
3.1.4.2 Sensible heat }	
3.1.4.3 Latent heat }	
3.1.4.4 Carbon dioxide (Baumgartner/Hager, Murphy)	
3.1.4.5 Water (Lossaint, Schnock)	

	Number of Words
3.2 Primary Production (Attiwill)	40,000
3.2.1 Introduction (Attiwill)	6,500
3.2.1.1 Aims. To assess plant biomass and net primary production data for investigated forest types throughout the world; to interpret net primary and biomass distribution in terms of principal biological and environmental factors; to quantify transfer to other trophic levels	
3.2.1.2 Definitions. Net primary production in terms of increments and fluxes (with reference to IBP Handbooks and other sources)	
3.2.1.3 The measurement of net primary production. Basic processes (photosynthesis and respiration, translocation and growth, mortality, litterfall and flows to other trophic levels); comparisons of extensive data (early literature, CVP-type indices, IBP biomass estimates, detailed measurements within selected ecosystems)	
3.2.1.4 Bases for present comparison. Development of simple model for data collection, analysis, and assessment, including definition of necessary terms	
3.2.2 Primary production in different forest ecosystems of the world	
3.2.2.1 Equatorial (Lomer)	3,000
3.2.2.2 Tropical (Freson)	3,000
3.2.2.3 Mediterranean (Lossaint/Rapp)	3,000
3.2.2.4 Temperate deciduous (Heller)	6,000
3.2.2.5 Coniferous (Anderson)	6,000
3.2.3 Biological and environmental factors influencing net primary production	7,500
3.2.3.1 Biological. Stand structure including species composition, age distribution, life forms, and canopy structure (particularly the distribution of leaf area index)	

		Number of Words
3.2.3.2	Environmental. Climatic influences (including preliminary models of seasonal net primary production); edaphic influences	
3.2.4	World-wide perspectives (Rodin/Lieth)	5,000
3.2.4.1	Forest productivity. Efficiency of production; comparison with earlier indices of production	
3.2.4.2	Comparisons of forest productivity and biomass with data from other ecosystems	

	Number of Words
3.3 Consumer Heterotrophs (Thamdrup)	30,000

3.3.1 Introduction

3.3.1.1 Definition of secondary production
3.3.1.2 Primary production as basis for secondary production
3.3.1.3 General methodology. Population and community ecology

3.3.2 Consumer communities of forest ecosystems

3.3.2.1 Functional groups - definition and discussion
3.3.2.2 Stratification of the fauna. Main food chains
3.3.2.3 Living plants as food source for animals
3.3.2.3.1 Main feeding types in respect of plant species, plant part, and feeding method
3.3.2.3.2 Food quality (content of essential nutrients, content of polyphenols and other chemical repellents; physical protection against consumers, taste; digestibility; food selection; assimilation efficiency)
3.3.2.3.3 Availability of food
3.3.2.3.4 Synchronisation of animal activity to food quality and availability
3.3.2.3.5 Competition for food and other resources (vicariance)

3.3.2.4 Dead organic matter and microflora as food for animals
3.3.2.4.1 Main feeding types (microphytophages, leaf litter consumers, consumers of dead wood, consumers of mixed diet)
3.3.2.4.2 Food quality (as 2.3.2)
3.3.2.4.3 Availability of food
3.3.2.4.4 Synchronisation of animals to seasonal patterns of food quality and availability
3.3.2.4.5 Competition for food and other resources

Number of Words

3.3.2.5 Predation and parasitism
- 3.3.2.5.1 Main types of predation (behavioral aspects)
- 3.3.2.5.2 Food quality
- 3.3.2.5.3 Food availability
- 3.3.2.5.4 Competition for food and other resources

3.3.2.6 Pantophages

3.3.2.7 Relative importance of systematic groups within functional groups. Latitudinal lines in density, biomass and population metabolism
- 3.3.2.7.1 Phytophages
- 3.3.2.7.2 Sapro- and microphytophages
- 3.3.2.7.3 Zoophages

3.3.2.8 Population- and community dynamics (fluctuations, phenology, succession, aging)

3.3.3 Secondary production by animals in forest ecosystems

- 3.3.3.1 Methods
- 3.3.3.2 Biomass, element content, and production of phytophages
- 3.3.3.3 Biomass, element content, and production of saprophages
- 3.3.3.4 Biomass, element content, and production in zoophages
- 3.3.3.5 Consumer biomass and production in relation to primary production
- 3.3.3.6 Consumer biomass and production in relation to age of stand
- 3.3.3.7 Seasonal aspects of secondary production

3.3.4 Energy flow through consumers in forest ecosystems

- 3.3.4.1 Methods
- 3.3.4.2 Temperate deciduous forests
- 3.3.4.3 Temperate evergreen forests
- 3.3.4.4 Boreal forests
- 3.3.4.5 Mediteranean forests
- 3.3.4.6 Tropical forests
- 3.3.4.7 A general model of energy flow through consumers
- 3.3.4.8 Comparison of forest ecosystems in relation to energy flow

Number of Words

3.3.4.8.1 Main channeling of energy flow
3.3.4.8.2 Controlling factors
3.3.4.8.3 Efficiencies

3.3.5 The influence of animals on the functioning of forest ecosystems
3.3.5.1 The influence of phytophages on primary production
3.3.5.2 The influence of phytophages on plant species composition and replacement
3.3.5.3 The influence of consumers on mineral cycling
3.3.5.4 The role of zoophages in forest ecosystems

3.3.6 Effects of human activities on the fauna of forest ecosystems
3.3.6.1 Monoculture
3.3.6.2 Clearcutting
3.3.6.3 Burning
3.3.6.4 Chemical treatment

	Number of Words
3.4 Decomposition of Forest Litter (Satchell)	40,000
3.4.1 Introduction (Satchell)	1,000
3.4.1.1 Objectives	
3.4.1.2 Definitions of litter -Concepts of "standing dead," litter fall, litter layer	
Definitions of decomposer - Progressive decay from senescent tissue to stable residual organic matter with concurrent synthesis and decay of microbial tissue	
Definitions of biomass	
Definitions of mineralization	
3.4.2 Litter production and composition	4,500
3.4.2.1 Amounts (Tables for different types of forests) [Satchell]	2,000
3.4.2.1.1 Above ground (Weight of leaves, branches, fruits, etc.)	
3.4.2.1.2 Standing dead	
3.4.2.1.3 Below ground (Roots, litter layer)	
3.4.2.2 Characteristics (Domsch)	2,500
3.4.2.2.1 Structural (Physical)	
3.4.2.2.2 Organic (Cellulose, lignin, waxes, etc.)	
3.4.2.2.3 Bioelements	
3.4.3 Decomposer organisms	
3.4.3.1 Micro-organisms (Domsch)	2,000
3.4.3.1.1 Taxonomic groups of different forest types and types of forest soils (including biomass)	
3.4.3.1.2 Succession - Ecogroups	
3.4.3.1.3 Physiological groups	
3.4.3.2 Fauna, including biomass (Reference to saprophagous fauna description in preceding chapter) [Satchell]	750
3.4.4 Decomposition process	
3.4.4.1 Measures of total decomposition (Witkamp and Domsch)	1,250
3.4.4.1.1 CO_2, O_2, ATP, enzymes, gravimetric methods	
3.4.4.2 Controlling factors (qualitative description)	
3.4.4.2.1 Moisture and temperature (Witkamp)	1,000
3.4.4.2.2 Substrate quality (inhibitors, lignin, phenolic compounds, etc.) [Domsch]	1,000

		Number of Words
3.4.4.3	Successions	
3.4.4.3.1	Senescence (Decomposition on the phyllosphere) [Domsch]	1,000
3.4.4.3.2	Decomposition of standing dead (Satchell)	750
3.4.4.3.3	Decomposition in the litter layer	
3.4.4.3.3.1	Microbial (including methods of total activity measurement, sequence of chemical transformations, weight loss; separate section on wood decay), mineralization and leaching	3,000
3.4.4.3.3.2	Faunal (including effects of canopy - fauna faeces, comminution, litter burial successions) [Witkamp]	1,500
3.4.4.3.3.3	Fauna - microflora interactions	750
3.4.4.3.4	Decomposition below ground	
3.4.4.3.4.1	Buried leaves (Satchell)	500
3.4.4.3.4.2	Root decomposition	1,000
3.4.4.4	Decomposition products	
3.4.4.4.1	Mineralized organic matter (respiratory CO_2, NH_4, NO_3, etc.) [Witkamp]	2,000
3.4.4.4.2	Unstructured organic matter (Stable products, accumulation of) [Satchell (Tamm?)]	1,500
3.4.4.4.3	Structured organic matter (Biomass production)	
3.4.4.4.3.1	Microflora (Witkamp)	1,000
3.4.4.4.3.2	Fauna (Satchell)	750
3.4.5	Decomposition models (Satchell)	8,000
3.4.5.1	Deterministic models	
3.4.5.1.1	Mixed deciduous temperate forest (One example, comparison with related forest types)	
3.4.5.1.2	Coniferous forest (One example, comparison with related forest types)	
3.4.5.1.3	Mediterranean forest (Comparison with other sclerophyllous forests)	
3.4.5.1.4	Tropical forests	
3.4.5.1.5	Other types of forests	
3.4.5.2	Mechanistic models	

		Number of Words
3.4.6	Global patterns	
3.4.6.1	Mean residence time of litters related to phytogeography and climatic variables [Satchell (Kira?)]	1,000
3.4.6.2	Pattern of microbial activity as function of world climate	
3.4.7	Human influences on decomposition	
3.4.7.1	In temperate and boreal forests (clear felling, slash burning, grazing, fire) [Satchell (Brinkmeyer?)]	1,500
3.4.7.2	In mediterranean and tropical forests (clear felling, slash burning, grazing, fire)	1,500

	Number of Words
3.5 Soil Processes (Ulrich)	30,000

3.5.1 Root dynamics (deciduous and coniferous ecosystems) (Harris)

- 3.5.1.1 Seasonal accumulation/turnover of root organic matter
- 3.5.1.2 Root organic matter accumulation during forest development
- 3.5.1.3 The significance of root dynamics to element cycling
- 3.5.1.4 The significance of root sloughing to the forest energy balance

3.5.2 Dynamics of water (Benecke)

- 3.5.2.1 Driving forces
  - 3.5.2.1.1 Input variables (precipitation, throughfall, stem flow)
  - 3.5.2.1.2 Output variables (transpiration, evaporation, runoff, subsurface flow, seepage)
  - 3.5.2.1.3 Storage and depletion, spatial variation in soil
- 3.5.2.2 Internal processes
  - 3.5.2.2.1 Water potentials
  - 3.5.2.2.2 Fundamental equations and principles (Darcys law, equation of continuity, flow equations, hydraulic conductivity, soil water characteristics, diffusivity)
- 3.5.2.3 Simulation of evapotranspiration and percolation

3.5.3 Dynamics of chemical elements (Khanna)

- 3.5.3.1 Ways of input
  - 3.5.3.1.1 Rain input, leaf washout
  - 3.5.3.1.2 Dry fallout
  - 3.5.3.1.3 Gas adsorption
  - 3.5.3.1.4 Litterfall and grass
  - 3.5.3.1.5 Wet sedimentation
  - 3.5.3.1.6 Root turnover (exudation, respiration, death)
  - 3.5.3.1.7 Subsurface flow
  - 3.5.3.1.8 Groundwater
  - 3.5.3.1.9 Fertilization

		Number of Words
3.5.3.2	Internal processes (Ulrich)	
3.5.3.2.1	Release and mineralization from organic matter	
3.5.3.2.2	Microbial turnover	
3.5.3.2.3	Ion exchange equilibria	
3.5.3.2.4	Desorption and dissolution equilibria	
3.5.3.2.5	Weathering	
3.5.3.2.6	Transport within soil	
3.5.3.3	Ways of output (Mayer)	
3.5.3.3.1	Root uptake	
3.5.3.3.2	Gas exchange	
3.5.3.3.3	Subsurface flow	
3.5.3.3.4	Leaching from root zone	
3.5.3.3.5	Erosion	
3.5.3.3.6	Export	

	Number of Words
4.1 Growth, Aging, and Succession (Loucks)	35,000
4.1.1 Introduction of concepts (Loucks)	
4.1.1.1 Growth and development of strata (Work of Hett, Fralish, Goff, Loucks and others)	1,600
4.1.1.2 Rate of change of stand structure and composition (Work of Goff, Zeadler, Shugart, Hytteborn and others)	1,200
4.1.2 Patterns of stand development	
4.1.2.1 Model of tree population changes in response to growth functions (Ek)	2,000
4.1.2.2 Regeneration and stand development in North Europe (Havas, Hytteborn, USSR)?	3,000
4.1.2.3 Stand establishment and development in the tropics (Bullock)	2,000
4.1.3 Patterns of species replacement	
4.1.3.1 Studies of species change with time (Loucks) - (Survey of all regions with data from Botkin, Loucks, Japan, Poland, France, Chile and California)	2,400
4.1.3.2 Succession models in mixed conifer-hardwoods of North America (Johnson)	3,000
4.1.4 System diversity in relation to geography, productivity and time (Loucks/Shugart)	
4.1.4.1 World-wide patterns in ecosystem diversity (plant and animal)	24,000
4.1.4.2 Explanatory models and postulates	2,000
4.1.5 Human modification of compositional dynamics in the IBP research sites (Loucks et al.)	
4.1.5.1 Influences of long-term treatments in Europe and Asia	2,000
4.1.5.2 Responses to human impact in the Americas	2,000

Number of Words

4.2 Carbon and Energy Metabolism (Reichle) 18,000

4.2.1 Introduction

4.2.1.1 Concepts and their ecological significance
4.2.1.2 Definition of terms and equations
4.2.1.3 General model structure (O'Neill/Sollins)

4.2.2 Flows and storage of carbon in forest ecosystem

4.2.2.1 Total carbon fixation (basic principles, ranges between forests, capacities, daily rates and annual values) (Strain/Hozumi)

4.2.2.2 Translocation and accumulation of photosynthate (relation to growing season, sources of trans- 35,000
port, chemical composition, accretion of mass by various components) (Harris)

4.2.2.3 Autotrophic respiratory fluxes (comparisons with ecosystems having different temperature regimes and forest types, above- belowground relations, contribution by different plant components) (Strain)

4.2.2.4 Heterotrophic respiration (contribution by grazers vs decomposers, relative importance, ranges of values, special features) (Grizainski/Kitizawa/Wiedeman)

4.2.2.5 Net ecosystem production (accretion of biomass, accumulation of organic detritus, patterns with forest type, age and/or latitude) (Attiwill/Satchell)

4.2.3 Fluxes of energy in the forest ecosystem

4.2.3.1 Efficiencies of energy conversion and retention by the total ecosystem (ecosystem production equations, maintenance and production efficiencies, ratios of metabolic parameters) (Reichle)

4.2.3.2 Energy flow through all trophic levels (trophic transfer terms, production relations, energetic pyramids) (Grodzinski/Kazamerik)

4.2.3.3 Comparisons of forests with other ecosystems of the same region (analysis of metabolic parameters and productivity relations with other ecosystems) (Reichle)

4.2.4 Specific examples of representative ecosystems

4.2.4.1 Temperate deciduous (Reichle)
4.2.4.2 Temperate coniferous
4.2.4.3 Tropical

	Number of Words
4.2.5 Broader-scale interpretations of ecosystem dynamics	
4.2.5.1 Seasonal and annual fluctuations (temporal response of fluxes and changes in pool sizes, integrated rates) (Sollins)	
4.2.5.2 Comparative ecosystem production relations	
4.2.5.3 Global patterns in carbon and energy flow (balances of CO_2 fluxes between landscape and atmosphere for different types of ecosystems) (Attiwill)	

	Number of Words
4.3 Chemical Cycling in the Ecosystem (Rapp)	35,000
4.3.1 Introduction-general model of mineral cycling	3,500
4.3.1.1 Compartments	
4.3.1.2 Fluxes	
4.3.1.3 Input-output	
4.3.1.4 Driving variables	
4.3.2 Site comparison of chemical elements budgets	21,000
4.3.2.1 Determination of budgets characteristics and derivated parameters	2,000
4.3.2.2 Equatorial sites (Ogawa)	1,500
4.3.2.3 Tropical sites (Malaisse)	1,500
4.3.2.4 Mediterranean sites (Rapp)	2,000
4.3.2.5 Temperate deciduous sites (Denaeyer/Reichle/Shugart)	4,000
4.3.2.6 Temperate coniferous sites (Cole/Nihlgard)	4,000
4.3.2.7 Boreal sites (Rodin)	4,000
4.3.2.8 Interbiome comparison	
4.3.3 Factors affecting mineral cycling	9,500
4.3.3.1 Temperature (Mayer)	
4.3.3.2 Water (Mayer)	
4.3.3.3 Seasonal variations	
4.3.3.5 Tree species	
4.3.3.6 Organic matter production	
4.3.4 Extension to bioelement cycling in a larger landscape	

	Number of Words
4.4 Water Relations and Hydrologic Cycles (Waring)	27,000

4.4.1 Introduction

4.4.2 Objectives

4.4.2.1 Development of the structure of a general model of the hydrologic subsystem

4.4.2.2 Development of the couplings between the hydrologic subsystem and other subsystems as a means of addressing questions relative to the water relations of ecosystems

4.4.2.3 Comparison of contrasting units in terms of forest cover, climate, substrate, and interpretation with respect to importance of couplings

4.4.2.4 To indicate promising avenues for basic and applied research

4.4.3 General structure of a hydrologic model

4.4.3.1 Hydrology of the above ground portion

4.4.3.1.1 Foliage - interception, dew-fall, throughfall, evaporation (water and nutrients)

4.4.3.1.2 Bole - stemflow, evaporation (water and nutrients)

4.4.3.1.3 Storage by biomass - sapwood, heartwood

4.4.3.1.4 Snowpack - accumulation, melt (water and nutrients)

4.4.3.2 Hydrology of the forest floor and soil

4.4.3.2.1 Forest floor - interception, storage, evaporation, leaching

4.4.3.2.2 Soil - overland flow and erosion, infiltration, percolation, seep-age, lateral flow and interflow, nutrient transport

4.4.3.3 Surface water hydrology

4.4.3.3.1 Streams and rivers

4.4.3.3.2 Lakes, ponds, and reservoirs

4.4.3.3.3 Wetlands

Number of Words

4.4.3.4 Groundwater hydrology

4.4.3.5 Coupling relationships between the four parts of the hydrologic system

4.4.3.6 Treatment of spatial heterogeneity

4.4.4 Couplings between the hydrologic subsystem and other major subsystems of the ecosystem

4.4.4.1 Couplings to the terrestrial biotic system

4.4.4.1.1 Transpiration
4.4.4.1.2 Root uptake
4.4.4.1.3 Interchange, weathering, and fixation
4.4.4.1.4 Litter decomposition
4.4.4.1.5 Animal habitat and food chains
4.4.4.1.6 Effects of changes in biomass and litter on hydrology

4.4.4.2 Couplings to the stream biotic system

4.4.4.2.1 Through water level and velocity
4.4.4.2.2 Through transport and deposition of sediment and detritus and resulting effects on bottom conditions
4.4.4.2.3 Through changes in chemical and physical quality of streamwater and resulting transport
4.4.4.2.4 Through base flow, recharge, and bank storage

4.4.4.3 Couplings to the lake biotic system

4.4.4.3.1 Through water level
4.4.4.3.2 Through deposition of sediment and detritus and resulting effects on bottom conditions
4.4.4.3.3 Through changes in chemical and physical quality of inflowing stream water
4.4.4.3.4 Through base flow and recharge

Number
of Words

4.4.5 Comparisons of transpiration by conifers and hardwoods under similar environments - daily and seasonal

4.4.6 Watershed comparisons - Lake Wingra; Coweeta, N.C., H. J. Andrews Or.; Hubbard Brook, N.H.; Walker Branch (possibly Beaver Creek)

4.4.7 Opportunities

4.4.7.1 Basic research
4.4.7.2 Applied research

4.4.8 Summary

Number of Words

5.1 Statistical Analysis of Dynamic Parameters (Schutt)

- 5.1.1 Relationships of system dynamics with environmental variables
- 5.1.2 Relationships of system dynamics with geography and general site characteristics
- 5.1.3 Relationships of model parameters with one another

5.2 Analysis of Linear Woodland Models (O'Neill)

- 5.2.1 Limitations of linear models
- 5.2.2 Sensitivity analysis
- 5.2.3 Stability analysis
- 5.2.4 Transient response analysis

5.3 Behavior of Generalized Forest Models (Shugart)

- 5.3.1 Development of formal relations for theory
- 5.3.2 Boundaries of time responses
- 5.3.3 Boundaries of stability responses
- 5.3.4 Testing of initial formal relations

5.4 Data Requirements and Behavior of Complex Ecosystem Models (Sollins)

- 5.4.1 Responses of example models in useful applications
- 5.4.2 Potential utility of present IBP models
- 5.4.3 Important parameters required for existing ecosystem models
- 5.4.4 New problems in ecosystem modeling

6.1 Forest Influences on the Environment (Molchanov)

6.2 Modifications for Improving Yield of Products (Tamm)

6.3 Management Practices Other Than Silviculture (Andersson)

6.4 Impact of Modern Technology on Forests (Olson)

PROPOSED TIMETABLE - WOODLANDS VOLUMES

October 1973	Rough assessment of number of pages. (See Chief Editor and advisors).
January 1974	Full chapter outlines with indications of contents of individuals collaborating with chapter author. Chapter author's comments on shape of chapter in light of individual components.
March 1974	Replies to communication from Chief Editor (and advisors) to chapter authors.
April 1974	Meeting of all (or a majority) of Chief Editors (PT) with Convenor. Proposed main agenda: 1. Discussion of individual biome and theme outlines. 2. Identification of gaps and of areas of duplication. 3. Arrangements for exchange of information (particularly between biomes and themes). 4. Discussion of intersectional collaboration for volumes covering general principles of ecosystem analysis (mainly: PT, PM and PF).
November 1974	Chapters shaped up and exchanged between all chapter editors.
September 1974	Meeting of chapter editors, Chief Editor (advisors and editorial board) for integration of materials.
February 1975	Submission of "final" drafts to Chief Editor.
May 1975	Chief Editor(s') revisions to Convenor.
June 1975	Discussions between Convenor and Chief Editor(s) - if necessary.
June-July 1975	Sending of final volumes to the printers.

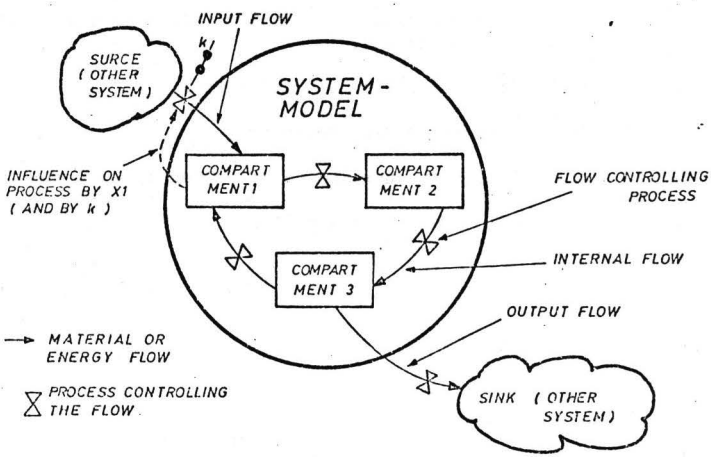
ABOUT INTERSITE COMPARISON

by Torgny Schütt

1. Introduction

Any two ecosystems can be compared in many respects. In general, any ecosystem can be viewed as a system with inputs from surrounding systems, which the system itself affects with its outputs, and consisting of internal compartments, between which internal flows exist.

Figure 1: Model diagram of an ecosystem



The amount of material or energy in a compartment is the compartment state variable. Such a variable can have influence on a process. We indicate this, as in Figure 1, with a dotted line.

When other, external, factors have influences on the process, we indicate this also with a dotted line with a ring, as in Figure 1 (temperature, moisture, and sometimes nutrients control most processes and flows).

How these influences are working is not indicated in the figure. This must be stated separately, in mathematical terms (e.g. $\dot{x}_1 = k.x_1$) that express our understanding of these biological processes.

2. Inputs, outputs, comparisons

Two ecosystems, which have the same kind of input and output flows can be compared with respect to the values of these flows. If many external factors affect, for example, the input flow, it is possible to study (compare) how these factors and the resulting input flows vary from one system to the next. Such a comparison, for example, can be made of the increases in biomasses, aboveground and belowground, over a year (system productivity) for all of our approximately fifty different ecosystems. A good basic comparison is possible if we analyse the productivity, the yearly net inflow of biomass to the standing crop compartments of the system, as a function of some external abiotic parameters and variables.

$$P = f\ (L_G,\ T_G,\ P_R,\ N_A,\ A) \qquad (1)$$

Where P = productivity

L_G = length of growing season

T_G = mean air temperature during growing season

P_R = annual precipitation

N_A = amount of available nutrients (mainly nitrogen) in the soil

A = age of stand

A change in parameters/variables in (1) can, of course, be made, if we think some others are of more importance. This does not change anything in principle. We proceed in the same way. If we plot corresponding values of P, L_G, T_G, P_R, N_A, A, from one ecosystem, in the $pxL_GxT_GxP_RxN_AxA$-space (these variables as axes), we get a point in this space. We then take the next system, and so on. When we have finished, we have 46 points in our space, and perhaps we can see a useful pattern among the points. Anyway it will be possible to define some measure of closeness (similarity, taxonomic distance) of different systems. This way to proceed is well known in ecology. I will not continue here with input-output-comparison.

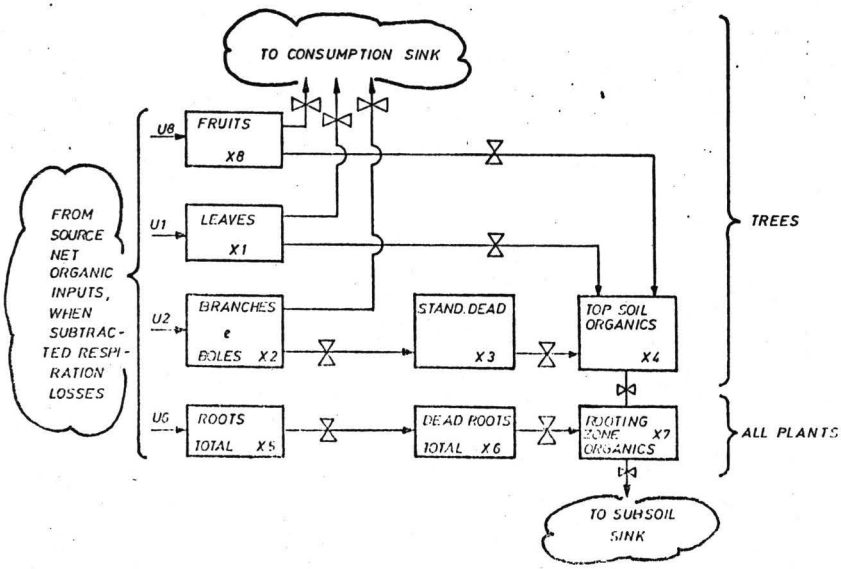
3. Transfer-coefficients-comparison

If we can define an internal structure of the ecosystem, e.g. for biomass transfer, it would be possible to assume a linear flow model for the limited objectives of gross world comparisons with constant transfer coefficients. We could then see how these rate coefficients vary from one ecosystem to another. But, though the variation may be not too big, also small differences are probably of great interest. Such a comparison in parameter-space seems to be worth while for synthesis.

4. Compartment model

A simple, basic compartment model is exhibited in Figure 2. To go to a more detailed model with more compartments is easy if enough site data are available, but should perhaps be avoided at this stage.

Figure 2: Linear constant transfer coefficient model of a forest ecosystem, biomass transfers

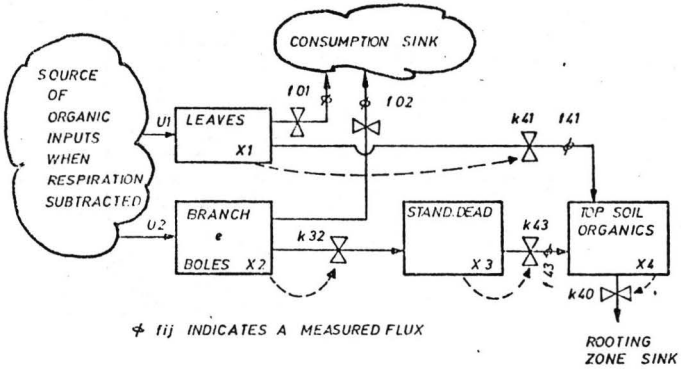


where x_1, ..., x_8 are the sizes (biomasses) of the different compartments.

Because of lacking data on consumption of fruits the fruit transfers have to be left out. Also the root-transfers have to be left out, because only the amount of total roots and annual increment are known, but not the output flux to dead roots. This would have been possible to calculate if the

output flux and annual increase of dead roots or rooting zone organics were known. Unfortunately they are not. We therefore end up in the simple structure shown in Figure 3. Even this simple structure is supported with data only from a few sites.

Figure 3: Simple, data supported linear model of forest tree-biomass-transfers



From the figure we get the following equations for biomass variation:

(2)
$$\dot{x}_1 = u_1 - f_{c1} - f_{41}$$
$$\dot{x}_2 = u_2 - f_{c2} - k_{32}x_2$$
$$\dot{x}_3 = k_{32}x_2 - f_{43}$$
$$\dot{x}_4 = k_{41}x_1 + k_{43}x_3 - k_{40}x_4$$

We also have the relations

(3)
$$f_{41} = k_{41}x_1$$
$$f_{43} = k_{43}x_3$$

From this it is possible to calculate the unknown quantities u_1, u_2, k_{40}, k_{41}, k_{43}, k_{32} in the following way:

(4)
$$k_{41} = \frac{f_{41}}{x_1}$$
$$k_{43} = \frac{f_{43}}{x_3}$$
$$k_{40} = \frac{f_{41} + f_{43} - \Delta x_4}{x_4}$$
$$k_{32} = \frac{f_{43} + \Delta x_3}{x_2}$$
$$u_1 = \Delta x_1 + f_{c1} + f_{41}$$
$$u_2 = \Delta x_2 + \Delta x_3 + f_{c2} + f_{43}$$

where the Δx are the annual increases of the compartments.

One reason for describing the original data, in Table 1, by the use of transfer coefficients and inflows is, of course, to make a continuous-time-model that is able to reproduce the data samples. This model can also be used to interpolate between data points or to extrapolate beyond the original data time interval. The model is therefore useful in extending original observations to new domains.

Another reason for using the data of Table 2 instead of the original data, table 1, is that they can show up to be "simpler", that is, they may vary less with the other site-parameters, Table 3.

Table 1: Data from 17 research sites in USSR given by KAZIMIROV and MOROZOVA (1) - only the data from these projects were sufficient for the simplified model -

Site Name	x_1	x_2	x_3	x_4	Δx_1	Δx_2	Δx_3	Δx_4	f_{41}*	f_{43}	f_{c1}*	f_{c2}
	grams/m^2				grams/m^2				grams m^{2}yr			
R Site 1	570	2248	195	1870	8	106	4.0	7	140	39♣	16	161
2	821	3771	370	1930	13	163	7.4	11	220	103	207	271
3	1021	5945	530	1980	17	227	10.6	13	261	144	258	571
4	950	7088	620	2060	15	259	12.4	12	285	164	293	423
5	991	7757	685	2000	16	277	13.7	10	312	182	320	459
6	653	2797	270	3380	10	134	5.4	14	151	75	159	209
7	753	3413	340	6100	11	153	6.8	20	181	94	185	247
8	550	2040	104	1740	30	147	16.0	11	143	50	153	197
9	910	5290	335	1850	21	209	16.5	12	231	103	227	312
10	980	5840	418	1920	14	225	14.0	14	251	119	241	344
11	1090	8720	562	2200	7	230	10.6	16	273	139	252	369
12	1150	12110	688	2470	0	213	6.0	19	286	147	257	360
13	1140	13280	810	2600	-2	180	2.9	20	288	150	240	330
14	1080	17450	798	2960	-4	134	.5	21	263	131	216	265
15	970	18260	711	3280	-5	99	-1.2	21	248	115	195	214
16	810	20060	712	3550	-6	42	-1.9	20	225	103	164	145
17	740	19310	744	3900	-8	6	-2.0	20	217	103	146	109

* Total foliage, litter fall and consumption. No understory data presented.

♣ No branches

Δx Annual increase of the compartment

5. Data analysis and comparison

From Table 2 we can see, immediately, the influence of age on:

1) Biomass inflows: Biomass inflow to needles is of the same magnitude as biomass inflow to branches and bole. With increasing age the biomass inflows first increase, reach maxima and then drop. For the old trees the biomass inflow to needles is higher than to branches and bole.

2) Mortality: With increasing age the forest biomass increases very rapidly (Table 1). The transfer coefficient from branches and bole to standing dead decreases (the trees seem to become more healthy with age as a consequence of thinning and removal).
   The turnover from standing dead to litter also tends to decrease with increasing age.
   The transfer coefficient of needles to litter seems to be almost independent of age.

3) Decomposition: Decomposition of litter to rooting-zone-organic seems to be more intensive during the middle age of the forest than during youth and old age.

These tendencies, are more easily seen in Table 2 than in Table 1. Here the transfer coefficients, together with the compartment-model, are of advantage, and seem to express the ecological experience (knowledge) in a useful way.

The changes with soil type and vegetation type, too, are most easily seen in Tables 2 and 3. The ages of the first seven forests and forest 9 and 10 are almost the same. Forest 3 is on the same soil as forests 8 to 17. If we rearrange the forests, in the order shown in Table 4, the data are more easy to interpret.

We can now calculate the system parameters, Table 2.

Table 2: System parameters - calculated from the data in Table 1.

		Inflows		Transfere coefficients				Turn over times			
		U_1	U_2	k_{40}	k_{41}	k_{43}	k_{32}	k_{40}^{-1}	k_{41}^{-1}	k_{43}^{-1}	k_{32}^{-1}
		g/m^2yr		1/1000 yrs				years			
APPROX. SAME AGES AT DIFF. SOILS	Russian site 1	141	310	92.0	246	200	19.1	10.9	4.1	5.0	52.4
	2	440	549	161.7	268	278	29.3	6.2	3.7	3.7	34.1
	3	536	783	147.5	256	272	26.0	6.8	3.9	3.7	38.5
	4	593	858	212.1	300	265	24.9	4.7	3.3	3.8	40.2
	5	648	932	242.0	315	266	25.2	4.1	3.2	3.8	39.7
	6	320	424	62.7	231	278	28.7	15.9	4.3	3.7	34.8
	7	377	501	41.8	240	276	29.5	23.9	4.2	3.7	33.9
AGESERIES ON THE SAME MAIN SITE	8	326	410	104.6	260	481	32.4	9.6	3.8	2.1	30.9
	9	479	641	174.1	254	307	22.6	5.7	3.9	3.3	44.2
	10	506	702	185.4	256	285	22.8	5.4	3.9	3.5	43.9
	11	532	749	180.0	250	247	17.2	5.6	4.0	4.0	58.1
	12	543	726	167.6	249	214	12.6	6.0	4.0	4.7	79.3
	13	526	663	160.8	253	185	11.5	6.2	3.9	5.4	87.0
	14	475	531	126.0	244	164	7.5	7.9	4.1	6.1	133.3
	15	438	427	104.9	256	162	6.2	9.5	3.9	6.2	161.3
	16	383	288	86.8	278	145	5.1	11.5	3.7	6.9	196.1
	17	355	216	76.9	293	138	5.2	13.0	3.4	7.2	192.3

Table 3: Russian spruce-forests - environmental parameters and main characteristics of the sites

site nr.	soil texture	age yrs	LAI m^2/m^2	stocking density stems/ha	mean annual precipit. l/m^2	length of grow. season days	mean temp. grow.seas. ^oC	mean tot. rad.gr.seas. cal/cm^2	depth root zone cm	height of trees m
R 1	sand	37	1.8	9010	650	150	11.9	51400	7-10	4.2
R 2	dry sandy loam	45	2.6	9620	650	150	11.5	51400	40-45	6.9
R 3	sandy loam	39	3.4	9980	650	150	11.9	51400	-	7.8
R 4	loam	43	4.3	6310	650	150	11.9	51400	60-65	9.8
R 5		38	4.4	4480	650	150	11.9	51400	0-75	15.2
R 6		42	2.0	9410	650	150	11.9	51400	40-50	5.8
R 7		41	2.4	9930	650	150	11.9	51400	40-50	6.7
R 8	sandy loam	22	1.8	34800	650	150	11.9	51400	50	2.6
R 9		37	3.0	13750	650	150	11.9	51400	60	6.8
R10		45	3.2	9240	650	150	11.9	51400	60	8.8
R11		54	3.6	4820	650	150	11.9	51400	65-70	11.1
R12		68	3.8	2336	650	150	11.9	51400	80	14.2
R13		82	3.8	1898	650	150	11.9	51400	80	17.1
R14		98	1.8	1319	650	150	11.9	51400	90	19.6
R15		109	3.2	1080	650	150	11.9	51400	80	20
R16		126	2.7	856	650	150	11.9	51400	80	22.6
R17		138	2.4	1087	650	150	11.9	51400	90	22.8

From Table 4 we can easily see the following relationships:

1) Biomass inflows: A monotone increase from "cladinosum-saxatile" to "oxalidosum". The U2/U1-proportion varies over vegetation-type, but should appear more constant, I believe, if also the root-flow were included in U2.

2) Mortality: Seems to be lowest for "cladinosum-saxatile", for branches and boles, while the needle mortality seems to be highest for "oxalidosum".

3) Decomposition: The decomposition coefficient, k_{40}, seems to vary greatly with vegetation type. It is lowest for "uliginio-herbosum". The absolute flux(es) to the root zone layer(s), $k_{40} \cdot x_4$, increase monotonically with the vegetation type-order in Table 4. Perhaps this is a better way to compare.

As we have seen it can be of advantage to use the transition flux, or transfer coefficients to understand and describe the ecosystem behaviour. They are defined in a simple way, and have usually a well understood biological meaning, which is important.

Usually they vary during the seasons, and from one site to another, depending on species, length of growing season, season temperature, annual precipitation, soil type, and age of stand, $k_{ij} = f_{ij}\ (s, L_G, T_G, P_A, N_A, A, t)$. If enough data were provided from many sites, with different values of these variables, it would be possible to determine the functions f_{ij}. Because many factors cannot be taken into account in a simple description (model) of an ecosystem, and because of the sparce data usually at hand, the functions can usually be estimated only in a stochastic way.

Although the influences on k_{ij} of a few of the variables (e.g. A, t) can be studied in a national program, the determination of f_{ij} is most conveniently done in an international program, as IBP.

Table 4: Changes with soil and vegetation type

Vegetation types	site name	inflows U_1	inflows U_2	transfere-coefficients k_{40}	k_{41}	k_{43}	k_{32}	$\frac{U_2}{U_1}$
		g/m^2yr		1/1000 yrs				
Cladinosum-saxatile	1	141	310	92.0	246	200	19.1	2.2
Politrichosum	6	320	424	62.7	231	278	28.7	1.33
Uliginio-herbosum	7	377	501	41.8	240	276	29.5	1.33
Vacciniosum	2	440	549	161.7	268	278	29.3	1.28
Myrtillosum	3	536	783	147.5	256	272	26.0	1.46
Oxalidoso-Myrtillosum	4	593	858	212.1	300	265	24.9	1.44
Oxalidosum	5	648	932	242.0	315	266	25.2	1.44

6. Data required, available and expected

To know what data are required we must first of all know why data are required. In our case we want to understand the functioning of forest ecosystems to some degree, to be able to define a compartment structure (model) of a forest. We then require, depending from the resolution of the model, a certain number of compartments and transfers between them.

To be able to determine the values of transfer coefficients in a defined ecosystem model a particular data set is required: different sets for different models. If, instead, a data set is given a particular model can be defined, using most of the data. We should keep this two situations apart.

6.1 A proper biomass compartment model

A model of high resolution is shown in Figure 4.

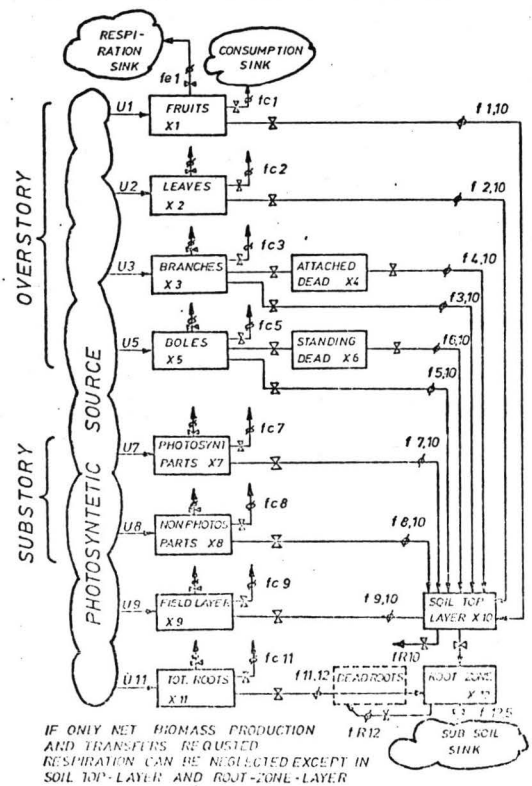


Fig. 4
Biomass compartment model of high resolution

6.2 Available data-sets

The data sets available at the Göttingen workshop cannot support a model like the one in Figure 4, but only simpler models, Figure 3. Table 5 shows the number of sites, available at present, with different kinds of data.

Table 5: Number of data sets with different kinds of data (second Figure(after +) represents the boreal sites of USSR)

compartment	state	increment	litterf.	consumpt.	respir.
fruits	10+5	8+5	13	0	0
leaves	22+17	15+17	18+17	4+17	0
branches	25+17	16+17	13+17	17	0
boles	25+17	16+17	13+17		0
stand.dead	10+17	3+17	0	X	X
photos.act.parts	7+?	4+?	0+?	1+?	0
ph.nonact.p.	5+?	4+?	0+?	0+?	0
field layer	13+17	10+17	0	1+17	0
living roots	17+17	6+17	0	17	0
dead roots	17	1+17	0		0
top soil layer	14+17	2+17	X	X	0
root zone layer	14+17	1+17	X	X	0

Only 17 out of 46 data sets, the ones from the boreal sites of USSR, are suitable for a more detailed analysis. Will it be possible to bring the data sets from the other sites to a more satisfactory state?

6.3 Expected data-sets

According to an estimate from ELLENBERG and LOUCKS (2) another 50 IBP-projects should be possible to be included in the synthesis work.

The transfer coefficients of the model in Figure 4 can be determined, if the fluxes belong to only one state variable and if annual data are given for the state variables (compartment sizes), increments in compartment sizes, with consumption indicated, respiration and litter flows. The unknown biomass inflows, U1, ..., U11, and outflow to the subsoil sink can then also be calculated.

If any flow depends on more than one state variable, more data are needed, for example two measurements per year.

7. Conclusions

It has been shown, through examples, that analysis of forest ecosystem site-data can advantageously be made by using compartment models and transfer coefficients. For this procedure a proper data set is required.

The data sets now available support only very simple models. The analysis of system sensitivity, stability (eigen values), and time responses is, in these cases, very easy to achieve, but not of too much interest.

Good comparison of forest ecosystems, over the world, requires a big number of sites (some hundreds).

To be able to reach the objective of meaningful intersite comparisons the existing data sets have to be completed, and data sets (complete as well) from the 50 additional sites have to be established.

Before talking about "complete" data sets, we have to decide what kind of model with respect to existing data and data possible to collect, we want to make. What shall be the objectives?

ECOSYSTEM, OPEN THERMODYNAMIC SYSTEM

THE OAK FOREST OF VIRELLES-BLAIMONT

A. GALOUX, Station de Recherches des Eaux et Forêts,
Groenendaal-Hoeilaart (Belgium) +

From the point of view of the thermodynamics of irreversible processes(1) an ecosystem can be considered as consisting of two open systems which exchange with each other energy (heat and work) and matter through their boundaries, which are themselves included in a closed system (exchanging energy with the exterior, but no matter). The first system or open phase (I) is composed of living organisms limited within their porous external membranes, the second one (II) is the ambiant exterior environment with its vast population of molecules which are metabolic products of living beings. The boundaries of the closed system are the outer limit of the atmosphere through which only radiant energy is exchanged with space.

1. First Law

In open as well as in closed systems conservation of energy remains true. The exchanges of energy in the system per unit time is equal to energy flow from the surroundings $dE=d_eE$ and $d_iE=0$ (I).
In a closed system the energy supplied by the exterior during the time span dt is equal to the sum of the heat and the mechanical work performed at the boundaries of the system: $dE = dQ - pdV$ (2).
It is also demonstrated that the resultant flow of energy $d^I\Phi$ received by phase I during the time span dt is equal to the sum of the heat coming from the exterior d_e^IQ and of the energy

(1) Theoretical considerations are from PRIGOGINE, I.: Thermodynamics of irreversible processes, J. Wiley and Sons, Interscience, 1967.

+The author expresses his thanks to Prof. NICOLIS,G.,SANFELD,A. and SANFELD-STEINCHEN,A., Department of Physics of the University Brussels, for interesting discussions and critical comments.

flow $d_i^{I}\Phi$ received from phase II, that is $d^{I}\Phi = d_e^{I}Q + d_i^{I}\Phi$, $d^{II}\Phi = d_e^{II}Q + d_i^{II}\Phi$ (3) and that the energy flow received by phase I from phase II is equal and of opposite sign to the energy received by phase II from phase I, that is $d_i^{I}Q + d_i^{II}Q = 0$ (4).

2. Second Law

In this system total entropy is equal to the sum of entropies of each phase I and II. Moreover entropy variation can be separated into two parts, the entropy flow from exchanges with space and entropy rise resulting from interior processes in phases I and II, $dS = d_eS + d_iS$ (5), with $d_iS > 0$ (irreversible processes).

3. Ecosystem model. Multicomponent systems with chemical reactions. Entropy flow and production.

From (2) we can write $\frac{dQ}{T} = \frac{dE + pdV}{T}$ (6). If we introduce the possible changes of the number of moles, we get $dS = dE/T + pdV/T - \sum_\gamma \frac{\mu_\gamma}{T} dn_\gamma$ (7) (Gibbs equation) with $\mu_\gamma = -T\left(\frac{\partial S}{\partial n_\gamma}\right)_{EV\dot{n}_\gamma}$
On the other hand, $A = -\left(\frac{\partial G}{\partial \xi}\right)_{pT}$ with $G = H - TS$, hence
$A = -\left(\frac{\partial H}{\partial \xi}\right)_{pT} + T\left(\frac{\partial S}{\partial \xi}\right)_{pT} = r_{pT}$ (heat of reaction) $+ T\left(\frac{\partial S}{\partial \xi}\right)_{pT}$ (8).
If $T\left(\frac{\partial S}{\partial \xi}\right)_{pT}$ is negligible, entropy production due to chemical changes is proportional to the heat of reaction.

$\frac{d_iS}{dt} = \frac{A\nu}{T} \cong \frac{r_{pT}\nu}{T}$ (9), with $\nu = \frac{d\xi}{dt}$ (entropy production of a living organism measured by its metabolism, $r_{pT} < 0$ = endothermic reaction, $r_{pT} > 0$ = exothermic reaction).

From (7) and remembering that an ecosystem is made up of two open phases I and II at temperatures T^{I} and T^{II}, included in a closed system (biosphere element), it is demonstrated that:

$$dS = d_eS + d_iS \quad (10)$$

where $d_eS = \frac{d_e^{I}Q}{T^{I}} + \frac{d_e^{II}Q}{T^{II}}$ and

$$d_iS = d_i{}^{I}\Phi\,(1/T^{I}-1/T^{II}) - \sum_{\gamma}\left(\frac{\mu_{\gamma}^{I}}{T^{I}} - \frac{\mu_{\gamma}^{II}}{T^{II}}\right)d_{i}n_{\gamma}^{I} + \frac{A^{I}d\xi^{I}}{T^{I}} + \frac{A^{II}d\xi^{II}}{T^{II}} \geqslant 0$$

Total entropy change (dS) consists of:

a) an entropy flow resulting from the radiant energy exchanges with space (no matter exchange)

$$d_eS = \frac{d_e{}^{I}Q}{T^{I}} + \frac{d_e{}^{II}Q}{T^{II}}$$

b) a total entropy production $d_iS \geqslant 0$ in phases I and II resulting from

1°) an entropy production associated with the transport of heat in two directions through matter between two phases at different temperatures: $d_i{}^{I}\Phi(1/T^{I}-1/T^{II})$ mainly diffusion of water vapour in the boundary layer between I and II);

2°) an entropy production connected with the transport of matter (water) (1) in the two directions between the two phases

$$-\sum_{\gamma}\left(\frac{\mu_{\gamma}^{I}}{T^{I}} - \frac{\mu_{\gamma}^{II}}{T^{II}}\right)d_{e}n_{\gamma}\ (1)$$

(essentially diffusion of water vapour between I and II linked to changes of phases, absorption of liquid water) (2).

3°) an entropy production associated with the chemical reactions in the two phases (mainly gross photosynthesis of autotrophic plants photochemical reaction, respiration of autotrophic and heterotrophic organisms) (3)

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(1) $\mu_{\gamma} = (\mu_{\gamma})_p^{o} + RT \ln p_{\gamma}$; water is not the only matter transported between I and II. In principle, other entropy production associated with transports of matter can be taken into account CO_2, O_2, Ca, P... In the present case, these entropy productions are considered quantitatively as negligible.

(2) Vaporization: $\Delta H = RT \ln p/p^{o}$ (irreversible) + $T\Delta S$(reversible) (nonsaturated air).

(3) $= A = -\left(\frac{\partial G}{\partial \xi}\right)_{pT}$ (for a photochemical reaction, A = ordinary chemical contribution + supplement term), with $\partial G > 0$ in the endothermic chemical reaction, $\partial G < 0$ in the exothermic chemical reactions (respiration).

4. Entropy of radiant energy (1)

If I is the amount of monochromatic radiant energy passing per second per unit area drawn normally to the radiation direction, then the temperature of the radiation is given by:

$$T = \frac{h\bar{\nu}}{k} \frac{1}{\ln\left(\frac{2h\bar{\nu}^3\Omega}{c^2 f}+1\right)} \qquad \text{(Planck)} \qquad (11)$$

where Ω is the solid angle and $f = I/\Delta\bar{\nu}$ is the specific intensity of the radiation, i.e. energy flow, in energy units (erg) per unit time (sec) per unit area (cm^2) divided by the unit frequency interval (sec^{-1}).

In order to calculate the temperature of solar radiation at the surface of the earth, we have to take into account the isotropic scattering into the solid angle subtended by the solar disc at the earth ($\Omega_1 = 0.68 \times 10^{-4}$ steradians) to be increased to 4π (Ω_2). We obtain T_2 at the surface of the earth by equation $\ln\left(\frac{\Omega_2}{\Omega_1}\right) = \frac{h\bar{\nu}}{k}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$, $T_1 = 6000^\circ K$ ($I = \sigma T^4$), T_2 ($= 0.3 - 3\,\mu$) is varying between 2400° and 400° K.

The temperature of solar radiation when entering the ecosystem is very different from the kinetic temperature (molecular motion speed) of the constituent matter of the ecosystem which is defined by $\frac{3}{2}nkT = \sum_{i=1}^{n} \frac{1}{2} m\omega^2$. On the other hand, it is remembered that $T = Q/\bar{\rho}\, Cp$ (T ecosystem matter = $\pm$ 200°K to 320°K).

Entropy of polychromatic radiation such as solar radiation of solar disc, sky and clouds, can be obtained by adding entropies calculated for each spectral band $\Delta\lambda$,

$$dS = \sum_{0.3\,\mu}^{3\,\mu} (dQ)\,\Delta\lambda/(T)\Delta\lambda$$

We have to measure precisely and continuously (above the atmosphere and just above the ecosystem) radiant energy in the spectral fractions between 0.3 and 100μ.

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(1) See SPANNER, D.C., Introduction to Thermodynamics, Academic Press, 1964.

At the present time, continuous measurements can be made just above the ecosystem with certain advanced equipment, but no continuous measurements are performed above the atmosphere.

Above the ecosystem, it is now possible to get values of direct solar radiation, of sky and clouds diffuse radiation (sky and clouds short waves radiations can be roughly separated by using coefficients of cloudiness), of reflected short wave radiation, values of atmosphere and of terrestrial infrared radiations. One can use radiation spectra respectively established for solar disc, sky, clouds and reflected global radiation. To estimate solar disc radiation distribution, air masses that are variable from month to month must be taken into account.

Spectra that are actually known and already published do not differ very much from each other. Their utilisation in order to establish total entropy of fluxes gives similar results. Values of atmospheric and terrestrial long waves radiation must be known with very high precision. These values are very large and take a dominant position in the calculation of entropy flow(1).

Since no measurement in high altitude was made, the radiation flow emitted by the ecosystem and measured just above it, does not take into account the dissipation of sensible heat and the reversible latent heat ($T \Delta S$) fluxes that take place in high altitude.

5. Stationary state of the ecosystem (biospheric elementary system)

In the stationary states, positive entropy production has to be compensated for by a negative flow of entropy and

$$\frac{dS}{dt} = \frac{d_eS}{dt} + \frac{d_iS}{dt} = 0 \quad (12) \qquad \text{with } \frac{d_iS}{dt} > 0 \text{ and } \frac{d_eS}{dt} < 0$$

(1) For terrestrial long waves radiation, a black body spectrum may be considered. In oceanic temperate regions, the same may be said for radiation from cloudy atmosphere; but for clear sky long waves radiation, a particular spectrum must be taken in account.

Moreover, the total heat received by the system is zero.

$$dQ = d_e^{I}Q + d_e^{II}Q = 0 \text{ et } \frac{d_eS}{dt} = \frac{d_eQ}{dt}\left(\frac{1}{T^I} - \frac{1}{T^{II}}\right) < 0 \qquad (13)$$

The entropy flow (incoming and outgoing radiant energy) is negative because energy received at high temperature T^I is returned to space at a lower temperature T^{II}.

Application of those theoretical considerations requires many conditions which are not easy to fulfill.
If heat received by the system has to be null ($dQ = d_e^{I}Q + d_e^{II}Q = 0$), we must choose in an ecosystem of temperate regions a time span of about 365 days, for example between two moments t_1 and t_2 when mean temperature of the whole system (soil and atmosphere) is the same, which corresponds to respectively equal atmospheric and terrestrial radiations for t_1 and t_2. The fluctuation corresponding to a complete vegetation period between two days (spring and autumn) with the same mean temperature (soil and atmosphere) can also be employed (1).

In principle, the mass of matter in the system must be conservative: balance of air masses (same atmospheric pressure) and of water masses (evaporation + run off + drainage + chemical reactions = precipitations). Practically, if we know the difference between masses present at t_1 and t_2 and their respective temperatures, their flow dQ can be calculated.

In phase I, living organisms are characterized by a stationary non-equilibrium state that is maintained through variable flows of energy (essentially radiant) and of matter. For example, the incoming and outgoing water flows are varying between certain limits. If given levels are exceeded, the stationary state is broken. This is the case of the wilting point of plants (incoming water flow null) where an entropy rise (death) takes place. The stationary state is maintained as long as the edaphic water reserve (phase II) is varying between field capacity and destruction of capillaries.

(1) It must be taken into account that when water is evaporated it has a higher temperature than when it entered the ecosystem as precipitation.

6. Application to Forest ecosystem with measurements at 0 m

(z_0 = soil level), z_1 (= height of foliage) and z_2 (= z_1 + boundary layer), z_3 being the outer limit of the atmosphere.

(a) At the stationary state, $dS = d_eS + d_iS = 0$, $-d_eS = d_iS$ (12). On the other hand, total heat flow is zero and the flow in one phase is equal, but with opposite sign, to the flow in the other phase, $dQ = 0$, $d_e^{I}Q = -d_e^{II}Q$ (13).

(b) Entropy flow ($d_eS < 0$)

When equation (10) is used we obtain

$$d_eS = (d_eS)^{G*} + (d_eS)^{Am} - (d_eS)^{aG*} - (d_eS)^{Te}$$
$$+ Am\left(\frac{1}{T}Am - \frac{1}{T}I\right) - (d_eS)^{Vap} - (d_eS)^{Ko} < 0 \ (\mathrm{cal}\,{}^{o}K^{-1}) \qquad (14)$$

with $T^{Am} < T^{I}$.

$(d_eS)^{Vap} + (d_eS)^{Ko} = (d_eS)^{Te'}$ is an entropy flow rising between z_2 and z_3 (thus null at $z_o - z_2$), after transportation of K_o (sensible heat) and of Vap (reversible latent heat) to $z_2 - z_3$. (Evaporation in non-saturated air: $\Delta H = \Delta F + T\Delta S$; $(d_eS)^{Te'}$ is a part of $(d_eS)^{Te}$ between z_2 and z_3).

(c) Entropy production ($d_iS > 0$)

d_iS is made up of following terms:

1°) $(d_iS)^{Ko^{II}}_{z_o-z_2}$ and $(d_iS)^{Vap^{II}}_{z_o-z_2}$:

entropy production linked to heat and matter (water vapor) flows from phase I;

2°) $(d_iS)^{K_oII}$ and $(d_iS)^{Vap^{II}}$:

entropy rise (air and water) in $z_o - z_2$ transported to z_2-z_3;

3°) $A_P^{I}d\xi^{I}/T^{I}$: endoenergetic irreversible photochemical reactions with an ordinary chemical contribution and that of a radio-energetic term (gross photosynthesis);

4°) $A_r^{I}d\xi^{I}/T^{I}$: irreversible exothermic chemical reactions with $A_r = -(\partial G/\partial\xi)_{pT}$ where $\partial G<0$ and $A>0$ (I) (for example oxydation, respiration);

5°) $A^{II} d\xi^{II}/T^{II}$: several chemical reactions (negligible).

In an ecosystem,

$$\frac{A_p^{I} d\xi^{I}/dt}{T^{I}} \lesseqgtr \frac{A_r^{I} d\xi^{I}/dt}{T^{I}}$$, and all chemical reactions

(photosynthesis, respiration, digestion and assimilation of phytophagous and zoophagous organisms ...) can be considered at the stationary state as a chemical energy flow equal to

$$\frac{-\sum_{\gamma p} \vartheta^{I}_{\gamma p} \mu^{I}_{\gamma} v_{p}^{I}}{T^{I}}$$

where $\sum_{\gamma p}$ is a double summation on all reactions (indice p) and on all the components γ included in these reactions (1).

On the other hand let us suppose that at the stationary state

$$\left(div\, \mathcal{J}^{I}_{\gamma} = \sum_{\gamma} \nu^{I}_{\gamma p} v^{I}_{p} \right)$$

temperature is quasi uniform in phase I and that the convection is negligible. Under these conditions, entropy production $\sigma(S)$ per unit of volume is given in a continuous system by (2)

$$\sigma(S) = - \sum_{\gamma} \frac{1}{T^{2}} div\left(\mu^{I}_{\gamma} \mathcal{J}^{I}_{\gamma} \right) \quad (15)$$

Entropy production associated to heat and vapour (matter)flows between z_o and z_2 is equal to

$$(d_i S)^{K_o^{II}}_{z_o - z_2} = - \mathcal{J}^{II}_{th} \frac{\Delta T}{T^{2}} \qquad (16a)$$

$$(d_i S)^{VapII}_{z_o - z_2} = - \mathcal{J}^{II}_{m} \frac{v \Delta p}{T} \qquad (16b)$$

Hence

$$d_i S_{z_o - z_2} = -\mathcal{J}^{II}_{th} \frac{\Delta T}{T^{2}} - \mathcal{J}^{II}_{m} \frac{v \Delta p}{T} - \int_{V} \sum_{\gamma} \frac{div(\mu^{I}_{\gamma} \mathcal{J}^{I}_{\gamma})\, dV}{T^{I}} > 0$$

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(1) The sum of chemical reactions is

$$\sum_{\rho=1}^{p=n} \frac{A_{\rho}^{I} v_{\rho}^{I}}{T^{I}} \quad \text{with } A^{I}_{\rho} = -\left[\sum_{\gamma} \vartheta_{\gamma p} \mu_{\gamma} \right]$$

Hence this sum is equal to $- \dfrac{\sum_{p} \sum_{\gamma} \vartheta^{I}_{\gamma p} \mu^{I}_{\gamma}}{T^{I}}$

(2) The divergence of a flow gives, per unit of volume, the excess flow that is going out of the volume element over the flow that is coming in it ($div\, \mathcal{J} = \frac{\partial \mathcal{J}_x}{\partial x} + \frac{\partial \mathcal{J}_y}{\partial y} + \frac{\partial \mathcal{J}_z}{\partial z}$).
In the present case of irreversible reactions, the sign must be changed, hence equation (15).

Interpretation: If $d_eS + d_iS = 0$ (stationary state) and if $d_iS > 0$, then $-d_eS = d_iS$,

$$- d_eS_{z_o-z_2} = \left[(d_eS)^{G*} + (d_eS)^{Am} - (d_eS)^{aG*} - (d_eS)^{Te+Am}\left(\frac{1}{T}Am - \frac{1}{T^I}\right)\right]$$

$$= d_iS_{z_o-z_2} = -\mathcal{J}^{II}_{th}\frac{\Delta T}{T^2} - \mathcal{J}^{II}_{m}\frac{v\Delta p}{T} \text{ (with } \Delta T = T^{II} - T^I < 0$$

$$\text{and } \Delta p = p^{II} - p^I < 0) \quad -\int_V \sum_\gamma \frac{\operatorname{div}(\mu^I_\gamma \mathcal{J}^I_\gamma)\,dV}{T^I} \qquad (17)$$

(see (1)).

If at the stationary state we are considering the case where the contribution of the entropy source associated to the whole of the chemical reactions is null, then

$$\int_{chem} \sigma(S) = -\int_V \sum_\gamma \frac{\operatorname{div}(\mathcal{J}^I_\gamma \mu^I_\gamma)\,dV}{T} = 0$$

In equation (17), $-\mathcal{J}^{II}_{th}\Delta T/T^2$ and $-\mathcal{J}^{II}_{m}\frac{v\Delta p}{T}$ are always positive. Moreover, if $\int_{chem}\sigma(S) = 0$, the ecosystem is in stationary state (for example, a climax) and all the organic matter fixed by autotrophic plants is, at the same time, destroyed by autotrophic and heterotrophic organisms (respiration, oxydation) and biomass remains identical.

Chemical energy flow is dissipated and meanwhile the flows of associated matter (in equal quantities) are going from phase I to phase II and from II to I.

If $$-\int_V \sum_\gamma \frac{\operatorname{div}(\mathcal{J}^I_\gamma \mu^I_\gamma)\,dV}{T^I} < 0$$

the organic matter produced the ecosystem is destroying not only at the same time, but also a stock of matter accumulated previously (diminution of biomasses, for instance).

If $$-\int_V \sum_\gamma \frac{\operatorname{div}(\mathcal{J}^I_\gamma \mu^I_\gamma)}{T^I}\,dV > 0$$

the ecosystem is stocking organic matter (growth and development of ecosystem = augmentation of biomasses and of dead organic matter in soil.)

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(1) At level z_2, $(d_eS)^{Vap}$ and $(d_eS)^{Ko}$ are zero.

$+d_iS_{z_o-z_2}$ can be considered as being the entropy variation of open phase I and that of the open phase II (z_o-z_2).
The three component terms of $d_iS_{z_o-z_2}$ are thus the production of dissipation entropy (always > 0) associated with the diffusion heat flow (Ko) and the vapour flow (Vap) in the boundary layer of foliage and the entropy production of the potential chemical energy flow through the ecosystem. That last flow is the ecosystem net production (P N E) of ecologists (1).

Entropy production associated with heat and matter (water vapour) flows and that of the chemical reactions are taking plase in phase II (boundary layer II/I) and in phase I respectively. The first is a low quantity (between z_1-z_2) and can really always be totally compensated for by heat from exothermic reactions.
For R. FLOROV (1969) (2), the sum of entropy productions associated with heat (Ko) and matter (H_2O, CO_2, O_2) (Vap) flows can even be considered as a measurement of the respiration of chlorophyllous autotrophic plants during the vegetation period.

As to the difference

$$\left[- d_eS - \left(-\mathcal{J}^{II}_{th} \frac{\Delta T}{T^2} - \mathcal{J}^{II}_{m} \frac{v \Delta p}{T}\right)\right] = -\int_V \sum_\gamma \frac{\operatorname{div} (\mathcal{J}^I_\gamma \mu^I_\gamma)\, dV}{T^I} > 0$$

it is an approximated value of the organic matter accumulation (P N E) in cal $^oK^{-1}$.

In the case of a deciduous forest of temperate region, equation (17) applied during the only active period of vegetation, leads to an approach of the net primary production (net photosynthesis) minus the respiration of heterotrophic organisms during that time.

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(1) Gross photosynthesis ($PB = A_p d\xi^I$) - respiration of chlorophyllous autotrophic plants ($R_A = A^I_{r1} d\xi^I$) = net primary productio (net photosynthesis (PNI). Net primary production - respiration of heterotrophic organisms (= consuments and bioreductors of organic matter ($R_H = A^I_{r2} d\xi^I$) = ecosystem net production (P N E).
$PB - R_A - R_H = PNE - \int_V \sum_\gamma \operatorname{div} (\mathcal{J}^I_\gamma \mu^I_\gamma)\, dV.$

(2) FLOROV, R.J. - On the entropy of the plant leaf system. State University "Clement Ohrisdky", Sofia, Faculty of Biology, Bulgaria, Sofia, 1969.

ENTROPY FLOW AND ENTROPY PRODUCTION IN THE OAK FOREST OF VIRELLES-BLAIMONT CONSIDERED AS AN OPEN SYSTEM (25-5 to 25-10.1967)

Equation (17) is applied to measurements made at z_2 (+ 19m), that is, above forest foliage (FIG. 1).

$$-d_eS_{z_o-z_2} = \left[(d_eS)^{G*} + (d_eS)^{Am} - (d_eS)^{aG*} - (d_eS)^{Te} + Am\left(\frac{1}{T^{Am}} - \frac{1}{T^{I}}\right)\right]$$

$$= + d_iS_{z_o-z2} = \left[-\mathcal{J}^{II}_{th}\frac{\Delta T}{T^2} - \mathcal{J}^{II}_{m}\frac{v\Delta p}{T} - \int_V \sum_\gamma \frac{\mathrm{div}(\mu^I_\gamma \mathcal{J}^I_\gamma)}{T^I}\,dV\right] \qquad (17)$$

Entropy flow and entropy production are obtained (FIG. 2):

$$\int d_eS = 44,^{10} + 524,37 - 9,83 - 592,07 + 29,88 = -3,55 \text{ cal } {}^oK^{-1}$$

(entropy flow at z_2)

If $\int dS = \int d_eS + \int d_iS = 0 \int d_eS = -\int d_iS$ (from 25-5 to 25-10-1967 with T = 283 °K at the beginning and at the end of the period).

Of course, heat flow is not null, but almost null. Effectively, Qi (biomasses) = +20, Qi (Soil 0,0 to 0,50 m + subsoil 0,50 to 1,00 m) = 4I+ 55 = 96, Qi (precipitation water) = 34,8 gr x 5,4°C (= ΔT between precipitations temperature and temperature of system) = + 188 that is Qi (total) = + 305 cal cm^{-2} period^{-1}; $\int (d_iS)^{Qi}$ = I,05 cal $^oK^{-1}$.

Thus $\int d_eS_{z2} + \int (d_iS)^{Qi} = -3,55 + 1,05 = -2,50$ cal$^oK^{-1}$.

$$+\int d_iS = \int (d_iS)^{Ko\,II}_{zo-z2} + \int (d_iS)^{Vap\,II}_{zo-z2} + \int_V \sum_\gamma \frac{\mathrm{div}\,(\mu^I_\gamma \mathcal{J}^I_\gamma)}{T^I}dV = 2,50 \text{ cal}^oK^{-1}$$

$$\int (d_iS)^{Ko\,II}_{zo-z2} \left(= \mathcal{J}^{II}_{th}\frac{\Delta T}{T^2} = 0,275\right) + \int (d_iS)^{Vap\,II}_{zo-z2} \left(= \mathcal{J}^{II}_{th}\frac{v\Delta p}{T} = 0,135\right) = 0,41 \text{cal}^oK^{-1}$$

that is 118 cal cm^{-2} period^{-1} (calculation per decade, Florov method) $\int (d_iS)^{PNE}_{per} = 2,50 - 0,41 = 2,09$ cal cm^{-2} per^{-1}.

Ecosystem net production during the vegetation period (gross primary production of autotrophic plants minus respiration of autotrophic plants minus respiration of heterotrophic organisms (animal consuments - animal and vegetal bioreductors) (= P N E) is following:

$$\int_V \sum_\gamma \mathrm{div}\,(\mu^I_\gamma \mathcal{J}^I_\gamma)dV = 2,09 \times 288,6 = 603 \text{ cal cm}^{-2} \text{ per}^{-1}.$$

On the other hand, respiration of heterotrophic bioreductors during the period, measured by A. FROMENT, amounts to +119 cal cm^{-2} per^{-1}.

Hence net primary production (gross primary production of autotrophic plants minus their own respiration) = 603 + 119 = 722 cal cm^{-2} per^{-1} (1).

For comparison, net primary production established by P. DUVIGNEAUD with the method of biomasses difference between two given times, amounts to 699 cal cm^{-2} per^{-1} (1).

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(1) FROMENT, A.;TANGHE, M.;DUVIGNEAUD, P.;GALOUX, A.; DENAEYER-DE SMET, S.;SCHNOCK, G.; GRULOIS, J.; MOMMAERTS-BILLET, F. and VANSEVEREN, J-P; -La chênaie mélangée calcilole de Virelles-Blaimont en Haute Belgique."

Productivité des écosystèmes forestiers, Actes du Colloque de Bruxelles, Collection Ecologie et Conservation, n° 4, Unesco, 1971, pp. 635-665.

Entropy growth at the level of an elementary atmospheric volume considered as a closed system and situated at the geographical coordinates of Virelles-Blaimont.
(Data after LINACRE, E.T., 1969 at the upper limit of atmosphere)
(Period of 25 May to 25 October 1967, 221 760 minutes)(Fig.3).

A. = Entropy flux

$\int(d_eS)^{G^+}$ = 119963 : 1298,4 = 92,39

$\int(d_eS)^{aG^+}$ = 47985 : 1039,7 = 46,15

$\int(d_eS)^{Te}$ = 71978 : 189,25 = 380,33 (0,325 cal.cm^{-2} min^{-1} = 254,5 °K) (1)

$\int d_eS$ = 92,39 - 46,15 - 380,33 = -334,09 cal cm^{-2} °K^{-1} periode^{-1}

B. = Entropy production in phase I

$\int d_iS^I$ = + 3,14 cal °K^{-1} cm^{-2} pér.$^{-1}$

C. = Entropy production in phase II

- 334,09 + 3,14 = -330,95, $\int d_iS^{II}$ = + 330,95

a) Heat and matter flows

- between boundary layer and upper limit of atmosphere

$\int d_iS = J_{th}\ \Delta\ T/T^2 + J_m\ \bar{v}\ \Delta q/T$

$\int(d_iS)^{K_oII}$ = 7006 cal x 34,1/288,6^2 = 2,87

$\int(d_iS)^{VapII}$ = 18214 x 17,54 x 0,000622/293,15 (= phototemperature) = 0,68

- inside of the boundary layer

$\int(d_iS)^{K_oII}$ = 0,275 $\int(d_iS)^{VapII}$ = 0,135

b) Energy, cyclones, hurricanes, electricity, kinetic energy of air;

D. = Entropy growth in atmosphere with variable pressure and temperature, at constant volume (C.-a taken in account, C.-b not taken in account).

$\int d_iS^{II}_{atm}$ = + 330,95 - 3,96 = + 326,99

$\int d_iS^{II}atm = m\ (c_p \ln T/T_o - r_1 \ln p/_{Po})$ = + 326,99 cal cm^{-2} périod^{-1}

(entropy equation of perfect gas)

p = 2,95 mm Hg

T = -18,65°C (2)

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(1) VON DER HAAR (1967) has published mean values of infrared radiation leaving the earth and measured by satellites. For latitude of Virelles-Blaimont, mean value for June-October is 0,324 cal cm^{-2} min^{-1}.

(2) Tables for relations altitude/atmospheric pressure give for altitude 40 000 m, a temperature of -22,8°C and a pressure of 2,15 mm Hg.

Fig. 1 LEGEND.

S	Solar disc incident radiation λ
D	Sky and clouds incident radiation λ
G*	Incident global radiation λ
Te	Earth-vegetation radiation Λ
Am	Incident atmospheric radiation Λ
aS	Reflected solar disc radiation λ
aD	Reflected sky and clouds radiation λ
a_NAm	Reflected atmospheric radiation Λ
a	Albedo coefficient for global radiation λ%
a_N	Albedo coefficient for atmospheric radiation Λ%
a_p	Photosynthetic efficiency of global radiation
Q_1	Short radiation balance (G* - aS - aD) λ
Q_2	Long waves radiation balance (T + a_N - Am) Λ
Q	Net radiation balance ($Q = Q_1 + Q_2$) λ+Λ
K_o	Sensible heat in diffusion-convection
Vap	Latent heat in evapotranspiration
Q_V	Sensible heat accumulation in biomasses
Q_r	Latent heat in dew
Q_L	Advection energy
Q_{Li}	Sensible heat in interior air
Q_{prec}	Sensible heat in precipitation water
PNE	Net ecosystem production

Table 1.- Energy conservation balance with distribution of values between phases I and II. Oak forest of Virelles-Blaimont (25.5 to 25.10.1967).

	I Q_V	I Ko	I Vap	I PNE	I Ko	I Vap
Phase I	+18	+7.006	+18.214	+603	+3.020	+1.634
	$\int d_e^I Q = +25.841$				$\int d_i^I Q = +4.654$	
	$\int d^I \Phi = +30.495$					
	II Q_G	II Q_{Li}	II $Q_{Préc.}$		II Ko	II Vap
Phase II	+96	+2	+188		-3.020	-1.634
	$\int d_e^{II} Q = +286$				$\int d_i^{II} Q = -4.654$	
	$\int d^{II} \Phi = -4.368$					

$$\int dQ = \int d^I \Phi + \int d^{II} \Phi$$

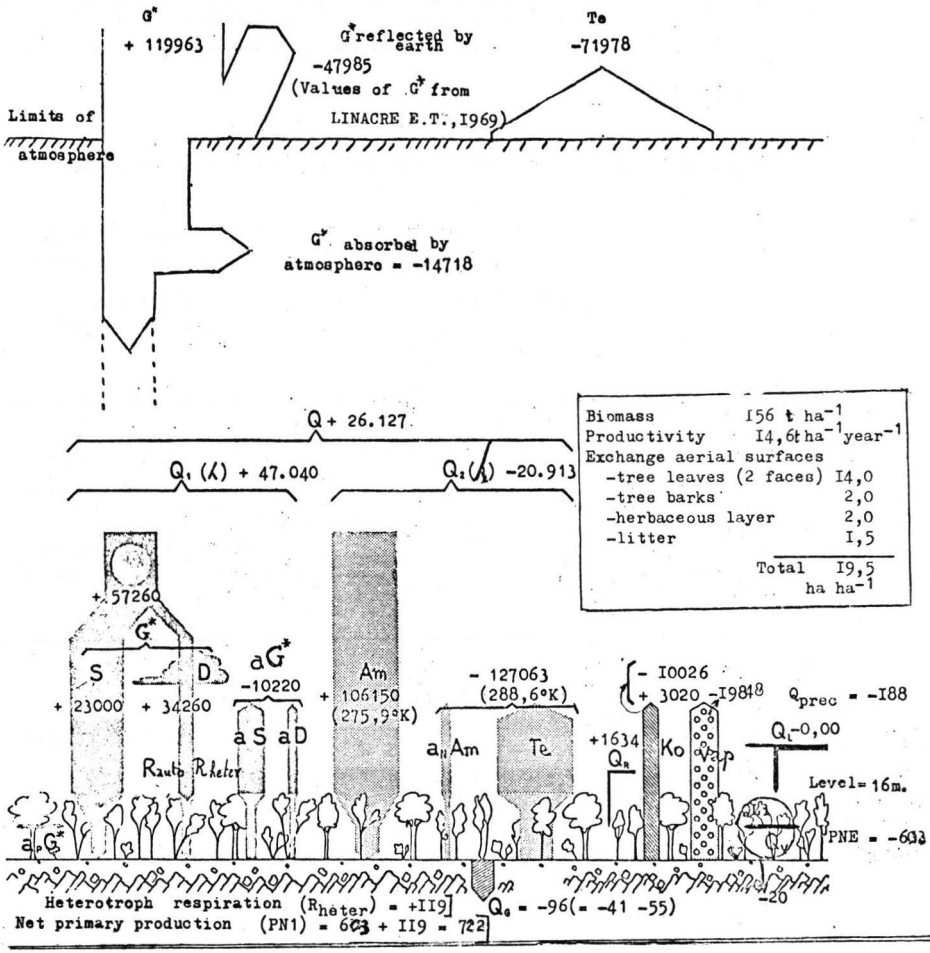
$$+ 26.127 = + 30.495 - 4.368$$

$$\int d_i^I Q = -\int d_i^{II} Q$$

$\overset{I}{Ko}(+) = -\overset{I}{Ko}(-)$

$\overset{I}{Vap}(+) = -\overset{I}{Vap}(-)$

Fig 1, OAK FOREST OF VIRELLES-BLAIMONT, ENERGY BALANCE AT LEVEL + I6 m (25.5 - 25.10.I967)
(cal cm^{-2} per^{-1})



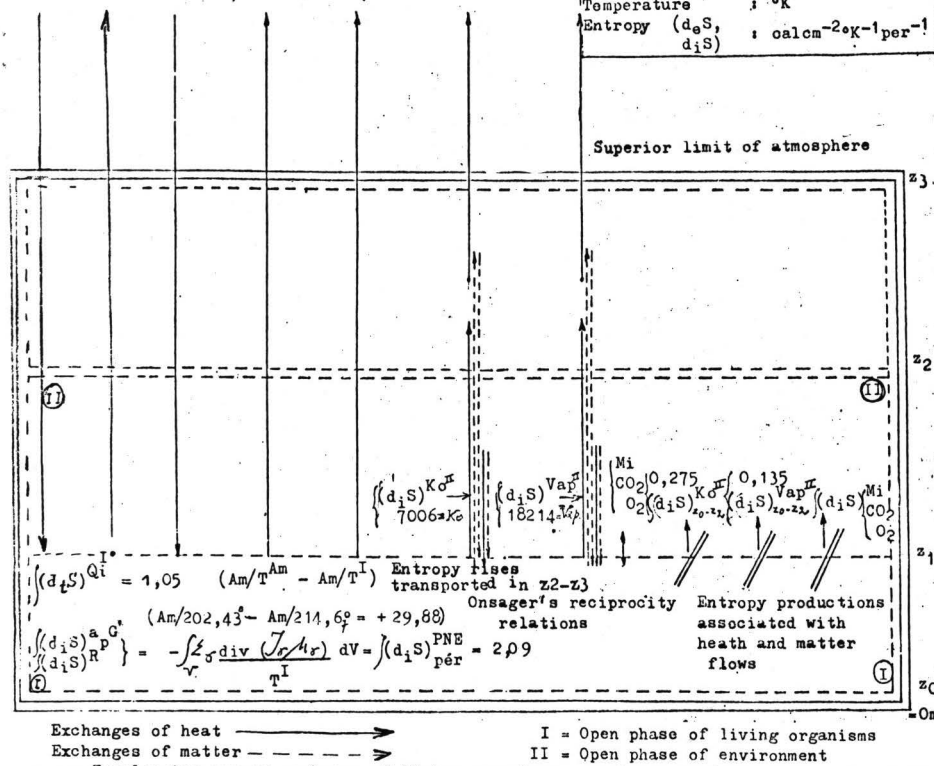
$$Q = G^* - aG^* + Am - a_N Am - Te$$

$$Q1 = G^* - aG^*$$

$$Q2 = Am - a_N Am - Te$$

$$Q + Q_G + Q_V + Q_{Li} + Q_{prec} + Q_L + Q_R + Ko + Vap + PNE = 0$$

Fig 2. Ecosystem model. Closed system formed by two subsystems or open phases. Entropy flow related with exterior (space) (d_eS) and entropy production due to changes within open phases I and II (d_iS). Mixed oak forest of Virelles-Blaimont.



Exchanges of heat ⟶ I = Open phase of living organisms

Exchanges of matter - - - - - ⟶ II = Open phase of environment

- - - - Envelopping porous membrans of living organisms = exchange surfaces between I and II

═══ Limits of closed system = = = = = Conventional limits of closed system

z_1 = superior level of living organisms (= + 16 m)

z_2 = superior level of measurements in phase II (= + 25 m)
(= conventional superior level of phase II)

z_3 = superior limits of atmosphere (phase II)

$$Q_i^I = Q_G + Q_{Li} + Q_V + Q_{prec.})$$

Fig.3. Ecosystem model. System closed at the upper limit of atmosphere including two open subsystems or phases. Entropy flow (d_eS) (space) and entropy production within the open phases I and II (d_iS). (Total open phase II up to the upper limit of atmosphere).

Oak forest of Virelles-Blaimont.

Period	: 25.5 - 25.10.1967
Radiation (G^*, aG^*, Am, Te)	: cal cm^{-2} per^{-1}
Temperature	: °K
Entropy (d_eS, d_iS)	: cal cm^{-2} $°K^{-1}$ per^{-1}

$\int(d_eS)G^*$	$\int(d_eS)aG^*$	$\int(d_eS)^{Te}$
92,39	46,15	380,33
G^*	aG^*	Te
119963	47985	71978
1298,4	1039,7	189,25

Upper limit of atmosphere

z3

(II)

$\int d_iS^{II} = +330,95$

$\int(d_iS)^{Ko^{II}} = +3,145$

$\int(d_iS)^{Vap^{II}} = +0,815$

$\int(d_iS)^{II}_{atm} = 326,99 =$

$m(C_p \ln T/To - r_1 \ln P/Po$

hence $\begin{cases} P = 2,95 \text{ mm Hg} \\ T = -18,65°C \ (254,5°K) \end{cases}$

that is $z3 = \pm 40000m$ altitude

z2

z1

$\int d_iS^{I} = +3,14$

$\int(d_iS)^{PNE}_{per} = +2,09$

$\int(d_iS)^{Qi} = 1,05$

(I)

z0

Upper limit of lithosphere

List of symbols :

A = Chemical affinity

Cp = Calorific capacity

E = Internal energy

F = Helmholtz free energy (= E - TS)

G = Gibbs free energy (= E - TS + pV = H - TS)

H = Enthalpy or heat content function

J = Rate or generalized flux of irreversible process

J_{th} = Heat flow, J_m = matter flow

k = Boltzmann's universal constant

n = Number of moles

n_γ = Number of moles of component γ

p = Pressure

Q = Heat received by the system (including radiant energy)

r_{pT} = Reaction heat at constant temperature and pressure

R = Universal gaz constant

S = Entropy

t = Time

T = Absolute temperature

v = Velocity

$\bar{V}_\gamma$ = Molar partial volume of γ

V = Volume

W = Work

λ = Wave length

μ_γ = Chemical potential of γ

ν_γ = Stoechimetric coefficient of γ

ξ = Degree of advancement or extent of reaction

ρ = Density

Φ = Resultant flow of energy

Ω = Solid angle

ν = Wave frequency

h = Planck's constant

I = Density of radiation flow

f = Specific intensity of radiation

c = Propagation velocity of an electromagnetic wave; c = velocity of molecular motion

σ = Stefan-Boltzmann's constant

m_γ = Mass of component γ

G^* = Incident global radiation flow (solar disc + sky + clouds) (0,3 - 3 μ)

aG^* = Reflected global radiation flow (0,3 - 3 μ)

A_m = Atmospheric radiation (3 - 100 μ)

Te = Radiation flow emitted to space direction by terrestrial surfaces (soil + vegetation) (3 - 100 μ)

Ko = Sensible heat of diffusion-convection

Vap = Latent heat of vaporization (evapotranspiration)

z = Any height level

apG^* = Value of global radiation used by gross photosynthesis

R = Respiration

Mi = Mineral elements.

Simulation of one-dimensional moisture transfer in unsaturated, layered, field soils[1]

R. R. van der Ploeg and P. Benecke[2]

Introduction

The research of which we report is part of the West German contribution to a larger international ecological program, the so-called "International Biological Programme (IBP)", see Ellenberg (1971). The German contribution on which we report is called the Solling-Project. The IBP, which started its work in 1961, has as its central theme: "The biological basis of productivity and human welfare". Part of the IBP's concern is man's growing demand for clean water. Among many other topics, see Ellenberg (1971), it was decided to study in the Solling-Project the moisture regime of some small sample sites, located in either a beech forest, a spruce forest, or in an open meadow, to find out about possible differences in water consumption by the vegetation in these sample sites. The same sample sites are used by all the other scientists that work together in this ecological Solling-Project.

The sample sites are located closely together in the northern part of West Germany. The cool and humid area (the so-called "Solling") in which the sample sites are situated, is underlain by permeable Mesozoic sandstones in which large amounts of groundwater are stored. Typical watersheds are hard to discover in the plateau-like Solling area and not much hydrological work has been done in it so far. Since many researchers in our ecological project

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[1] Institute of Soil Science and Forest Nutrition, Georg-August University, 2 Buesgenweg, 34 Goettingen, West Germany.

[2] This research was supported by the German Research foundation (DFG) under projects Be 401/9 and Be 401/11.

need soil moisture data, since we do not find typical watersheds in our research areas, and hence since we cannot build weirs from which run-off characteristics can be analyzed, it was decided to study the moisture regime of our research areas by means of soil physical methods. A large number of tensiometers were installed at different depths in the soil and measurements are taken frequently. The tensiometers can be heated so that they can be used in cold periods. The soils in our research area never dry out very much and therefore we are also able to use the tensiometers during the summertime. Occasionally we do use a neutron meter and also a self-recording gamma ray apparatus is installed in one of our research sites.

Using soil moisture characteristics to study the water balance of an area puts emphasis on moisture transport phenomena that occur in the soil. The theory of unsaturated moisture flow is well developed. Usually a nonlinear partial differential equation is used to describe unsaturated moisture flow. Unfortunately this differential equation is of such complexity that it can be solved only for ideal cases. A few analytical solutions do exist, but most practical unsaturated moisture flow problems can be solved only by use of approximating methods, such as the method of finite differences. Even the method of finite differences requires a good deal of mathematical, physical and computer-programming background of the researcher who wants to use the method. We have developed a computer simulation program that is much simpler than the method of finite differences. We are using this simulation method presently to approximate a solution to the previously mentioned partial differential equation to describe moisture flow processes as we encounter them in the field. We will discuss in some detail a simulation program and we will show some results that we are obtaining with it. First, however, we will review the theory of infiltration briefly.

Theory of infiltration

Unsteady, unsaturated, isothermal, three-dimensional moisture movement in soil is governed by a nonlinear partial differential equation, known in the literature as a nonlinear Fokker-Planck equation, see Philip (1969), or as a soil moisture flow equation, Giesel et al. (1973). This equation can be given, see Kirkham and Powers (1972), p. 242), as:

$$\partial(K\,\partial\psi/\partial x)/\partial x + \partial(K\,\partial\psi/\partial y)/\partial y + \partial(K\,\partial\psi/\partial z)/\partial z + \partial K/\partial z = \partial\theta/\partial t \qquad (1)$$

where

x, y, z = space coordinates, such that z is measured perpendicularly to the soil surface, with the positive direction upward

t = a time coordinate

ψ = negative pressure head (suction head)

θ = volumetric moisture content

K = capillary conductivity of the isotropic soil.

For one-dimensional, unsaturated, vertical moisture flow in soil, equation (1) can be written as:

$$\partial(K\,\partial\psi/\partial z)/\partial z + \partial K/\partial z = \partial\theta/\partial t \qquad (2)$$

For one-dimensional, unsaturated, horizontal moisture flow in soil, equation (1) can be written as:

$$\partial(K\,\partial\psi/\partial x)/\partial x = \partial\theta/\partial t \qquad (3)$$

If one uses the soil water diffusivity, D, instead of the capillary conductivity, K, where D and K are related as:

$$D = K\,d\theta/d\psi \qquad (4)$$

then equation (3) can be written as:

$$\partial(D\,\partial\theta/\partial x)/\partial x = \partial\theta/\partial t \qquad (5)$$

If one assumes D to be a constant, then equation (5) can be written as:

$$D\, \partial^2\theta/\partial x^2 = \partial\theta/\partial t \qquad (6)$$

For future use we note here that equation (6) is of the same form as Fick's second law, which describes gaseous diffusion with a constant diffusivity coefficient. Fick's second law usually is given as:

$$D\, \partial^2 C/\partial x^2 = \partial C/\partial t \qquad (7)$$

in which C is the concentration (say in g/cm^3) of the diffusing gas.

We return now to equation (1). A solution of equation (1), subject to appropriate boundary and initial conditions, would enable one to calculate the moisture content θ (or the suction head ψ) as a function of time for any location in the soil profile as long as the profile remains unsaturated. However, equation (1) is of such complexity that solutions are hard to find. Solutions for unsaturated moisture flow problems can be obtained only under special conditions. Most work has been done for one-dimensional, vertical moisture flow.

For a homogeneous soil and for simple initial and boundary conditions, Philip (1957a, 1957b) provided a numerical solution to the one-dimensional, unsaturated moisture flow equation. For the same problem Parlange (1971) gave an analytical solution. Hanks and Bowers (1962) attacked the one-dimensional infiltration problem by using the method of finite differences. This method allows not only for more complicated initial and boundary conditions, but also for nonhomogeneous soils. Wang and Laskminarayana (1968) used the method of finite differences for infiltration into nonhomogeneous soils. A

recent use of this method in solving a one-dimensional infiltration problem is by Giesel et al. (1973), who included hysteresis.

Even the method of finite differences, although straightforward, requires a certain amount of mathematical skill. Many soil scientists, soil hydrologists, ecologists, and scientists from other disciplines working on soil moisture problems do not have the time to become familiar with the mathematical prerequisites of the finite differences methods. Van der Ploeg (1973, in press) used a simulation program for one-dimensional infiltration. The simulation program requires a minimum of mathematical knowledge and the programming language is simple. Van der Ploeg (1973) compared the results of the simulation program with the theories of Philip (1957a, 1957b) and Parlange (1971) for Yolo light clay and found a good agreement. The simulation program of Van der Ploeg (1973) is now extended to include layered soils. The results of the simulation program for layered field soils are compared with actual field observations and a good agreement is found. Van Keulen and Van Beek (1971) also developed a simulation program for moisture movement in layered soils. They did not, however, check their results against experimental or field data. Simulation programs can also be used for other transport phenomena in soils, as shown by Wierenga and De Wit (1970) and De Wit and Van Keulen (1972). The simplicity and conciseness of a simulation program can be readily illustrated with the use of equation (7) for gas diffusion.

Illustration of simulation program

Figure 1 shows a horizontal container filled with soil through which gaseous N_2 is diffusing. We assume that no chemical or biological processes affect the N_2 while it is diffusing through the soil. Diffusion proceeds from left to right. The concentration, C, of N_2 is kept constant during the diffusion process at both ends of the soil container. Let us assume that the constant N_2 concentration at the left is 100×10^{-9} g/cm^3 and at the right is 10×10^{-9} g/cm^3. Also let us assume that the initial N_2 concentration in the soil is also 10×10^{-9} g/cm^3, that the constant diffusion coefficient, D, is equal to 2.5×10^{-9} cm^2/min, and that the length, L, of the soil column is equal to 50 cm. Let us now suppose that we wish to determine the N_2 concentration throughout the soil container at any particular time after the diffusion experiment has begun. In mathematical terms the problem can be stated as follows: Find a solution to the partial differential equation:

$$D\,\partial^2 C/\partial x^2 = \partial C/\partial t$$

subject to the boundary conditions (BC's):

BC1: $C = 100$, at $x = 0$, $t \geq 0$

BC2: $C = 10$, at $x = 50$, $t \geq 0$

and subject to the initial conditions (IC):

IC: $C = 10$, $0 < x < 50$, $t = 0$

To work with nice numbers, we multiply the values of the boundary conditions, the initial conditions, and also the diffusivity by a factor of 10^9. To solve the problem, knowledge of calculus and differential equations is required. Using the method of separation of variables, see Kirkham and Powers (1972, p. 431), one can find as solution:

$$C(x,t) = BC1 + (BC2 - BC1)\{x/L + (2/\pi)\sum_{m=1}^{\infty}[(1/m)(-1)^m \exp(-m^2\pi^2 Dt/L^2)\sin(m\pi x/L)]\} \quad (8)$$
$$+ (2/L)\sum_{m=1}^{\infty}\{L(BC1 - IC)/(m\pi)[\cos(m\pi) - 1]\exp(-m^2\pi^2 Dt/L^2)\sin(m\pi x/L)\}$$

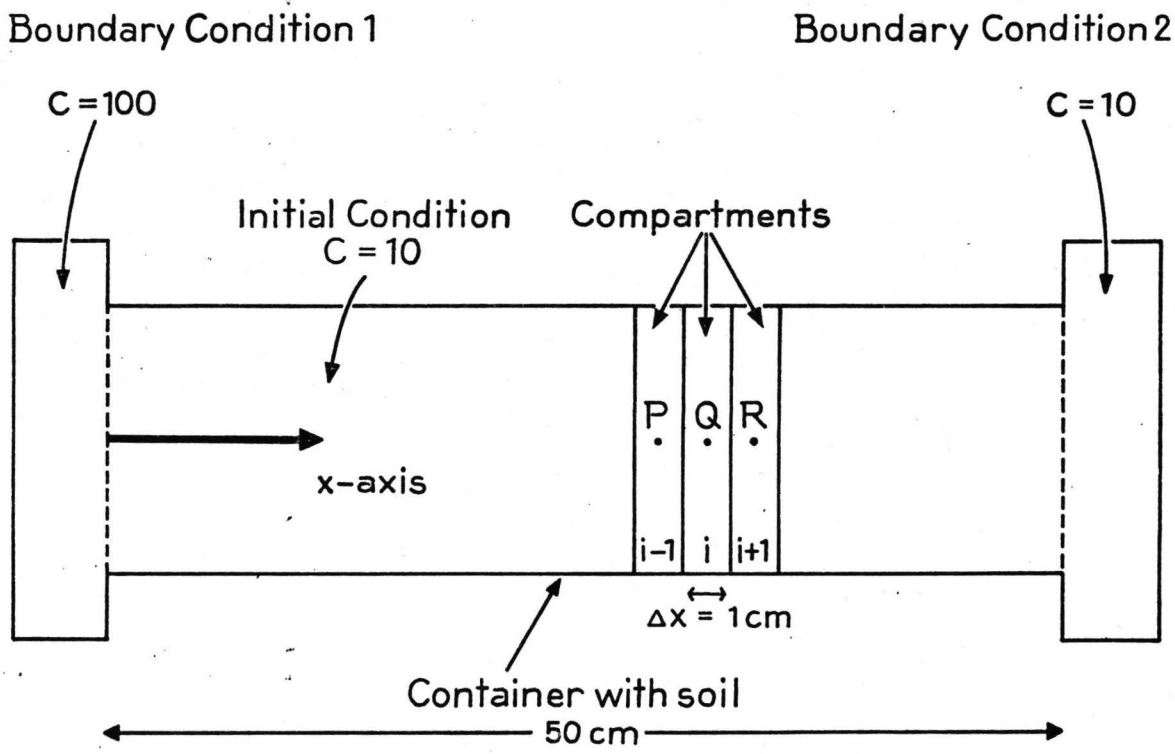
Boundary Condition 1
Boundary Condition 2
C = 100
C = 10
Initial Condition
C = 10
Compartments
P
Q
R
x-axis
i-1
i
i+1
Δx = 1cm
Container with soil
50 cm

Fig. 1

from which the N_2 concentration, $C(x,t)$, can be calculated for any location in the soil column and at any time.

We will now show how the problem can be solved by use of the simulation program S/360 CSMP, see IBM (1972). First, we consider the soil container as consisting of 50 equally thick sections, called "compartments", each being 1 cm thick, as shown in Fig. 1. A horizontal x-axis extends from the left wall of the container to the right. The thickness of each compartment is called Δx; hence $\Delta x = 1$ cm. At some time after the diffusion process has begun, we fix our attention on three consecutive compartments somewhere in the middle of the container. Let the centers of the three compartments be points P, Q and R. For example, of the 50 compartments under consideration, points P, Q and R could be located in the 28th, 29th and 30th compartments, respectively. In more general terms, points P, Q and R are located in compartments i-1, i and i+1, respectively. The N_2 concentration at points P, Q and R is representative of the N_2 concentration in compartments i-1, i and i+1, respectively. To determine if any diffusion takes place between these points, and hence between the compartments, we use Fick's first law. Fick's first law can be written as:

$$q = - D \, \partial C / \partial x \qquad (9)$$

in which D is the diffusion coefficient (cm^2/sec) and q is the rate of mass transfer per unit area ($g/cm^2/sec$) along the x-axis and $\partial C/\partial x$ is the concentration gradient along the x-axis ($g/cm^3/cm$). Now if we denote the rate of mass flow between points P and Q per unit area by $q_{P,Q}$, then we can write:

$$q_{P,Q} = -D(C_Q - C_P)/\Delta x \qquad (10)$$

In the same way we can write the mass flow rate between points Q and R per unit area, $q_{Q,R}$, as:

$$q_{Q,R} = - D(C_R - C_Q)/\Delta x \qquad (11)$$

If we work with the total cross-section A of the soil container, rather than with a unit area, then we can calculate the change in concentration of N_2 in the compartment around point Q as follows. We denote the change in mass of N_2 in the compartment around point Q per unit time by $(\Delta m)_Q$. Hence $(\Delta m)_Q$ is given by:

$$(\Delta m)_Q = (q_{P,Q} - q_{Q,R})(A)(1 \text{ sec}) = A(q_{P,Q} - q_{Q,R})g$$

The volume of the compartment around point Q is calculated as $(A)(\Delta x)cm^3$. Hence the concentration increment, $(\Delta C)_Q$, is found as:

$$(\Delta C)_Q = \frac{(\Delta m)_Q}{(A)(\Delta x)} = \frac{q_{P,Q} - q_{Q,R}}{\Delta x} \quad g/cm^3$$

In the above expression we can substitute equations (10) and (11) for $q_{P,Q}$ and $q_{Q,R}$ and we find:

$$(\Delta C)_Q = \frac{-D\left(\frac{C_Q - C_P}{\Delta x}\right) - -D\left(\frac{C_R - C_Q}{\Delta x}\right)}{\Delta x}$$

or after some arithmetic:

$$(\Delta C)_Q = D\,(C_P - 2C_Q + C_R)/(\Delta x)^2 \qquad (12)$$

In general we can write:

$$(\Delta C)_i = D\,(C_{i-1} - 2C_i + C_{i+1})/(\Delta x)^2 \qquad (13)$$

where in our model with 50 compartments i ranges from 2 to 49, inclusive. Only the 1st and the 50th compartments need special consideration since they are adjacent to the constant boundary concentrations (BC1 = 100, BC2 = 10).

So far, we have considered the concentration change in an arbitrary compartment during an arbitrary period of time. In a subsequent time increment we could determine a new Δq for any arbitrary compartment. It is necessary to keep track of the concentration changes in each of the 50 compartments of the model. This can be done easily with the simulation language CSMP, due to a built-in function, see IBM (1972, p. 9),

$$Y = \text{INTGRL (IC,X)} \qquad (14)$$

The above CSMP statement stands for the following mathematical operation:

$$y = \left[\int_{t=0}^{t=final} x(t)dt\right] + IC, \qquad (15)$$

where IC represents the initial conditions: $IC = y_{t=0}$. To illustrate the ease with which concentration changes in the individual model compartments can be handled using CSMP, let us consider the compartment around point Q once again. To follow the concentration changes taking place in this compartment during the diffusion process, we could use the following CSMP-like statement:

$$C_Q(t) = \text{INTGRL} \left[C_Q(t=0), \Delta q_Q \right] \qquad (16)$$

A similar statement could be written for each of the remaining compartments to describe the concentration changes taking place in each. However, with CSMP it is not necessary to write a statement of the form of equation (16) for each of the 50 compartments in the model. One general statement of the form:

$$C_i(t) = \text{INTGRL} \left[C_i(t=0), \Delta q_i, 50 \right] \qquad (17)$$

is sufficient.

Table 1 shows the actual CSMP program that simulates the N_2 diffusion through the soil in the container. Close resemblance between algebraic language and computer language on the one hand and conciseness of the program on the other are striking features of the CSMP simulation language. This program is a slight modification of the one given by IBM (1972, p. 42).

Figure 2 shows a comparison between the results of the simulation program for the diffusing N_2 through the soil column and the same results as calculated from equation (8). As can be seen, the simulation program approximates the exact mathematical solution quite well. The shown curves are calculated for: x = 0.5, x = 4.5, x = 14.5, x = 24.5, and x = 39.5 cm.

```
/       DIMENSION C(50),DELC(50),CINIT(50)
/       EQUIVALENCE (C1,C(1)),(DELC1,DELC(1)),(CINIT1,CINIT(1))
FIXED I
STORAGE    CZERO(50)
INITIAL
TABLE     CZERO(1-50)=50*100.0
PARAMETER BC1=100.0,BC2=100.0,D=2.5,DELTAX=1.0
NOSORT
      DO 1 I=1,50
    1 CINIT(I)=CZERO(I)
DYNAMIC
PROCEDURE DELC1=DIFFUS(BC1,BC2,D,C1,DELTAX)
      DELC(1)=D*(2.0*BC1-3.0*C(1)+C(2))/DELTAX**2
      DO 2 I=2,49
    2 DELC(I)=D*(C(I-1)-2.0*C(I)+C(I+1))/DELTAX**2
      DELC(50)=D*(C(49)-3.0*C(50)+2.0*BC2)/DELTAX**2
ENDPRO
      C1=INTGRL(CINIT1,DELC1,50)
NOSORT
      C5=C(5)
      C15=C(15)
      C25=C(25)
      C35=C(35)
      C45=C(45)
TIMER FINTIM=100.0,PRDEL=2.0
PRINT C5,C15,C25,C35,C45
END
STOP
```

table 1

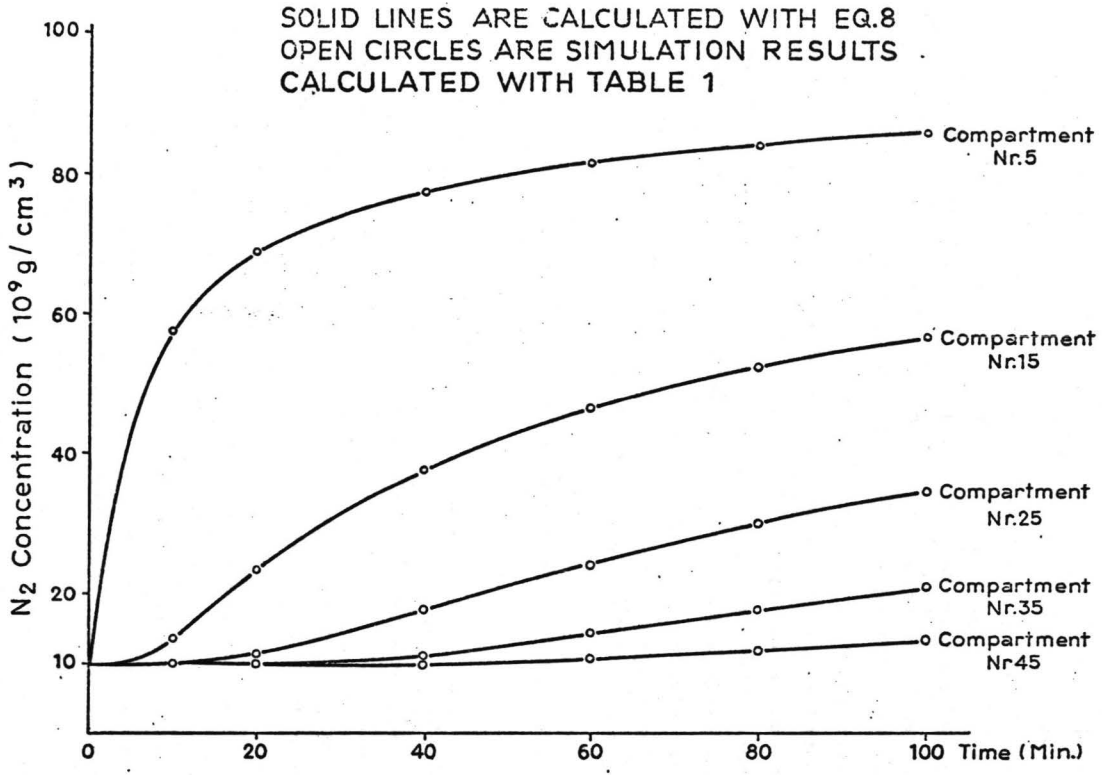
SOLID LINES ARE CALCULATED WITH EQ.8
OPEN CIRCLES ARE SIMULATION RESULTS
CALCULATED WITH TABLE 1
N_2 Concentration (10^9 g/cm^3)
100
80
60
40
20
10
0
20
40
60
80
100
Time (Min.)
Compartment Nr.5
Compartment Nr.15
Compartment Nr.25
Compartment Nr.35
Compartment Nr.45

Fig. 2

To simulate one-dimensional infiltration in a homogeneous soil, the CSMP program of Table 1 needs to be modified only slightly. One would now use Darcy's law instead of Fick's law. We will not take space here to discuss such a program. The complete program for simulating one-dimensional infiltration into homogeneous soil can be found in Van der Ploeg (1973). For Yolo light clay Van der Ploeg used a relation between volumetric moisture content θ and suction, and another relation between volumetric moisture content and capillary conductivity. For layered soils one needs the two above-mentioned relations for each soil layer. We also will not take space here to discuss the simulation program for layered soil. Programming details for such a program can be found in Van der Ploeg (1973). Other programming information can be found in IBM (1972), Wierenga and De Wit (1970), De Wit and Van Keulen (1972), and Van Keulen and Van Beek (1971).

We will now discuss briefly the soil with which we worked.

Soil Data

The sample sites with which we work are located closely together and the soil profile at the different locations shows a close resemblance. However differences exist; for example, the capillary conductivity varies from site to site and such differences cannot be ignored. We will not discuss the soil properties at every sample site, but we will concentrate on one sample site in the beech forest. This sample site of 1 ha is located in a flat area and the trees are all about 125 years old. The soil profile that we find here is developed in about 60 cm loess. Between 60 - 100 cm we can find a transition layer consisting of solifluction material and loess. Between 100 - 140 cm we find very dense solifluction material, and from 140 - 180 cm we have weathered sandstone, which gradually changes to unweathered sandstone.

A rather acid, brown earth with a slight tendency towards podzolization has been formed in the above-described materials. Due to the dense solifluction layer between 100 and 140 cm deep, which may act as a stagnation layer for moisture movement, the soil shows locally weak marmorization. Rather than considering morphological features of the profile and subdividing the profile into horizons accordingly, we distinguished five physically different layers, as far as moisture characteristic and capillary conductivity were concerned. Our layers are: Layer 1 (0-20 cm), Layer 2 (20-60 cm), Layer 3 (60-100 cm), Layer 4 (100-140 cm), and Layer 5 (140-180 cm).

Table 2 shows pairs of values of the moisture characteristic for each of our five layers.

Table 3 shows pairs of values of moisture content versus capillary conductivity. To simulate infiltration into a soil profile, the initial moisture content throughout the soil profile must be known. Further, the duration and intensity of occurring rainstorms must be known. We assume that for the periods we simulated there was no evapotranspiration. Precipitation data were collected by use of a selfrecording rain gauge. In our research area of 1 ha in size, a large number of tensiometers were installed. They were installed at depths of: 15 cm, 45 cm, 85 cm, 135 cm, and 175 cm. The tensiometers are read off at short, irregular intervals. The readings can be used as initial conditions for a simulation run, and they can also be used as checks against results of a simulation run. We can use our simulation method for periods when there is no evapotranspiration, especially for the spring and the fall, when the precipitation comes as rain. We have collected precipitation data and tensiometer data since 1968, and we use our simulation method for all periods without canopy cover, hence without transpiration. For the periods without transpiration we find a good agreement between field observations and simulation data. We will now discuss some results.

table 2

Layer 1		Layer 2		Layer 3		Layer 4		Layer 5	
θ cm^3/cm^3	ψ cm	θ	ψ	θ	ψ	θ	ψ	θ	ψ
0.180	3500.00								
0.200	2400.00	0.200	2950.00	0.200	3050.00	0.200	3800.00		
0.220	1500.00	0.220	1730.00	0.220	1670.00	0.220	2300.00	0.222	1000.00
0.240	800.00	0.240	700.00	0.240	800.00	0.240	1230.00	0.237	400.00
0.260	350.00	0.260	245.00	0.260	275.00	0.260	270.00	0.265	100.00
0.280	210.00	0.280	133.00	0.280	120.00	0.280	117.00	0.270	60.00
0.300	145.00	0.300	80.00	0.300	64.00	0.300	45.00	0.275	40.00
0.320	100.00	0.320	40.50	0.320	33.50	0.320	1.00	0.288	20.00
0.340	70.00	0.340	22.50	0.340	17.50			0.302	10.00
0.360	40.70	0.360	14.00	0.360	9.00			0.309	7.00
0.380	32.50	0.380	9.00	0.380	4.70			0.312	5.00
0.400	22.50	0.400	5.40	0.400	2.60			0.313	1.00
0.420	15.50	0.420	2.65	0.420	1.44				
0.440	11.00	0.440	1.00						
0.460	7.60								
0.480	5.20								
0.500	3.50								
0.520	2.20								
0.540	1.30								

table 3

Layer 1		Layer 2		Layer 3		Layer 4		Layer 5	
ψ cm	K cm/day	ψ	K	ψ	K	ψ	K	ψ	K
				0.0	7.0000	0.0	1.5000	0.0	10.0000
		5.0	12.0000	5.0	3.8000	5.0	1.0000	5.0	5.0000
		10.0	7.0000	10.0	1.9000	10.0	0.4500	10.0	2.2000
15.0	10.0000	15.0	3.8000	15.0	0.9500	15.0	0.2100	15.0	0.9500
20.0	5.8000	20.0	2.2000	20.0	0.4800	20.0	0.1000	20.0	0.4000
25.0	3.0000	25.0	1.2000	25.0	0.2400	25.0	0.0600	25.0	0.1900
30.0	1.4500	30.0	0.6800	30.0	0.1200	30.0	0.0400	30.0	0.0800
35.0	0.7000	35.0	0.3800	35.0	0.0700	35.0	0.0290	35.0	0.0500
40.0	0.3600	40.0	0.2200	40.0	0.0350	40.0	0.0210	40.0	0.0300
45.0	0.1800	45.0	0.1200	45.0	0.0230	45.0	0.0160	45.0	0.0200
50.0	0.1000	50.0	0.0700	50.0	0.0180	50.0	0.0135	50.0	0.0150
60.0	0.0400	60.0	0.0300	60.0	0.0150	60.0	0.0100	60.0	0.0105
70.0	0.0250	70.0	0.0190	70.0	0.0090	70.0	0.0080	70.0	0.0085
80.0	0.0180	80.0	0.0140	80.0	0.0080	80.0	0.0070	80.0	0.0075
100.0	0.0120	100.0	0.0100	100.0	0.0065	100.0	0.0058	100.0	0.0061
150.0	0.0085	150.0	0.0070	150.0	0.0048	150.0	0.0043	150.0	0.0056
200.0	0.0068	200.0	0.0056	200.0	0.0040	200.0	0.0036	200.0	0.0038
300.0	0.0050	300.0	0.0043	300.0	0.0032				
500.0	0.0037	500.0	0.0033	500.0	0.0025				
800.0	0.0029	800.0	0.0021						
1000.0	0.0026	1000.0	0.0019						

Results

Figure 3 shows a comparison between the results of the simulation program and actual field measurements. Soil suction values versus time are plotted, with the natural rainfall given as an insert in the upper part of Fig. 3. We have simulated the suction in the soil for the month of May 1969. One can see that there is a good agreement (at least for field work) between theory and practice. The total amount of rain that fell during May 1969 was 100.7 mm. The simulation model calculated that during May 57.5 mm of the soil moisture seeped down into underlying sandstone, thus contributing to ground water recharge. The difference between precipitation and seepage is the amount of moisture that was additionally atored in the 180 cm soil profile.

In our model of the soil that we used in the simulation program, we had the five physically different layers subdivided into 10 cm thick compartments. We considered 180 cm of soil profile and thus we had 18 compartments. To simulate the soil suction for a whole month and for 18 different depths, as in Fig. 3, a little over two minutes of computer time is required. The results shown in Fig. 3 are typical for other periods without evapotranspiration that we have simulated. Fig. 3 shows that for our layered soil the nonlinear Fokker-Planck equation (equation 2), which is approximated by our simulation method, can indeed be used to describe infiltration.

We thus have developed a computer model that simulates infiltration quite well for periods without evapotranspiration. For periods where there is evapotranspiration, the results of our present model do, of course, not compare with field observations. However, with the field data for periods with evapotranspiration, combined with a correct simulation program for periods without evapotranspiration, evapotranspiration rates can now be calculated. We will report on the evapotranspiration results in a subsequent paper.

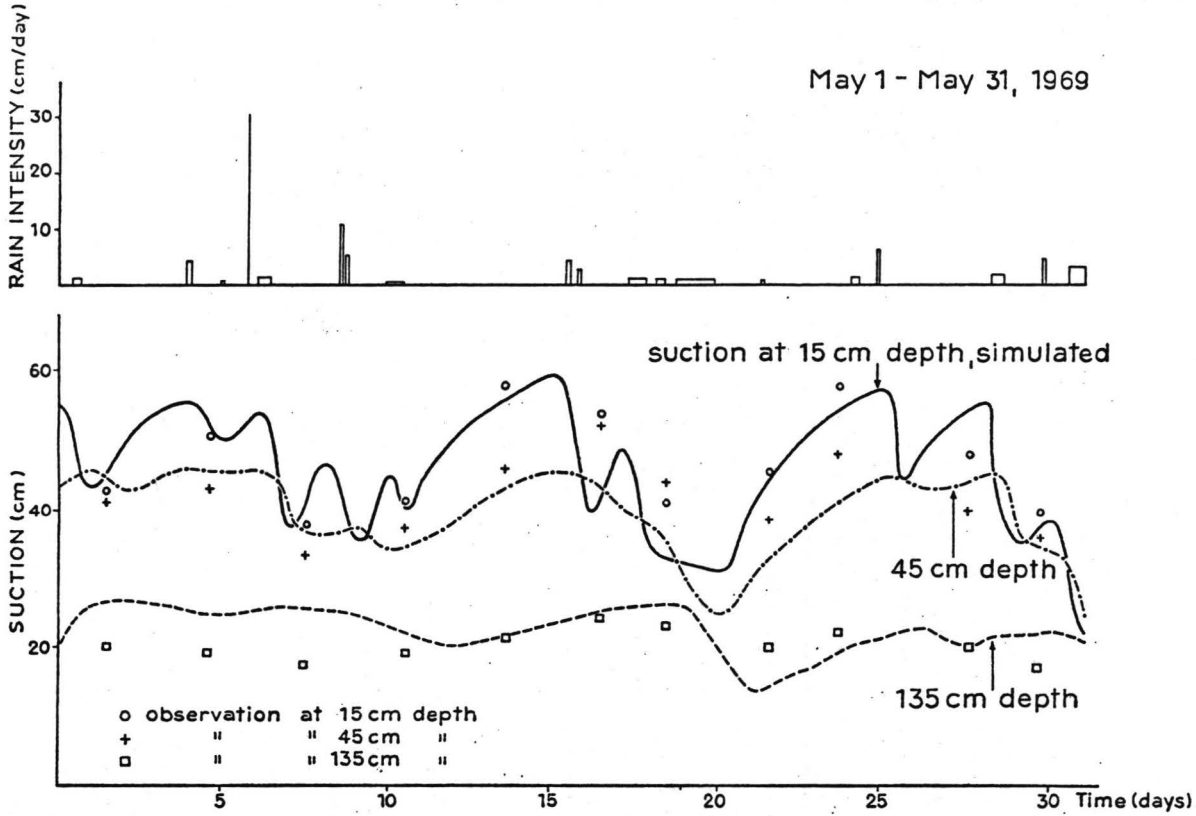
May 1 - May 31, 1969
RAIN INTENSITY (cm/day)
30
20
10
SUCTION (cm)
60
40
20
suction at 15 cm depth, simulated
45 cm depth
135 cm depth
o observation at 15 cm depth
+ " " 45 cm "
□ " " 135 cm "
5
10
15
20
25
30
Time (days)

Fig. 3

Summary

The one-dimensional diffusion equation describing the diffusion of gaseous N_2 through a horizontal soil column has been discussed in some detail as an illustrative example of the use of a simulation program. For a constant coefficient of diffusion, the analytical solution has been compared with the simulation program results. The two results show good agreement. The simulating computer program is shown to be simple and concise. It has been indicated how the simulation program can be extended to approximate the solution of the one-dimensional moisture flow equation in both homogeneous and layered soils. Although the problems could have been handled equally well with finite differences methods, it is suggested that the simulation program is simpler.

The simulation program is used in a field study about moisture movement in layered soil. For natural conditions of precipitation and no evapotranspiration, simulation data are compared with field data which are representative of a large forest area. A good agreement is found. It is thus shown that: 1) a simulation program easily can be used to describe soil moisture movement, and 2) the soil moisture equation (nonlinear Fokker-Planck equation), which is approximated by the simulation program, successfully can be used to describe infiltration processes as we encounter them in the field.

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A biomass model from the Danish beech forest project

Hestehave - site

by Henning Petersen

This simplified model was developed as an exercise during the IBP woodland workshop by means of the simulation language CSMP (Continuous System Modelling Programme).

The initial condition as shown on fig. 1 is based on the data given in the data sheets for the Göttingen meeting with some supplementary figures partly calculated from data available from the site and partly derived as tentative estimates with some support in the literature (marked with ^{o}). The data on standing crop refers mainly to measurements from September-October 1970. Figures on the diagram marked b are obtained by balancing inputs with outputs and annual increment of a compartment.
Dimensions are $kg.ha^{-1}$ and $kg.ha^{-1}yr^{-1}$

Mathematical formulation of the model

The model is formulated as a linear model with constant transfer coefficients.
The flux to compartment 01 (i.e. the gross primary production of tree leaves) is made acceptor controlled.
i.e.: J 0001 = A 0001 x C 01
where A 0001 = F 0001/IC01 (= 28042/2133)
(J: transfer rate; A: transfer coefficient; C: compartment; F: initial annual flux; IC: initial condition of compartment)

The flux to compartment 06 (i.e. gross primary production of ground flora) is made constant i.e.: J 0006 = F 0006 (= 1920)

The fluxes to other compartments are made donor controlled
e.g. J 0102 = A 0102 x C01
where A 0102 = F 0102/IC01 (= 199/2133)

The differential equations are expressed in the following form:
e.g.: DC01 = J0001 - J0100 - J0102 - J0103 - J0104 - J0105 - J0107 - J0108

The behaviour of the model over a period of time (10 years) is obtained by writing: (e.g.) C 01 = INTGRL (IC01, DC01) followed by writing the simultation time (FINTIM), Integration steps (DELT) and output steps (OUTDEL) (here 10, 0.01 and 0.25 respectively)

Following this order the computer prints out the time behaviour of each compartment in the form of a curve between the maximum and minimum values obtained.

Results: The simulation of the behaviour of the compartments over a 10 year period is given in fig. 2-10, solid lines.

The slight increase of compartment 01 and 02 is unexpected because inputs and outputs have been balanced in these cases. It is caused by making the flux to compartment 01 acceptor dependent.
The increases in compartments 03,04 and 05 were expected because of the annual increment in these compartments.

The remaining compartments stay practically constant as expected.

Sensitivity analysis:

We formulated the problem: How will a change in the initial value given for the flux from tree leaves to consumers influence the behaviour over time of each of the compartments?

Table 1

		change in compartment size after 10 years (%)								
Flux	flux change	C01	C02	C03	C04	C05	C06	C07	C08	C09
0107	+ 5 %	-3.7	-3.3	-1.3	-0.7	-1.4	0	+1.2	-0.4	-0.4
0107	+10 %	-7.2	-6.6	-2.5	-1.5	-2.8	0	+2.1	-0.7	-0.7

It is seen from table 1 that the change has the greatest influence in compartment 01 and 02. This change is greater than the change of the consumer compartment (C07). The changes of the branch stem and root compartments are rather high.

Simulation of a phytophage outbreak in the first of ten years

As an example of simulating a change in the ecosystem we tried to introduce a tenfold increase in the primary consumption rate i.e. the transfer rate from compartment 01 to 07 in the first of ten years to see how the model behave during this ten year period.

To introduce this in the programme we used a switching function the general from of which is:

$$X = FCNSW\ (A_1,\ A_2,\ A_3,\ A_4)$$

This means:

if $A_1 < 0$ X becomes A_2,
if $A_1 = 0$ X becomes A_3, and
if $A_1 > 0$ X becomes A_4.

In our case we defined T = Time - 1
and made the function switch function: X = FCNSW (T, 10, 10, 1)

If Time = 1 which is the first year of simulation T (A_1) becomes 0, and therefore X becomes 10 (A_3)
If Time > 1 which means second to tenth year of simulation T becomes greater than 0, and X becomes 1 (A_4)
The X is now attached as a factor to the equation for the fluxrate J 0107.

The result of the simulation can be seen in fig. 2-10, dotted curves. In fig. 8 we see the effect on the phytophage compartment:

a steep about 10 fold increase in the first year followed by a sudden decrease to about half of the "normal" compartment size. The compartment size keeps its magnitude during the following years of simulation indicating a very slow recovery of the compartment.

The same very slow recovery is true for the simulation of compartment 01, the tree leaves (fig. 2). This is naturally quite unrealistic as a simulation of the real world; since all the other compartments depend on compartment 01 the simulation of their behaviour is no more reasistic; the main reason for this behaviour of the model comes from making the input to compartment 01 simply acceptor controlled. When the size of the 01 compartment is reduced the flux rate to the compartment is also reduced, and there are no mechanisms in the model to ensure a realisticly rapid recovery.

The cooperation of various participants of the workshop is gratefully acknowledged.

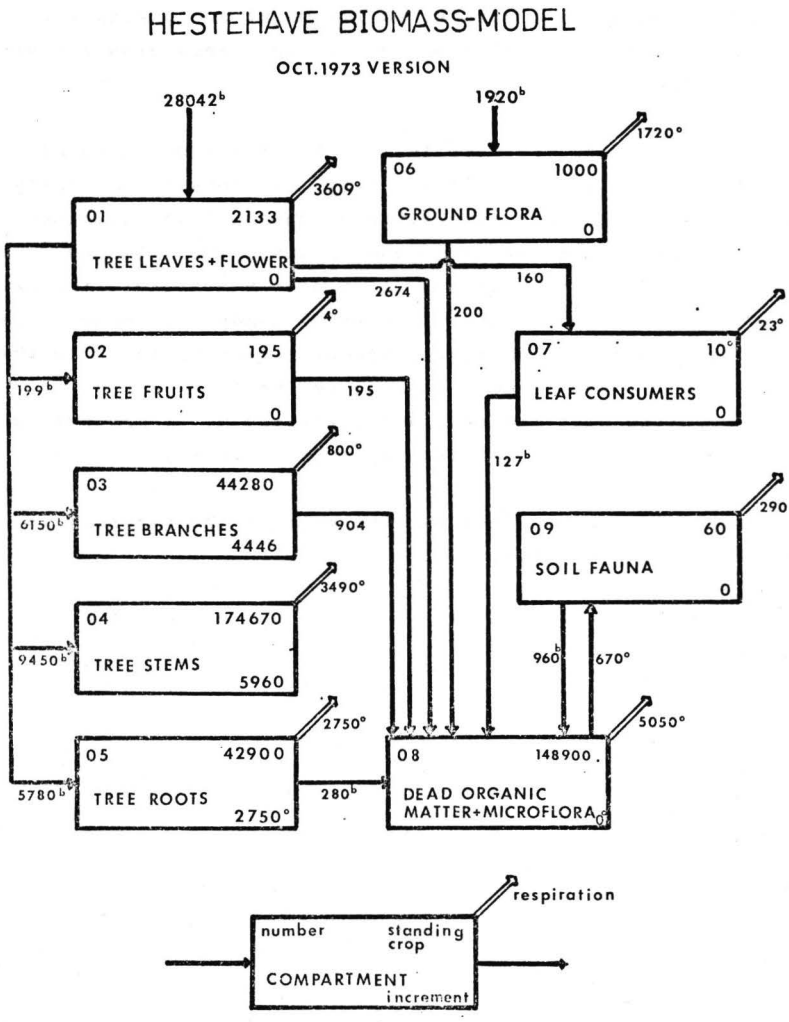


Fig.1. Danish beech forest project. Hestehave site. Biomass model. Diagram showing compartments and fluxes in initial conditions.

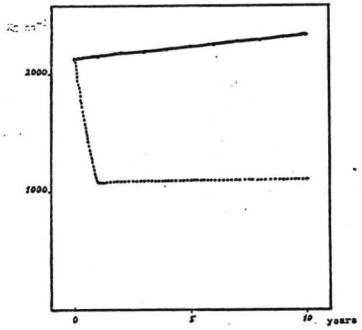


Fig.2.Compartment 01:Tree leaves +flowers

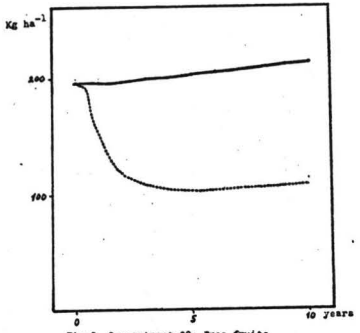


Fig.3. Compartment 02: Tree fruits

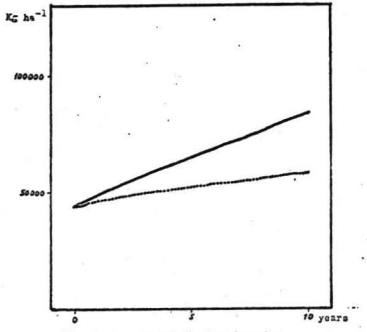


Fig. 4: Compartment 03: Tree branches

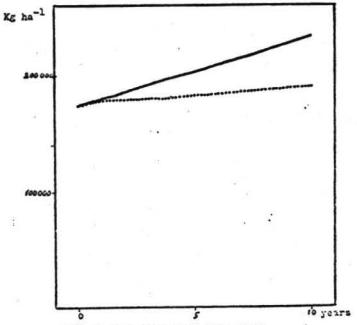


Fig. 5: Compartment 04: Tree stems

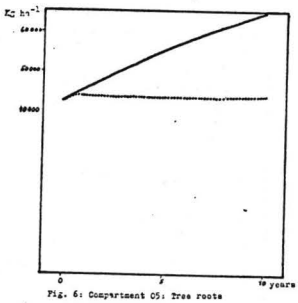


Fig. 6: Compartment 05: Tree roots

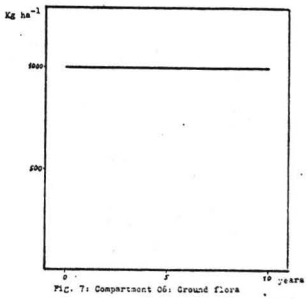


Fig. 7: Compartment 06: Ground flora

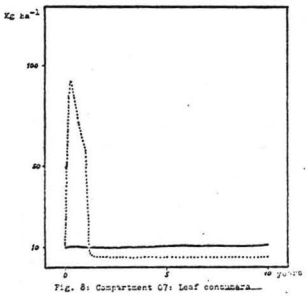


Fig. 8: Compartment 07: Leaf continuare

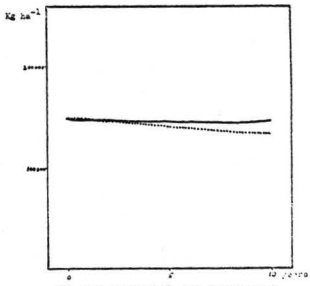


Fig. 9: Compartment 08: Dead organic matter microflora

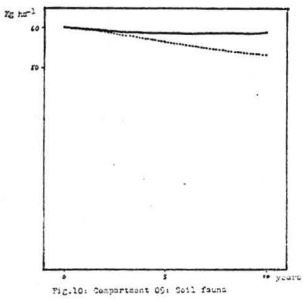


Fig.10: Compartment 09: Soil fauna

SOME RELATIONSHIPS CONCERNING BIOELEMENT CYCLING

P. K. Khanna

The available data concerning bioelement cycling for various sites were divided into the following two groups:

1. Temperate Deciduous
2. Temperate Non-Deciduous

The sites from tropical region could not be included in the comparison because only one site (Eucalyptus-Attiwill) was available with sufficient data for this purpose. Table 1 compiles the state of data on bioelement cycling.

TABLE 1

			Number of Sites	
			Temperate deciduous	Temperate non-deciduous
Data sheets received			17	29+
State variables on bioelement contents			12	27
Increments for overstorey			11	25
Fluxes	(a)	Litterfall	11	25
	(b)	Precipitation	11	22
	(c)	Throughfall	11	20
	(d)	Percolation and leaching through soil	3	18

There are only a few sites which make feasible an INPUT-OUTPUT analysis of the system, because in most of the cases the data on the leaching from soil layers (output term) are not available. (compare with fig. 3 of

+17 sites out of each of these figures are Russian sites.

TABLE 2

Total Above Ground Uptake (kg/ha)

Site	N	P	K	Ca	Mg	Na
Temporate Deciduous						
Solling (B_1)	62.85	6.00	41.36	37.63	4.52	6.46
Långaröd	49.40	4.95	33.40	46.90	7.03	3.42
Kongaund	152.00	8.56	42.20	63.10	10.20	13.39
Öved	68.40	4.50	48.80	106.60	38.90	12.30
Linnebjer	111.20	6.68	52.20	72.65	27.43	12.11
Oak Ridge	ND	ND	27.20	135.07	ND	ND
Meathop	81.17	9.24	56.57	123.14	20.03	ND
Hestehaven	ND	7.28	35.59	76.48	13.17	20.30
$\bar{x}$	87.50	6.74	42.17	82.70	17.33	11.33
s	37.91	1.76	9.98	35.428	12.33	5.87
s%	43.32	26.13	23.66	42.84	71.19	51.85
Temperate Non-Deciduous						
Solling (F_1)	62.98	5.60	42.94	44.83	5.33	10.60
Kongaund	88.00	6.83	44.40	45.70	10.20	23.33
Duke	65.49	14.19	30.36	35.27	9.26	
Thompson	26.40	3.00	23.40	25.10		
Russian 1	17.36	1.81	8.14	21.47		
2	29.93	3.33	14.74	34.66		
3	38.95	4.27	19.57	42.69		
4	53.27	5.76	24.70	44.65		
5	60.28	5.99	25.19	46.73		
6	29.47	3.09	14.77	27.32		
7	44.65	4.51	26.17	41.49		
8	25.92	2.77	12.95	27.66		
9	35.53	3.93	17.69	38.63		
10	37.31	4.08	18.00	40.89		
11	38.94	4.24	18.76	42.32		
12	39.07	4.23	18.40	42.55		
14	32.91	3.62	17.06	35.98		
15	31.52	3.36	15.50	32.48		
16	27.83	3.05	14.08	27.60		
17	25.50	2.88	12.77	24.60		
$\bar{x}$	40.57	4.53	20.98	36.13	8.26	
s	17.33	2.59	9.41	8.08	2.58	
s%	42.71	57.26	44.87	22.63	31.26	
t-test for means significant at	5%	5%	0.1%	1%		

of Schütt, T. on 'About Intersite Comparison'). Moreover, only a few bioelements have so far been studied and data for some of the important ones like S have been available only for one site.

The following parameters relevant to bioelement cycling were calculated. Certain observations are also included. All of the values are for one year.

1. Total above ground bioelement uptake (kg/ha) =AU= Increment Overstorey (kg/ha) + Litterfall (kg/ha) + Throughfall (kg/ha)- Atmospheric Input (kg/ha) (Table 2)

The coefficient of variation expressed as percentage of mean lies around 50 or less for above ground uptake of bioelements. The mean values for sites with deciduous vegetation are greater for all bioelements than those with non-deciduous vegetation. The t-test for means between two site groups is significant for N and P at 5% level, for Ca at 1% and K at 0.01% level.

2. Bole Production per unit of bioelement uptake =(tons/kg)= Bole Production/Above Ground Uptake
   (tons/ha) (kg/ha)
   (Table 3)

For the production of one ton of bole, on the average, 60-90g N, 500-1100g P, 100-150 K, 70 -100g Ca, and 600-800g Mg are mobilized by overstorey every year. The t-test between the means of deciduous and non-deciduous vegetation for any bioelement is not significant at 5% level. On the whole, the Russian sites mobilize lower amounts of nutrients than the other sites for the production of the same amount

TABLE 3

Bole Production/Total Bioelement Uptake

Site	N	P	K	Ca	Mg	Na
Temperate Deciduous						
Solling (B_1)	0.103	1.082	0.157	0.172	1.436	1.005
Långaröd	0.128	1.273	0.189	0.134	0.896	1.842
Kongaund	0.066	1.180	0.239	0.160	0.990	0.754
Öved	0.146	2.222	0.205	0.090	0.257	0.813
Linnebjer	0.056	0.928	0.119	0.085	0.226	0.512
Oak Ridge	-	-	0.083	0.017	-	-
Meathop	0.025	0.222	0.036	0.017	0.102	-
Hestehaven	-	0.710	0.145	0.068	0.393	0.255
$\bar{x}$	0.087	1.088	0.147	0.0929	0.614	0.863
s	0.046	0.612	0.068	0.0493	0.498	0.545
s%	52.73	56.25	45.33	63.902	80.99	63.14
Temperate Non-Deciduous						
Solling (F_1)	0.085	0.958	0.125	0.120	1.006	0.506
Kongaund	0.113	1.449	0.223	0.217	0.971	0.424
Duke	0.086	0.395	0.184	0.159	0.605	
Thompson	0.255	2.250	0.288	0.269		
Russian 1	0.054	0.519	0.115	0.044		
2	0.050	0.453	0.102	0.044		
3	0.053	0.480	0.105	0.048		
4	0.044	0.406	0.095	0.052		
5	0.041	0.417	0.099	0.053		
6	0.041	0.388	0.081	0.044		
7	0.031	0.304	0.052	0.033		
8	0.046	0.426	0.091	0.043		
9	0.052	0.471	0.105	0.048		
10	0.055	0.504	0.114	0.050		
11	0.055	0.507	0.115	0.051		
12	0.052	0.482	0.111	0.048		
14	0.040	0.359	0.076	0.036		
15	0.031	0.289	0.063	0.030		
16	0.015	0.134	0.029	0.015		
17	0.002	0.017	0.004	0.002		
$\bar{x}$	0.060	0.560	0.109	0.070	0.861	
s	0.052	0.493	0.063	0.068	0.222	
s%	86.37	87.98	58.25	97.34	25.81	
Significance of t-test for means	N.S.	N.S.	N.S	N.S.		

TABLE 4

Site	N	P	K	Ca	Mg	Na
Temperate Deciduous						
Solling (B_1)	0.209	0.354	0.160	0.205	0.384	0.016
Langaröd	0.364	0.465	0.266	0.341	0.356	0.105
Kongaund	0.546	0.409	0.393	0.393	0.333	0.081
Öved	0.409	0.533	0.332	0.296	0.105	0.046
Linnebjer	0.261	0.269	0.170	0.279	0.401	0.021
Oak Ridge	-	-	0.114	0.167	-	-
Meathop	0.081	0.047	0.089	0.109	0.047	-
Hestehaven	-	0.701	0.455	0.523	0.410	0.083
$\bar{x}$	0.3117	0.3969	0.2474	0.2891	0.2909	0.0587
s	0.1634	0.2067	0.1354	0.1324	0.1500	0.0364
s%	52.42	52.09	54.73	45.80	51.58	62.10
Temperate Non-deciduous						
Solling (F_1)	0.193	0.246	0.154	0.197	0.235	0.009
Kongaund	0.159	0.234	0.191	0.263	0.186	0.044
Duke	0.128	0.451	0.211	0.210	0.211	
Thompson	0.420	0.800	0.359	0.375		
Russian 1	0.181	0.171	0.129	0.156		
2	0.177	0.159	0.131	0.149		
3	0.194	0.171	0.138	0.148		
4	0.163	0.139	0.120	0.138		
5	0.171	0.150	0.126	0.135		
6	0.154	0.129	0.098	0.146		
7	0.123	0.111	0.074	0.097		
8	0.285	0.271	0.220	0.231		
9	0.217	0.191	0.158	0.170		
10	0.192	0.169	0.139	0.147		
11	0.164	0.139	0.114	0.125		
12	0.131	0.111	0.089	0.098		
14	0.081	0.064	0.046	0.057		
15	0.054	0.042	0.029	0.041		
16	0.011	0.003	-0.001	0.007		
17	-0.028	-0.031	-0.030	-0.028		
$\bar{x}$	0.1585	0.1860	0.1247	0.1431		
s	0.0943	0.1774	0.0856	0.0902		
s%	59.48	95.40	68.32	63.00		
t-test for means significant at	5%	5%	5%	5%		

of bole wood. a part of these nutrients are removed as increments of overstorey from the total amount of bioelement uptake.

3. Fraction removed from the total uptake content by overstorey increment.

(Increment Overstorey/AU) (Table 4)

From 25 to 40% of the total uptake of bioelements by deciduous trees are retained by the increment overstorey and are removed from the active turnover, with the exception of Na which makes about 6% only. In non-deciduous trees less than 20% (13 to 19%) of N, P, K, and Ca are removed. The t-test between the means for deciduous and non-deciduous plants is significant at 5% level for each bioelement. A part of the bioelements taken up by trees are washed down as canopy drip or throughfall. It is thus of interest to know the bioelements washed out (or intercepted) with precipitation.

4. Precipitation Input/Throughfall (Dimensionless coefficient) (Table 5)

A coeffecient greater than 1 would mean that the bioelements have been released by the vegetation cover. The values of this coeffecient vary with the type of the bioelement and can be arranged as follows:

N>P>Ca>Na>Mg>K for deciduous vegetation and

P>Ca≥N>Mg>K for non-deciduous vegetation

The amount of K released by canopy is about 5 times that added as rainfall input into the system. Whereas 84% of the total N input in the deciduous sites comes from the rain and only 16% is added as Leaf- and Stem-Washout,

TABLE 5 a

Precipitation Input/Throughfall

Site	N	P	K	Ca	Mg	Na
Temperate Deciduous						
Solling (B_1)	0.986	1.203	0.165	0.480	0.659	0.540
Langaröd	1.000	0.857	0.176	0.738	0.360	0.681
Kongaund	0.994	0.541	0.145	0.347	0.267	0.357
Öved	1.000	0.800	0.090	0.353	0.326	0.451
Linnebjer	0.423	0.025	0.035	0.327	0.344	0.412
Oak Ridge	-	-	-	0.727	-	-
Meathop	0.623	0.274	0.094	0.246	0.378	0.428
Hestehaven	-	0.882	0.517	0.964	0.642	0.541
$\bar{x}$	0.839	0.655	0.174	0.523	0.425	0.487
s	0.251	0.402	0.159	0.256	0.158	0.108
s%	29.88	61.37	91.04	48.95	37.16	22.26
Temperate Non-deciduous						
Solling	0.855	0.718	0.185	0.399	0.535	0.405
Kongaund	0.339	0.132	0.070	0.201	0.149	0.214
Duke	0.586	0.457	0.140	0.623	0.376	
Thompson	0.393		0.061	0.378		
Russian 1	0.550		0.357	0.489		
2	0.367		0.270	0.397		
3	0.275		0.217	0.333		
4	0.239		0.192	0.267		
5	0.212		0.179	0.284		
6	0.333		0.244	0.383		
7	0.224		0.185	0.291		
8	0.289		0.278	0.338		
9	0.282		0.263	0.333		
10	0.289		0.256	0.324		
11	0.275		0.244	0.338		
12	0.275		0.256	0.343		
14	0.306		0.263	0.383		
15	0.314		0.278	0.411		
16	0.344		0.294	0.821		
17	0.407		0.357	0.523		
$\bar{x}$	0.358	0.436	0.227	0.393	0.353	
s	0.151	0.294	0.081	0.137	0.194	
s%	42.29	67.39	35.57	34.96	54.90	
t-test significant at 1%		NS	NS	NS		

TABLE 5_b

Precipitation Input/Percolation Output

Site	N	K	Ca	Mg	Na	S
Temperate Deciduous						
Solling (B_1)			1.50			
Langaröd						
Kongaund						
Öved						
Linnebjer						
Oak Ridge			0.38			
Meathop			0.12			
Hestehaven						
$\bar{x}$			0.67			
s			0.73			
s%			109.74			
Temperate Non-deciduous						
Solling						
Kongaund						
Duke						
Thompson	0.545	0.800	0.622			
Russian 1	1.833	0.5604	1.150	2.250	3.00	6.25
2	0.579	0.333	1.095	2.250	3.00	5.00
3						
4	1.100	0.286	0.434	1.50	3.00	5.00
5	0.917	0.333	0.575	1.125	3.00	4.17
6						
7						
8	1.375	0.500	1.095	2.250	3.00	5.00
9	1.264	0.459	0.996	2.09	2.73	4.46
10	1.264	0.448	0.996	2.00	2.50	4.35
11	1.183	0.417	1.027	1.957	2.61	3.82
12	1.642	0.467	0.991	2.046	2.86	4.46
13						
14	1.447	0.513	1.230	2.647	3.75	5.21
15	1.549	0.543	1.133	2.903	3.75	6.17
16	1.078	0.476	1.186	1.765	5.00	6.76
17	2.037	0.610	1.264	2.500	6.00	6.10
$\bar{x}$	1.275	0.483	0.986	2.044	3.36	5.10
s	0.411	0.125	0.247	0.480	0.99	0.89
s%	32.25	25.82	25.10	22.39	29.54	17.48
t-test significant at	1%	NS	NS	NS		

the values for non-deciduous sites are 40 and 60% respectively. The difference in the mean values for two site groups is significant only for N. The coeffecient of variation is 35 to 68% for non-deciduous and 30 to 90% for deciduous sites; it is the highest for K.

5. Precipitation Input/Percolation Output (Dimensionless coefficient) (Table 5b)

Since the percolation output data are very scanty, mainly the Russian sites can be compared for their Input/Output analysis. The coeffecient value of <1 indicates that the output of bioelement by percolation as for K is greater than its input through precipitation more than that leached by percolation. The value for Ca lies around 1 showing that input and output values balance each other.

6. Fraction of Stemflow in the Throughfall

Stemflow/Throughfall (Dimensionless fraction)

TABLE 6

Stemflow/Throughfall

Site	N	P	K	Ca	Mg	Na
Temperate Deciduous						
Solling (B_1)	0.079	0.054	0.293	0.163	0.164	0.209
Oak Ridge			0.051	0.030		
Meathop	0.043	0.041	0.137	0.186	0.168	0.223
Hestehaven		0.130	0.204	0.124	0.149	0.162
$\bar{x}$		0.075	0.171	0.126	0.160	0.198
s			0.103	0.069	0.010	0.032
s%			59.86	54.69	6.24	66.14

Stem flow contributes about 10% for N and P and about 10-20% for K, Ca, Mg, and Na of the total throughfall.

A MODEL OF ENERGY FLOW THROUGH CONSUMER COMPARTMENTS IN A BEECH FOREST

by Gerhard Weidemann

1. Introduction

As part of the workshop activities an attempt was made to fit the data now available from the German Solling-Project into a model of energy flow through consumers. It is hoped by this way to get some insight into the role of animals in forest ecosystems as well as experience in systems analysis and modelling*.

The following stepwise process was intended: a) building of an adequate compartment model; b) running and testing of a linear model; c) running and testing of a nonlinear model; d) proceeding to a seasonal model. The simulation language used was IBM System/360 CSMP.

All data are from the beech stand B1a. A general site description is given in the tabular part of this vol. for B1, which is the adjacent plot for all non-zoological investigations.

2. The compartment model

2.1. Definition of compartments

Since the main interest in this model is on consumers, the nonconsumer compartments were condensed while the consumers were subdivided into five compartments according to the main food resources of the respective taxonomic groups. Thus a ten-compartment-model was constructed (Fig. 1).

C 01 comprises all photosynthetic active green matter, i.e. leaves of trees and herbs, grasses and mosses.

C 02 fine roots, $\emptyset < 2$ mm

* The help of Mr. Prenzel, Dr. Shugart, Professor Ulrich and Dr. Van der Ploeg is gratefully acknowledged.

C 03 beech nuts

C 04 wood, bole, bark, twigs, branches, roots, $\emptyset > 2$ mm; including dead

C 05 phyllophages: all animals feeding on leaves (Solling: caterpillars, weevils) + juice suckers (S: aphids, cicadas)

C 06 rhizophages, feeding on living roots (S: weevil larvae)

C 07 saprophages + microphytophages feeding on dead organic matter and/or on microfungi, bacteria and soil algae (S: Deptera larvae, oribatid mites, collembolans, enchytraeids)

C 08 zoophages: predators (S: Centipedes, gamasid mites, spiders, harvestspiders, pseudoscorpionides, carabid and staphylinid beetles, zoophagous deptera)

C 09 pantophages, animals being phytophagous as well as zoophagous or saprophagous (S: elaterid beetle Athous subfuscus)

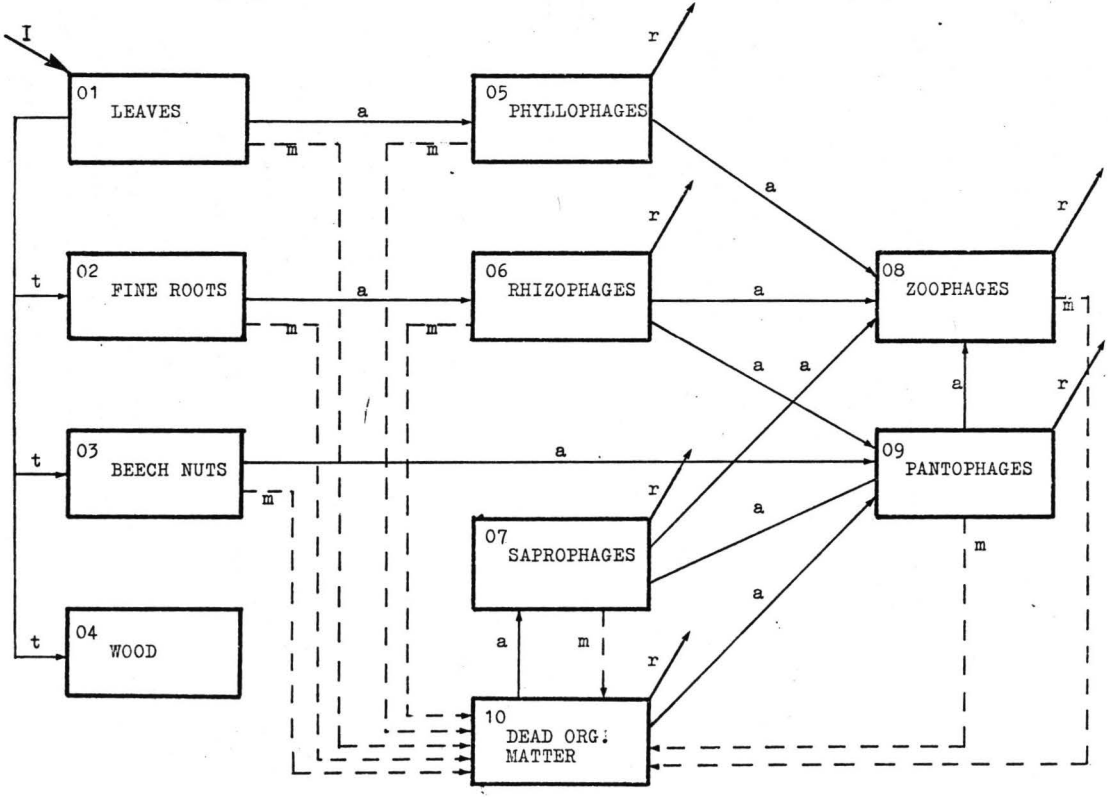
C 10 dead organic matter: all kinds of non-woody litter: dead leaves, bud scales as well as frass, faeces, exuvias, cadavers

2.2. Compartment size

In compartments with (possible) increment initial content is given as standing crop biomass (B; 10^3kcal * ha^{-1}). Otherwise production, resp. net primary production, (P; 10^3kcal * ha^{-1} * yr^{-1}) is used since it is this amount of biomass which may be transfered to the next trophic level.

Data for producer and dead organic matter compartments were taken from RUNGE (1973). They are all based on detailed measurements. Contents of consumer compartments are also based on measurements but make allowance for underestimates or groups not yet covered in different ways as given below.

Figure 1: Compartment model of energy flow through a beech forest, Solling, B1a
(I = Input, t = translocation, a = assimilation, r = respiration, m = mortality)



C 05 primary data: GRIMM (1973, SCHAUERMANN (1973), WINTER (1972); summary: FUNKE (1973): consumption 600., A/C=0.25, P/R=1. (weevils and caterpillars); assumption: consumption by aphids = 200., A/C=0.4, P/R=1.

C 06 primary data: SCHAUERMANN (1973); P/A=0.65, P/R=1. + raising A-value by 50 % to correct for underestimate of young larvae.

C 07 primary data: ALTMÜLLER (1973, respiration of diptera larvae), FAASCH (unpubl., standing crop of Collemb. and Oribat.), FUNKE (unpubl., Diptera, production of imagines). - Data for this compartment are very weak, for important groups are missing (e.g. enchytraeids) or only partly investigated.

C 08 primary data: ALBERT (1973, spiders), DIRKS (1973, centipedes), FAASCH (unpubl., gamasids), FUNKE (unpubl., zoophagous diptera), WEIDEMANN (1972, carabids, centipedes, spiders); assumption: Opiliones + Pseudoscorpiones 2/3 of carabid values.

C 09 primary data: STREY (1972, Athous subfuscus).

Initial conditions are summarized in Table 1.

Table 1: Compartment contents, initial conditions

	linear	seasonal	
C 01	15700.	1613.96	* 10^3kcal * ha^{-1} * yr^{-1}
C 02	8300.	32200.	-"-
C 03	1000.	102.8	-"-
C 04	1149600.	1149600.	* 10^3kcal * ha^{-1}
C 05	115.	8.5	* 10^3kcal * ha^{-1} * yr^{-1}
C 06	37.5	8.5	-"-
C 07	172.	17.2	-"-
C 08	72.5	30.	-"-
C 09	35	40	-"-
C 10	229264.	229264.	* 10^3kcal * ha^{-1}

2.3. Fluxes

Fluxes from donor to acceptor compartment were either measured (m; sources see above) and eventually corrected (c) making allowance for underestimates, or derived from assumptions (a), or calculated by balancing input and output (b). Respiration of plants was omitted. Fluxes to consumers are assimilation (!) by the acceptor. Mortality comprises litterfall, frass, faeces. Annual values are given in Table 2.

Table 2: Annual fluxes (10^3kcal * ha^{-1} * yr^{-1})

Input:	F 0001 =	77500.	(= net primary production)
Translocation:	F 0102 =	8300.	
	F 0103 =	1000.	
	F 0104 =	52500.	
Assimilation:	F 0105 =	230.	(m,c)
	F 0206 =	75.	(m,c)
	F 0309 =	25.	(a: 5 % of C 03 consumed, A/C =0.5)
	F 0508 =	57.5	(m,a: 50 % of C 05)
	F 0608 =	9.375	(m,c,a: 25 % of C 06)
	F 0609 =	9.375	(m,a: 25 % of C 06)
	F 0708 =	43.	(m,a: 25 % of C 07)
	F 0709 =	43.	(m,a: 25 % of C 07)
	F 0908 =	17.5	(m,a: 50 % of C 09)
	F 1007 =	390.	(a,b)
	F 1009 =	54.625	(m,b)
Respiration:	F 0500 =	115.	(m,c: P/R=1.)
	F 0600 =	37.5	(m,c)
	F 0700 =	180.	(a: R/A=0.6)
	F 0800 =	93.5	(m,c)
	F 0900 =	87.	(m)
	F 1000 =	24487.	(b)
Mortality:	F 0110 =	15470.	(m: litter fall)
	F 0210 =	8225.	(b)
	F 0310 =	975.	(b)
	F 0510 =	57.5	(b)
	F 0610 =	18.75	(b)
	F 0710 =	124.	(b)
	F 0810 =	33.875	(b)
	F 0910 =	27.5	(b)

3. Linear model

3.1.

In this model steady state is assumed, inputs and outputs of compartments are balanced with the exception of C 04 (wood etc.) which has no outputs and hence shows increment. Fluxes are made donor dependent, that is, they are of the type $F_{ij} = A_{ij} * IC_i$, where A is the transfercoefficient and IC_i means initial condition of compartment i. The constant transfer coefficients are derived by dividing the annual flux by the initial content of the donor compartment. Their values for the thus developed "donor controlled constant coefficient, linear model" are listed in Table 3.

The steady state linear model was subjected to a sensitivity analysis and to a simulation of a phytophage gradation to test its stability.

3.2. Steady state sensitivity analysis

If a steady state parameter of a system is changed the values of the state variables are changed to different extent and a new steady state is achieved. The sensitivity of a system to changes in flux rates, transfercoefficients, initial conditions etc. may be determined by a sensitivity analysis (see BRYLINSKY, 1972).

In our model only three fluxes were changed alternatively by ± 10 %. The results of these experiments are summarized in Table 4.

Raising or lowering the leaves-phytophages-flux (F 0105) by 10 % influences all but the dead organic matter and the saprophages compartment. In a more realistic model they would of course be affected also. If the flux from fine roots to rhizophages (F 0206) is changed, the compartments directly concerned are influenced as well as the connected zoophages and the saprophages and pantophages which are dependent on the also affected dead organic matter compartment. By changing the flux from phytophages to zoophages (F 0508) only these two compartments are concerned. There is no influence on the leaves due to the donor dependent flux from leaves to phyllophages.

The new steady state is achieved after different time for the different compartments and for the whole system it takes between six and ten years.

Table 3: Transfercoefficients (= means identical with A of linear model)

	linear	nonlinear
A 0102	0.52866	=
A 0103	0.06369	=
A 0104	3.34390	=
A 0105	0.01465	0.000127
A 0110	0.98535	=
A 0206	0.00903	0.000241
A 0210	0.99096	=
A 0309	0.02500	0.000714
A 0310	0.97500	=
A 0500	1.00000	=
A 0508	0.50000	0.006896
A 0510	0.50000	=
A 0600	1.00000	=
A 0608	0.25000	0.003448
A 0609	0.25000	0.007142
A 0610	0.50000	=
A 0700	1.04650	=
A 0708	0.25000	0.003448
A 0709	0.25000	0.007142
A 0710	0.72093	=
A 0800	1.28970	=
A 0810	0.46724	=
A 0900	2.48570	=
A 0908	0.50000	0.006896
A 0910	0.78571	=
A 1000	0.10681	=
A 1007	0.00170	0.000010
A 1009	0.00024	0.000007

3.3. Simulation of a phytophage outbreak in the first of ten years

A further experiment which is a kind of sensitivity analysis too was performed by simulating a phytophage outbreak in the first of a tenyears run. The flux rate F 0105 was raised ten times by using a switching function. The result is presented in Table 5.

All compartments are more or less influenced by a tenfold increase in the flux between leaves and phytophages, in which

Table 4: Sensitivity analysis. Relative change (%) of compartment size at the end of a ten years run, when a flux is changed as indicated in the linear model. "years" indicates recovery time till new steady state.

Compartment		C 01	C 02	C 03	C 04	C 05	C 06	C 07	C 08	C 09	C 10
initial size (1000kcal/ha*yr)		17500.	8300.	1000.	1674600	115.	37.5	172.	72.5	35.	229260
F 0105	+10%	-0.03	-0.03	-0.03	-0.01	+9.96	+1.3	0.0	+4.5	-0.009	0.0
	years	0.75	4.75	4.75		3.75	3.75		7.5	3.0	
	-10%	+0.03	+0.03	+0.03	+0.006	-9.97	-1.36	0.0	-4.5	+0.009	0.0
	years	0.75	3.75	2.25		4.0	4.25		6.25	4.0	
F 0206	+10%	0.0	-0.09	0.0	0.0	0.0	+9.9	-0.01	+0.82	+0.69	-0.01
	years		5.0				4.0	6.5	10.0	7.5	10.0
	-10%	0.0	+0.09	0.0	0.0	0.0	-9.92	+0.01	-0.82	-0.7	+0.01
	years		5.5				4.25	7.5	10.0	7.0	7.75
F 0508	+10%	0.0	0.0	0.0	0.0	-2.43	0.0	0.0	+3.3	0.0	0.0
	years					3.0			6.0		
	-10%	0.0	0.0	0.0	0.0	+2.57	0.0	0.0	-3.47	0.0	0.0
	years					3.5			4.25		

the absolute changes are greatest for they are primarily concerned. Of the other consumers the zoophages are most affected positively for the flux F 0508 is the biggest input to C 08. The other consumers are negatively influenced since the translocation fluxes are reduced when the size of C 01 is reduced. The same is valid for the increment of C 04 (wood). The influence on the saprophages is negligible.

Table 5: Simulation of phytophage outbreak; linear model

Comp.	IC	maximal change (1000kcal/ha*yr)	(%)	time	recovery time (years)
01	15700.	- 406.	-2.58	1.	2.5
02	8300.	- 118.	-1.42	1.25	9.74
03	1000.	- 14.21	-1.42	1.25	9.75
04	1674600.	- 1400.	-0.09	10.	increment reduction
05	115.	+ 871.57	-755.2	1.	7.25
06	37.5	- 0.433	-1.15	1.5	9.5
07	172.	- 0.04	-0.02	1.25	2.25
08	72.5	+ 171.61	+236.7	1.25	9.25
09	35.	- 0.115	-0.3	1.5	10.0
10	229260.	- 60.	-0.02	1.	4.5

The recovery time is that time the compartment uses to achieve again exactly the same value as at the starting point of the simulation. This time is shortest in the leaf compartment due to the constant input, and in the saprophages, which remained almost unchanged. The recovery time is dependent on the distance between the compartment in question and the leaf compartment (e.g. phyllophages 7.25, zoophages 9.25; beech nuts 9.75, pantophages 10.; fine roots 9.75, rhizophages 9.5).

4. Nonlinear model

4.1. Construction

From an ecological point of view the assumption that all fluxes are donor controlled will hardly prove right. Beside all abiotic and biotic influences energy flow from producers to consumers and between consumers should be dependent of both donor and acceptor. Under this assumption the linear model was changed to a nonlinear one in two steps by formulating fluxes to consumers in the general form $F_{ij} = A_{ij} * IC_i * IC_j$. In the first step only the flux F 0508 was constructed as indicated while initial conditions and the other fluxes remained as in the linear model. As a result of this the transfer coefficient A 0508 altered but the whole system stayed in balance.

In a second step all fluxes to consumers were manipulated in the same manner. Again the respective transfercoefficients were altered (see Table 3) but compartment sizes remained unchanged during simulation. This nonlinear model was subjected to a sensitivity analysis in the same way as the linear model.

4.2. Steady state sensitivity analysis

Changing alternatively by ± 10 % F 0105, F 0206, and F 0508 proved the system by no means as stable in a ten years run as it looked before. Only compartment 01 achieved a new steady state after 2.5 years due to its constant input, while C 02, C 03, and C 10 after a heavy disturbance in the first year exhibited a constant small increment up to the end of the simulation period. The consumer compartments on the other hand approximated zero.

To avoid this behaviour the flows should be controlled by dividing them into two components, a linear and a nonlinear, as proposed by PATTEN (1971). This has not yet been done.

4.3. Simulation of phytophage outbreak

This experiment gave the appropriate results as the sensitivity analysis.

5. Seasonal model

To simulate seasonality of the energy flow through the beech forest ecosystem the original linear model was changed in the following points:

a) input F 0001 was made variant with time by partitioning it according to data given by SCHULZE (1970) into 10-day-portions, from which CSMP generated the input function.
b) In the same way litter fall was made an independent function of time and was thus restricted to a short period in autumn.
c) As initial conditions standing crop biomass (10^3kcal/ha) on May, 1st. was taken. Values (from the sources stated above) are listed in Table 1.
d) As a first approximation the transfercoefficients of the linear model (Table 3) were used instead of the annual flows to calculate the flow rates.
e) The simulation was run over 36 decades (= 1 year) beginning on May, 1st.

Under the conditions mentioned the model proved to be still unstable. Therefore the flux rates were changed with the aid of an iteration procedure as proposed by ULRICH et al. (1973) in a way that their integrals approximated the desired annual fluxes. Furtheron the fluxes 0102, 0103, 0104 (translocation), and 0105 (phyllophage assimilation) were allowed to flow only during the growing season.

But even the results of this manipulation are not yet satisfactory, the system did not achieve steady state although at least some compartments approximated it. So it is felt that this is the way to come to a more realistic model, which mimics the beech forest under research and the behaviour of which may be tested.

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DESCRIPTION OF IBP DATA PRINTING PROGRAM

THE FOLLOWING COMPUTER PROGRAM WAS WRITTEN FOR THE PURPOSE OF PRINTING OUT DATA SUBMITTED TO THE 1973 INTERNATIONAL BIOLOGICAL PROGRAM WORKSHOP IN GOETTINGEN.

DATA CONCERNING GENERAL SITE DESCRIPTIONS AND STANDING CROPS, YEARLY INCREMENTS AND FLUXES OF BIOMASS, ENERGY AND BIOELEMENTS HAVE BEEN STORED ON COMPUTER CARDS AND DISC. THIS PROGRAM READS THE DATA AND PRINTS IT OUT IN A DESIRED FORM.

THE PROGRAM IS PRINTED OUT BELOW, ACCOMPANIED BY EXPLANATORY COMMENTS. FOLLOWING THE PROGRAM ITSELF AN EXAMPLE OF A DATA SET, THAT OF THE OAK RIDGE IBP PROJECT, IS LISTED.

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C     IBP DATA PRINTOUT PROGRAM.  WRITTEN IN 1973 BY DON DE ANGELIS,
C     INSTITUTE FOR SOIL SCIENCE AND FOREST NUTRITION, GOETTINGEN
C     UNIVERSITY.

      IMPLICIT REAL*4 (A-H,O-Z)
      DIMENSION DRAINA(50),DRAINB(50),DRAINC(50),DRAIND(50),DRAINE(50)
      DIMENSION DRAINF(50),DRAING(50),DRAINH(50),DRAINI(50),DRAINJ(50),
     2DRAINK(50),DRAINL(50),DRAINM(50)
      DIMENSION AGEA(50),AGEB(50),ALEAF(50),BLEAF(50),BASA(50),BASB(50),
     2BSINA(50),BGINB(50),STDNA(50),STDNB(50),SCAA(50),SCAB(50),SCBA(50)
     3,SCBB(50)
      DIMENSION STHA(50),STHB(50),PRAA(50),PRAB(50),PRBA(50),PRBB(50),
     2ALAT(50),DLAT(50),ALONG(50),BLONG(50),ALTA(50),ALTB(50),GLBRA(50),
     3GLBRB(50)
      DIMENSION RADBA(50),RADBB(50),ANNPRA(50),ANNPRB(50),ANTMPA(50),
     2ANTMPB(50),GSLA(50),GSLB(50),GSTA(50),GSTB(50),GSPA(50),GSPB(50),
     3GSRA(50),GSRB(50)
      DIMENSION GSRBA(50),GSRBB(50),PHA(50),PHB(50),DEPRZA(50),
     2DEPRZB(50)
      DIMENSION AUTHA(50),AUTHB(50),AUTHC(50),AUTHD(50),AUTHE(50),
     2SITEA(50),SITEB(50),SITEC(50),SITED(50),FORSTA(50),FORSTB(50),
     3FORSTC(50),FORSTD(50)
      DIMENSION SITEE(50),SITEF(50)
      DIMENSION SITEG(50)
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      DIMENSION FORSTE(50),FORSTF(50)
      DIMENSION SOILA(50),SOILB(50),SOILC(50),SOILD(50),SOILE(50),
     2SOILF(50),GEOA(50),GEOB(50),GEOC(50),GEOD(50),GEOE(50),GEOF(50)
      DIMENSION GEOJ(50),GEOK(50),GEOL(50)
      DIMENSION SOILG(50),SOILH(50),GEOG(50),GEOH(50),GEOI(50)
      DIMENSION SVA(50),SVB(50),SVC(50)
      DIMENSION SVD(50)
      DIMENSION FLXA(40),FLXB(40),FLXC(40),FLXD(40),FLXE(40)
      DIMENSION Q(20,40),CREM(20,40),FLUX(20,35)
      DIMENSION SUBA(20,40),SUBCR(20,40),SUBFL(20,40)
      DIMENSION PHOTO(20,40),RESP(20,40)
      DIMENSION ELEMA(20),ELEMB(20),ELEMC(20)
      DIMENSION PROJA(50),PROJB(50),PROJC(50),PROJD(50),PROJE(50)
      DIMENSION PROJF(50),PROJG(50),PROJH(50)
      DIMENSION YRA(50),YRB(50)
      DIMENSION SPA(50),SPB(50),SPC(50),SPD(50),SPE(50),SPF(50),SPG(50),
     2SPH(50),SPI(50),SPJ(50),SPK(50),SPL(50),SPM(50),SPN(50),SPO(50),
     3SPP(50),SPQ(50),SPR(50),SPS(50),SPT(50),SPU(50),SPV(50),SPW(50),
     4SPX(50)
      DIMENSION SPY(50),SPZ(50),SPAA(50),SPBB(50),SPCC(50),SPDD(50),
     2SPEE(50),SPFF(50),SPGG(50),SPHH(50),SPII(50),SPJJ(50),SPKK(50),
     3SPLL(50),SPMM(50),SPNN(50),SPOO(50),SPPP(50),SPQQ(50),SPRR(50),
     4SPSS(50),SPTT(50),SPUU(50),SPVV(50),SPWW(50),SPXX(50),SPYY(50),
     5SPZZ(50),SPAB(50),SPCB(50),SPDB(50),SPEB(50),SPFB(50),
     6SPGB(50),SPHB(50),SPIB(50),SPJB(50),SPKB(50)
      DIMENSION PUBA(50),PUBB(50),PUBC(50),PUBD(50)
      DIMENSION PUBE(50),PUBF(50),PUBG(50)
      DIMENSION NULLC(50)
      DIMENSION NULLX(50),NULLI(50),NULLF(50)


C     READING IN OF GENERAL CONTROL DATA.  THE FOUR INTEGERS READ IN
C     DETERMINE, (1) HOW MANY DATA SETS ARE TO BE READ AND PRINTED,
C     (2) HOW MANY PAGES (ASSUMING NINE DATA SETS PER PAGE) ARE USED IN
C     THE PRINTOUT, (3) WHICH PARTICULAR BIOELEMENTIS PRINTED OUT,
C     (4) HOW MANY COPIES OF THE PRINTOUT ARE MADE.

      READ 1002, NDATA,NPAGT,MIN,NSETS


C     READING IN OF GENERAL SITE DESCRIPTION DATA

      READ 1005,(ELEMA(M),ELEMB(M),ELEMC(M),M=1,17)
 1005 FORMAT(15A5)
 1006 FORMAT(12A5)
      READ 1006,(SVA(M),SVB(M),SVC(M),SVD(M),M=1,27)
      READ 1008,(FLXA(M),FLXB(M),FLXC(M),FLXD(M),FLXE(M),M=1,28)
 1008 FORMAT(15A5)
      DO 100 I=1,NDATA
      READ 1004,AUTHA(I),AUTHB(I),AUTHC(I),AUTHD(I),AUTHE(I),SITEA(I),
     2SITEB(I),SITEC(I),SITED(I),SITEE(I),SITEF(I),SITEG(I)
      READ 1004,FORSTA(I),FORSTB(I),FORSTC(I),FORSTD(I),FORSTE(I),
     2FORSTF(I)
      READ 1004,SPA(I),SPB(I),SPC(I),SPD(I),SPE(I),SPF(I),SPG(I),SPH(I),
     2SPI(I),SPJ(I),SPK(I),SPL(I),SPM(I)
 1004 FORMAT(13A5)
      READ 1004, SPN(I),SPO(I),SPP(I),SPQ(I),SPR(I),SPS(I),SPT(I),
     2SPU(I),SPV(I),SPW(I),SPX(I),SPY(I),SPZ(I)
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      READ 1004,SPAA(I),SPBB(I),SPCC(I),SPDD(I),SPEE(I),SPFF(I),SPGG(I),
     2SPHH(I),SPII(I),SPJJ(I),SPKK(I),SPLL(I),SPMM(I),
      READ 1004,SPNN(I),SPOO(I),SPPP(I),SPQQ(I),SPRR(I),SPSS(I),
     2SPTT(I),SPUU(I),SPVV(I),SPWW(I),SPXX(I),SPYY(I),SPZZ(I)
      READ 1004, SPAB(I),SPCB(I),SPDB(I),SPEB(I),SPFB(I),SPGB(I),
     2SPHB(I),SPIB(I),SPJB(I),SPKB(I),YRA(I),YRB(I)
      READ 1001,PROJA(I),PROJB(I),PROJC(I),PROJD(I),PROJE(I),PROJF(I),
     2PROJG(I),PROJH(I)
      READ 1004,SOILA(I),SOILB(I),SOILC(I),SOILD(I),SOILE(I),SOILF(I),
     2SOILG(I),SOILH(I)
      READ 1004, GEOA(I),GEOB(I),GEOC(I),GEOD(I),GEOE(I),GEOF(I),GEOG(I)
     2,GEOH(I),GEOI(I),GEOJ(I),GEOK(I),GEOL(I)
 1001 FORMAT(8A4)
      READ 1004,DRAINA(I),DRAINB(I),DRAINC(I),DRAIND(I),DRAINE(I),
     2DRAINF(I),DRAING(I),DRAINH(I),DRAINI(I),DRAINJ(I),DRAINK(I),
     3DRAINL(I),DRAINM(I)
      READ 1007,AGEA(I),AGEB(I),ALEAF(I),BLEAF(I),BASA(I),BASB(I),
     2BSINA(I),BSINB(I),STDNA(I),STDNB(I),SCAA(I),SCAB(I),SCBA(I),
     3SCBB(I)
 1007 FORMAT(19A5)
      READ 1007,STHA(I),STHB(I),PRAA(I),PRAB(I),PRBA(I),PRBB(I),ALAT(I),
     2BLAT(I),ALONG(I),BLONG(I),ALTA(I),ALTB(I),GLBRA(I),GLBRB(I)
      READ 1007,RADBA(I),RADBB(I),ANNPRA(I),ANNPRB(I),ANTMPA(I),
     2ANTMPB(I),GSLA(I),GSLB(I),GSTA(I),GSTB(I),GSPA(I),GSPB(I),GSRA(I),
     3GSRB(I)
      READ 1007,GSRBA(I),GSRBB(I),PHA(I),PHB(I),DEPRZA(I),DEPRZB(I)
      READ 1004, PUBA(I),PUBB(I),PUBC(I),PUBD(I),PUBE(I),PUBF(I),PUBG(I)
      READ 1002, NC,NI,NE,NP,NR,NCX,NIX,NEX,NPX,NRX,NCXX,NIXX,NEXX
 1002 FORMAT(14I5)
      DO 20 IJ=1,17
      DO 22 IK=1,28
      FLUX(IJ,IK) = 0.0
   22 CONTINUE
      DO 20 IK=1,37
      Q(IJ,IK) = 0.0
      CREM(IJ,IK) = 0.0
   20 CONTINUE
      DO 28 IK=1,37
      PHOTO(I,IK) = 0.0
      RESP(I,IK) = 0.0
   28 CONTINUE
      IF(NCX .EQ. 0) GO TO 60
      READ 1002, (NULLC(J),J=1,NCX)
      DO 51 IJ=1,17
      DO 51 IK=1,NCX
      NIL = NULLC(IK)
      Q(IJ,NIL) = -.001
   51 CONTINUE
   60 CONTINUE
      IF(NIX .EQ. 0) GO TO 52
      READ 1002, (NULLC(J),J=1,NIX)
      DO 53 IJ=1,17
      DO 53 IK=1,NIX
      NIL = NULLC(IK)
      CREM(IJ,NIL) = -.001
   53 CONTINUE
   52 CONTINUE
      IF(NEX .EQ. 0) GO TO 54
      READ 1002, (NULLC(J),J=1,NEX)
      DO 55 IJ=1,17
      DO 55 IK=1,NEX
      NIL = NULLC(IK)
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      FLUX(IJ,NIL) = -.001
   55 CONTINUE
   54 CONTINUE
      IF(NPX .EQ. 0) GO TO 56
      READ 1002, (NULLC(J),J=1,NPX)
      DO 57 IJ=1,17
      DO 57 IK=1,NPX
      NIL = NULLC(IK)
      PHOTO(IJ,NIL) = -.001
   57 CONTINUE
   56 CONTINUE
      IF(NRX .EQ. 0) GO TO 58
      READ 1002, (NULLC(J),J=1,NRX)
      DO 59 IJ=1,17
      DO 59 IK=1,NRX
      NIL = NULLC(IK)
      RESP(IJ,NIL) = -.001
   59 CONTINUE
   58 CONTINUE
   61 CONTINUE
      IF(NCXX .EQ. 0) GO TO 62
      READ 1002, (NULLX(J),J=1,NCXX)
   62 CONTINUE
      IF(NIXX .EQ. 0) GO TO 63
      READ 1002, (NULLI(J),J=1,NIXX)
   63 CONTINUE
      IF(NFXX .EQ. 0) GO TO 64
      READ 1002, (NULLF(J),J=1,NFXX)
   64 CONTINUE


C     READING IN OF STANDING CROPS OF BIOMASS, ENERGY OR BIOELEMENTS

      IF(NC .EQ. 0) GO TO 23
      READ 1003, (J,K,Q(J,K),M=1,NC)
 1003 FORMAT(4(2I5,E10.0))
   23 CONTINUE


C     READING IN OF INCREMENTS OF BIOMASS, ENERGY OR BIOELEMENTS

      IF(NI .EQ. 0) GO TO 24
      READ 1003,(JI,KI,CREM(JI,KI),M=1,NI)
   24 CONTINUE
      IF(NF .EQ. 0) GO TO 25


C     READING IN OF FLUXES OF BIOMASS, ENERGY OR BIOELEMENTS

      READ 1003,(JF,KF,FLUX(JF,KF),M=1,NF)
   25 CONTINUE


C     READING IN OF PHOTOSYNTHESIS DATA

      IF(NP .EQ. 0) GO TO 26
      READ 1003,(JP,PHOTO(I,JP),M=1,NP)
   26 CONTINUE
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C       READING IN OF RESPIRATION DATA

        IF(NR .EQ. 0) GO TO 27
        READ 1009,(JR,RESP(I,JR),M=1,NR)
   27 CONTINUE
 1009 FORMAT(5(I5,E10.0))
        IF(NCXX .EQ. 0) GO TO 65
        DO 66 IJ=1,17
        DO 66 IK=1,NCXX
        NIL = NULLX(IK)
        Q(IJ,NIL) = 0.0
   66 CONTINUE
   65 CONTINUE
        IF(NIXX .EQ. 0) GO TO 67
        DO 68 IJ=1,17
        DO 68 IK=1,NIXX
        NIL = NULLI(IK)
        CREM(IJ,NIL) = 0.0
   68 CONTINUE
   67 CONTINUE
        IF(NFXX .EQ. 0) GO TO 69
        DO 70 IJ=1,17
        DO 70 IK=1,NFXX
        NIL = NULLF(IK)
        FLUX(IJ,NIL) = 0.0
   70 CONTINUE
   69 CONTINUE
        DO 40 K=1,37
        SUBA(I,K) = Q(MIN,K)
   40 CONTINUE
        DO 45 K=1,28
        SUBFL(I,K) = FLUX(MIN,K)
   45 CONTINUE
        DO 42 K=1,37
        SUBCR(I,K) = CREM(MIN,K)
   42 CONTINUE
  100 CONTINUE

C       PRINTING OUT THE DATA

        DO 400 ISETS=1,NSETS
        IF(MIN .GT. 1) GO TO 201
        PRINT 2030
 2030 FORMAT(1H1,//,35X,'IBP WORKSHOP, GOETTINGEN, 1973')
        PRINT 2027
 2027 FORMAT(1H ,////,12X,'THE DATA SETS PRINTED BELOW ARE THOSE REACHING
     1 GOETTINGEN BEFORE THE DEADLINE' ,/,12X,'OF SEPT 1 PLUS AS MANY AS
     2 POSSIBLE OF THOSE SETS ARRIVING LATER.  PARTICIPANTS',/,12X,'ARE
     3STRONGLY URGED TO CHECK THEIR OWN DATA IN THE TABLES BELOW SO THAT
     4 ERRORS',/,12X,'MAY BE CORRECTED IF NECESSARY. IF YOU FIND ERRORS
     5PLEASE LEAVE A NOTE INDICATING',/,12X,'THE ERRORS ON THE BULLETIN
     6BOARD ON THE 3RD FLOOR OF THE FORESTRY BUILDING',////)
        PRINT 2046
 2046 FORMAT(1H ,/,12X,'THE DATA HAVE BEEN PLACED ON PUNCHED CARDS AND M
     1AGNETIC TAPE. THE COMPUTER PROGRAM',/,12X,'WHICH HAS PRINTED THIS
     2DATA WILL ALSO PERMIT A VARIETY OF REARRANGEMENTS OF',/,12X,'DATA.
     3  FOR EXAMPLE, ONE MIGHT WANT TO LIST SEVERAL QUANTITIES, SUCH AS
     4PRECIPITATION,',/,12X,'TEMPERATURE,AND PRODUCTIVITY, FOR A NUMBER
     5OF PROJECTS,SIDE-BY-SIDE FOR COMPARISON.',/,12X  ,'IF THE WORKING
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     6GROUPS THINK THAT ANY SUCH REARRANGEMENTS WOULD BE USEFUL PLEASE',
     7/,12X,'INFORM DON DE ANGELIS',////)
      PRINT 2028
 2028 FORMAT(1H ,12X,'SEVERAL ABBREVIATIONS ARE USED IN THE PRINTOUT.  T
     2HESE ARE LISTED BELOW',//,20X,'M = METERS'  ,/,  20X,      'SQ.M =
     3SQUARE METER',/,20X,'HA = HECTARES',/,20X,'CM = CENTIMETERS',/,
     420X,'DEG = DEGREES',/,20X,'MIN = MINUTES',/,20X,'L = LITERS',/,
     520X,'CAL = CALORIES',/,20X,'KCAL = KILOCALORIES',/)
      PRINT 2010
      PRINT 2029
 2029 FORMAT(1H ,12X,'THE TERM ''NO DATA'' IS USED WHEN NO DATA HAS BEEN
     2 PROVIDED OR THERE WAS NOT SUFFICIENT',/,13X,'TIME TO OBTAIN SUCH
     3DATA FROM THE REFERENCE LITERATURE SENT BY PARTICIPANTS',)
      DO 200 I=1,NDATA


C     PRINTING OUT OF GENERAL SITE DESCRIPTION DATA

      PRINT 2031
 2031 FORMAT(1H1,35X,'GENERAL SITE DESCRIPTIONS',////)
      PRINT 2011,AUTHA(I),AUTHB(I),AUTHC(I),AUTHD(I),AUTHE(I),SITEA(I),
     2SITEB(I),SITEC(I),SITED(I),SITEE(I),SITEF(I),SITEG(I)
 2011 FORMAT(1H ,2X,'RESEARCHER(S): ',6A6,8X,'SITE: ',7A6,/)
      PRINT 2040, YRA(I),YRB(I)
 2040 FORMAT(1H ,2X,'YEAR(S): ',2A6,/)
      PRINT 2038, FORSTA(I),FORSTB(I),FORSTC(I),FORSTD(I),FORSTE(I),
     2FORSTF(I)
 2038 FORMAT(1H ,2X,'FOREST TYPE: ',6A6,/)
      PRINT 2012, SOILA(I),SOILB(I),SOILC(I),SOILD(I),
     2SOILE(I),SOILF(I),SOILG(I),SOILH(I)
 2012 FORMAT(1H ,2X,'SOIL TYPE: ',8A6,/)
      PRINT 2042, GEOA(I),GEOB(I),GEOC(I),GEOD(I),GEOE(I),GEOF(I),
     2GEOG(I),GEOH(I),GEOI(I),GEOJ(I),GEOK(I),GEOL(I)
 2042 FORMAT(1H ,2X,'GEOLOGY: ',12A6,/)
      PRINT 2013,SPA(I),SPB(I),SPC(I),SPD(I),SPE(I),SPF(I),SPG(I),
     2SPH(I),SPI(I),SPJ(I),SPK(I),SPL(I),SPM(I),SPN(I),SPO(I),SPP(I)
 2013 FORMAT(1H ,2X,'PRINCIPLE PLANT TYPES: ',16A6)
      PRINT 2033,SPQ(I),SPR(I),SPS(I),SPT(I),SPU(I),SPV(I),SPW(I),
     2SPX(I),SPY(I),SPZ(I),SPAA(I),SPBB(I),SPCC(I),SPDD(I),SPEE(I),
     3SPFF(I),SPGG(I),SPHH(I)
 2033 FORMAT(1H ,2X,19A6)
      PRINT 2033,SPII(I),SPJJ(I),SPKK(I),SPLL(I),SPMM(I),SPNN(I),
     2SPOO(I),SPPP(I),SPQQ(I),SPRR(I),SPSS(I),SPTT(I),SPUU(I),SPVV(I),
     3SPWW(I),SPXX(I),SPYY(I),SPZZ(I)
      PRINT 2014,SPAB(I),SPCB(I),SPDB(I),SPEB(I),SPFB(I),SPGB(I),
     2SPHB(I),SPIB(I),SPJB(I),SPKB(I)
 2014 FORMAT(1H ,2X,12A6,/)
      PRINT 2015,DRAINA(I),DRAINB(I),DRAINC(I),DRAIND(I),DRAINE(I),
     2DRAINF(I),DRAING(I),DRAINH(I),DRAINI(I),DRAINJ(I),DRAINK(I),
     3DRAINL(I),DRAINM(I)
 2015 FORMAT(1H ,2X,'SOIL DRAINAGE: ',13A6,/)
      PRINT 2016, AGEA(I),AGEB(I),ALEAF(I),BLEAF(I)
 2016 FORMAT(1H ,2X,'AGE OF STAND: ',2A5,' YEARS',8X,'LEAF AREA INDEX: '
     2,2A5,' SQ.M/SQ.M',/)
      PRINT 2017, BASA(I),BASB(I),BSINA(I),BSINB(I)
 2017 FORMAT(1H ,2X,'BASAL AREA: ',2A5,' SQ.M/HA',7X,'BASAL AREA INCREM.
     2: ',2A5,'SQ.M/HA')
      PRINT 2010
      PRINT 2033, STHA(I),STHB(I),STDNA(I),STDNB(I)
 2033 FORMAT(1H ,2X,'STAND HEIGHT: ',2A5,' M',10X,'STOCKING DENSITY: ',
     22A5,'STEMS/HA',/)
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      PRINT 2018,SCAA(I),SCAB(I),SCBA(I),SCBB(I)
 2018 FORMAT(1H ,2X,'STANDING CROP, ABOVEGROUND: ',2A5,' G/SQ.M',11X,
     2'STANDING CROP, BELOWGROUND: ',2A5,' G/SQ.M')
      PRINT 2010
      PRINT 2019,PRAA(I),PRAB(I),PRBA(I),PRBB(I)
 2019 FORMAT(1H ,2X,'PRODUCTIVITY ABOVEGROUND: ',2A5,' G/SQ.M',13X,
     2'PRODUCTIVITY BELOWGROUND: ',2A5,' G/SQ.M')
      PRINT 2010
      PRINT 2020, ALAT(I),B_AT(I),ALONG(I),BLONG(I)
 2020 FORMAT(1H ,2X,'LATITUDE: ',A5,' DEG  ',A5,' MIN',7X,'LONGITUDE: ',
     2A5,'DEG  ',A5,'MIN',/)
      PRINT 2041 , ALTA(I),ALTB(I)
 2041 FORMAT(1H ,2X,'ALTITUDE: ',2A5,' METERS ABOVE SEA LEVEL')
      PRINT 2010
      PRINT 2021,GLBRA(I),G_BRB(I),RADBA(I),RADBB(I)
 2021 FORMAT(1H ,2X,'MEAN ANNUAL RADIATION, GLOBAL R: ',2A5,8X,', RAD. B
     2ALANCE: ',2A5,' CAL/SQ. CM ')
      PRINT 2010
      PRINT 2044, ANTMPA(I),ANTMPB(I)
 2044 FORMAT(1H ,2X,'MEAN ANNUAL TEMPERATURE: ',2A5,' DEG C',/)
      PRINT 2022, ANNPRA(I),ANNPRB(I)
 2022 FORMAT(1H ,2X,'MEAN ANNUAL PRECIPITATION: ',2A5,' L/SQ.M')
      PRINT 2010
      PRINT 2023, GSLA(I),GSLB(I)
 2023 FORMAT(1H ,2X,'LENGTH OF GROWING SEASON: ',2A5,' DAYS',/)
      PRINT 2032, GSTA(I),GSTB(I)
 2032 FORMAT(1H ,2X,'TEMPERATURE DURING GROWING SEASON: ',2A5)
      PRINT 2010
      PRINT 2045, GSPA(I),GSPB(I)
 2045 FORMAT(1H ,2X,'MEAN PRECIPITATION DURING GROWING SEASON: ',2A5,
     2' L/SQ.M')
      PRINT 2010
      PRINT 2024, GSRA(I),GSRB(I),GSRBA(I),GSRBB(I)
 2024 FORMAT(1H ,2X,'MEAN RADIATION OF GROWING SEASON, GLOBAL R: ',2A5,
     24X,', RAD. BALANCE: ',2A5,' CAL/SQ. CM')
      PRINT 2010
      PRINT 2025, PHA(I),PHB(I),DEPRZA(I),DEPRZB(I)
 2025 FORMAT(1H ,2X,'PH: ',2A5,9X,'DEPTH OF ROOTING ZONE: ',2A5,' CM',//
     2///)
      PRINT 2047,PUBA(I),PUBB(I),PUBC(I),PUBD(I),PUBE(I),PUBF(I),PUBG(I)
 2047 FORMAT(1H ,2X,'STATUS OF DATA: ',7A6)
  200 CONTINUE
  201 CONTINUE


C     PRINTING OUT OF STANDING CROP DATA

      DO 300 NPAG=1,NPAGT
      NP1 = (NPAG-1)*9 + 1
      NDIFF = NDATA - NP1 + 1
      IF(NDIFF .LT. 9) GO TO 301
      NP2 = 9 + (NPAG-1)*9
      GO TO 302
  301 CONTINUE
      NP2 = NDIFF + (NPAG-1)*9
  302 CONTINUE
      PRINT 2002,ELEMA(MIN),ELEMB(MIN),ELEMC(MIN)
 2002 FORMAT(1H1,5X,'COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT T
     2O AMOUNTS OF',3A5,' IN UNITS OF GRAMS/SQ.METER',/)
      PRINT 2003
 2003 FORMAT(18X,'(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED.
```

```
     1THE SYMBOL D.',/,18X,'MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER B
     2Y MEASUREMENT OR IN',/,18X,'THE JUDGMENT OF THE INVESTIGATOR. THE
     3SYMBOL ** MEANS THAT THE',/,18X,'COMPARTMENT WAS MEASURED JOINTLY
     4WITH CONTIGUOUS COMPARTMENTS SIMILARLY',/,18X,'SYMBOLIZED, AS WELL
     5 AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO',/,18X,'SYMBOLI
     6ZED.  THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE',/,1
     78X,'OF THE SUMMED COMPARTMENTS.)',//)
      PRINT 2004, (PROJA(I),PROJB(I),I=NP1,NP2)
      PRINT 2005,(PROJC(I),PROJD(I),I=NP1,NP2)
      PRINT 2005,(PROJE(I),PROJF(I),I=NP1,NP2)
 2004 FORMAT(27X,9(2A4,2X))
 2005 FORMAT(27X,9(2A4,2X))
      PRINT 2026
 2026 FORMAT(1H )
       DO 210 LA = 1,37
      IF(LA .EQ. 3 .OR. LA .EQ. 6) GO TO 30
      IF(LA .EQ. 11 .OR. LA .EQ. 21) GO TO 30
      IF(LA .EQ. 24 .OR. LA .EQ. 29) GO TO 30
      IF(LA .EQ. 34) GO TO 30
      GO TO 31
   30 CONTINUE
      PRINT 2010
 2010 FORMAT(1H )
   31 CONTINUE
      CALL DATAPT(SVA,SVB,SVC,SVD,SUBA,NP1,NP2,LA,NPAGT)
 2008 FORMAT(5X,4A5,2X,9(E10.4))
  210 CONTINUE
  300 CONTINUE


C     PRINTING OUT OF INCREMENT DATA

      DO 310 NPAG=1,NPAGT
      NP1 = (NPAG-1)*9 + 1
      NDIFF = NDATA - NP1 + 1
      IF(NDIFF .LT. 9) GO TO 311
      NP2 = 9 + (NPAG-1)*9
      GO TO 312
  311 CONTINUE
      NP2 = NDIFF + (NPAG-1)*9
  312 CONTINUE
      PRINT 2035, ELEMA(MIN),ELEMB(MIN),ELEMC(MIN)
 2035 FORMAT(1H1,5X,'COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT T
     20 INCREMENTS OF ',3A5,' IN UNITS OF GRAM/SQ.M',/)
      PRINT 2009
      PRINT 2004, (PROJA(I),PROJB(I),I=NP1,NP2)
      PRINT 2005,(PROJC(I),PROJD(I),I=NP1,NP2)
      PRINT 2005,(PROJE(I),PROJF(I),I=NP1,NP2)
      PRINT 2026
      DO 220 LA=1,37
      IF(LA .EQ. 3 .OR. LA .EQ. 6) GO TO 36
      IF(LA .EQ. 11 .OR. LA .EQ. 21) GO TO 36
      IF(LA .EQ. 24 .OR. LA .EQ. 29) GO TO 36
      IF(LA .EQ. 34) GO TO 36
      GO TO 37
   36 CONTINUE
      PRINT 2010
   37 CONTINUE
      CALL DATAPT(SVA,SVB,SVC,SVD,SUBCR,NP1,NP2,LA,NPAGT)
  220 CONTINUE
  310 CONTINUE
```

```
C     PRINTING OUT OF FLUX DATA

      DO 320 NPAG=1,NPAGT
      NP1 = (NPAG-1)*9 + 1
      NDIFF = NDATA - NP1 + 1
      IF(NDIFF .LT. 9) GO TO 321
      NP2 = 9 + (NPAG-1)*9
      GO TO 322
  321 CONTINUE
      NP2 = NDIFF + (NPAG-1)*9
  322 CONTINUE
      PRINT 2003, ELEMA(MIN),ELEMB(MIN),ELEMC(MIN)
 2003 FORMAT(1H1,5X,'COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF    '3A5,
     2' IN UNITS OF GRAM/SQ.METER/YEAR',/)
      PRINT 2009
      PRINT 2004, (PROJA(I),PROJB(I),I=NP1,NP2)
      PRINT 2005,(PROJC(I),PROJD(I),I=NP1,NP2)
      PRINT 2005,(PROJE(I),PROJF(I),I=NP1,NP2)
      PRINT 2026
      DO 50 LA=1,23
      IF(LA .EQ. 10 .OR. LA .EQ. 17) GO TO 32
      IF(LA .EQ. 21 .OR. LA .EQ. 25) GO TO 32
      GO TO 33
   32 CONTINUE
      PRINT 2010
   33 CONTINUE
      IF(LA .EQ. 17 .OR. LA .EQ. 21) GO TO 39
      IF(LA .EQ. 25) GO TO 39
      GO TO 38
   39 CONTINUE
      PRINT 2043, FLXA(LA),FLXB(LA),FLXC(LA),FLXD(LA),FLXE(LA)
 2043 FORMAT(1X,5A5)
      GO TO 50
   38 CONTINUE
      CALL DATAFS(FLXA,FLXB,FLXC,FLXD,FLXE,SUBFL,NP1,NP2,LA,NPAGT)
 2006 FORMAT(1X,5A5,1X,9(E10.4))
   50 CONTINUE
  320 CONTINUE


C     PRINTING OUT OF PHOTOSYNTHESIS DATA

      IF(MIN .GT. 1) GO TO 399
      DO 330 NPAG=1,NPAGT
      NP1 = (NPAG-1)*9 + 1
      NDIFF = NDATA - NP1 + 1
      IF(NDIFF .LT. 9) GO TO 331
      NP2 = 9 + (NPAG-1)*9
      GO TO 332
  331 CONTINUE
      NP2 = NDIFF + (NPAG-1)*9
  332 CONTINUE
      PRINT 2030
 2030 FORMAT(1H1,5X,'COMPARISONS AMONG ECOSYSTEMS WITH RESPECT TO PHOTOS
     2YNTHESIS AND TRANSLOCATION IN UNITS OF GRAM/SQ.M/YEAR',/,8X,
     3'OR KCAL/SQ.M/YEAR',/)
      PRINT 2009
      PRINT 2004, (PROJA(I),PROJB(I),I=NP1,NP2)
```

```
      PRINT 2005,(PROJC(I),PROJD(I),I=NP1,NP2)
      PRINT 2005,(PROJE(I),PROJF(I),I=NP1,NP2)
      PRINT 2026
      DO 230 LA=1,37
      IF(LA .EQ. 9 .OR. LA .EQ. 19) GO TO 231
      IF(LA .EQ. 28 .OR. LA .GT. 29) GO TO 231
      IF(LA .EQ. 3 .OR. LA .EQ. 6) GO TO 232
      IF(LA .EQ. 11 .OR. LA .EQ. 21) GO TO 232
      IF(LA .EQ. 24) GO TO 232
      GO TO 233
  232 CONTINUE
      PRINT 2010
  233 CONTINUE
      CALL DATAPT(SVA,SVB,SVC,SVD,PHOTO,NP1,NP2,LA,NPAGT)
  231 CONTINUE
  230 CONTINUE
  330 CONTINUE


C     PRINTING OUT OF RESPIRATION DATA

      DO 340 NPAG=1,NPAGT
      NP1 = (NPAG-1)*9 + 1
      NDIFF = NDATA - NP1 + 1
      IF(NDIFF .LT. 9) GO TO 341
      NP2 = 9 + (NPAG-1)*9
      GO TO 342
  341 CONTINUE
      NP2 = NDIFF + (NPAG-1)*9
  342 CONTINUE
      PRINT 2037
 2037 FORMAT(1H1,5X,'COMPARISONS AMONG ECOSYSTEMS WITH RESPECT TO RESPIR
     2ATION IN UNITS OF GRAM/SQ.M/YEAR',/,6X,'OR KCAL/SQ.M/YEAR',/)
      PRINT 2009
      PRINT 2004,(PROJA(I),PROJB(I),I=NP1,NP2)
      PRINT 2005,(PROJC(I),PROJD(I),I=NP1,NP2)
      PRINT 2005,(PROJE(I),PROJF(I),I=NP1,NP2)
      PRINT 2026
      DO 240 LA=1,37
      IF(LA .EQ. 11 .OR. LA .EQ. 21) GO TO 242
      IF(LA .EQ. 3 .OR. LA .EQ. 6) GO TO 242
      IF(LA .EQ. 28 .OR. LA .EQ. 29) GO TO 242
      IF(LA .EQ. 24) GO TO 242
      GO TO 243
  242 CONTINUE
      PRINT 2010
  243 CONTINUE
      CALL DATAPT(SVA,SVB,SVC,SVD,RESP,NP1,NP2,LA,NPAGT)
  241 CONTINUE
  240 CONTINUE
  340 CONTINUE
  399 CONTINUE
  400 CONTINUE
      END


      SUBROUTINE DATAPT(SVA,SVB,SVC,SVD,SUB,NP1,NP2,LA,NPAGT)
```

```
C     THIS SUBROUTINE ACCOMPLISHES THE ACTUAL PRINTING OUT OF DATA ON
C     STANDING CROPS, INCREMENTS, PHOTOSYNTHESIS AND RESPIRATION.
C     THE SUBROUTINE USES A VARIABLE FORMAT TECHNIQUE.  IT CAN PRINT
C     DATA OUT IN A NUMERICAL FORM, OR LEAVE BLANKS OR PRINT SPECIAL
C     SYMBOLS IN THE A-FORMAT IF REQUIRED.

      IMPLICIT REAL*4 (A-H,O-Z)
      DIMENSION SVA(1),SVB(1),SVC(1),SVD(1)
      DIMENSION SUB(20,40)
      DIMENSION CRB(100)
      DATA FMS/6HE10.4,/
      DATA FMT/6HA5,5X,/
      DATA FMU/6HE10.4)/
      DATA FMV/3HA5)/
      DATA FMA/6H(3X,4A/
      DATA FMB/6H5,2X ,/
      DATA CBL/'     '/
      DATA CBM/'    **'/
      DATA CBN/'    0.'/
      CRB(1) = FMA
      CRB(2) = FMB
      NP2N = NP2 - 1
      NFIN = NP2 + 2
      NPEND = NPAST*9
      NPENF = NPEND + 2
      NPENDM = NPEND - 1
      N1 = NP1
      N2 = NP1 +1
      N3 = NP1 + 2
      N4 = NP1 + 3
      N5 = NP1 + 4
      N6 = NP1 + 5
      N7 = NP1 + 6
      N8 = NP1 + 7
      N9 = NP1 + 8
      J = 2
      DO 10 I=NP1,NPENDM
      J = J + 1
      IF(SUB(I,LA) .EQ. 0.0) GO TO 11
      IF(SUB(I,LA) .EQ. -1.0 .OR. SUB(I,LA) .EQ. -100.) GO TO 11
      IF(SUB(I,LA) .EQ. -.001) GO TO 11
      CRB(J) = FMS
      GO TO 12
   11 CONTINUE
      CRB(J) = FMT
   12 CONTINUE
   10 CONTINUE
      I = NPEND
      IF(SUB(I,LA) .EQ. 0.0) GO TO 13
      IF(SUB(I,LA) .EQ. -1.0 .OR. SUB(I,LA).EQ. -100.) GO TO 13
      IF(SUB(I,LA) .EQ. -.001) GO TO 13
      CRB(NPENF) = FMU
      GO TO 14
   13 CRB(NPENF) = FMV
   14 CONTINUE
      IF(SUB(N1,LA) .EQ. 0.0) GO TO 21
      IF(SUB(N1,LA) .EQ. -1.0 .OR. SUB(N1,LA) .EQ. -100.) GO TO 23
      IF(SUB(N1,LA) .EQ. -.001) GO TO 24
      SA = SUB(N1,LA)
      GO TO 22
   21 SA = CBL
```

```
      GO TO 22
   23 SA = CBM
      GO TO 22
   24 SA = CBN
   22 CONTINUE
      IF(SUB(N2,LA) .EQ. 0.0) GO TO 31
      IF(SUB(N2,LA) .EQ. -1.0 .OR. SUB(N2,LA) .EQ. -100.) GO TO 33
      IF(SUB(N2,LA) .EQ. -.001) GO TO 34
      SB = SUB(N2,LA)
      GO TO 32
   31 SB = CBL
      GO TO 32
   33 SB = CBM
      GO TO 32
   34 SB = CBN
   32 CONTINUE
      IF(SUB(N3,LA) .EQ. 0.0) GO TO 41
      IF(SUB(N3,LA) .EQ. -1.0 .OR. SUB(N3,LA) .EQ. -100.) GO TO 43
      IF(SUB(N3,LA) .EQ. -.001) GO TO 44
      SC = SUB(N3,LA)
      GO TO 42
   41 SC = CBL
      GO TO 42
   43 SC = CBM
      GO TO 42
   44 SC = CBN
   42 CONTINUE
      IF(SUB(N4,LA) .EQ. 0.0) GO TO 51
      IF(SUB(N4,LA) .EQ. -1.0 .OR. SUB(N4,LA) .EQ. -100.) GO TO 53
      IF(SUB(N4,LA) .EQ. -.001) GO TO 54
      SD = SUB(N4,LA)
      GO TO 52
   51 SD = CBL
      GO TO 52
   53 SD = CBM
      GO TO 52
   54 SD = CBN
   52 CONTINUE
      IF(SUB(N5,LA) .EQ. 0.0) GO TO 61
      IF(SUB(N5,LA) .EQ. -1.0 .OR. SUB(N5,LA) .EQ. -100.) GO TO 63
      IF(SUB(N5,LA) .EQ. -.001) GO TO 64
      SE = SUB(N5,LA)
      GO TO 62
   61 SE = CBL
      GO TO 62
   63 SE = CBM
      GO TO 62
   64 SE = CBN
   62 CONTINUE
      IF(SUB(N6,LA) .EQ. 0.0) GO TO 71
      IF(SUB(N6,LA) .EQ. -1.0 .OR. SUB(N6,LA) .EQ. -100.) GO TO 73
      IF(SUB(N6,LA) .EQ. -.001) GO TO 74
      SF = SUB(N6,LA)
      GO TO 72
   71 SF = CBL
      GO TO 72
   73 SF = CBM
      GO TO 72
   74 SF = CBN
   72 CONTINUE
      IF(SUB(N7,LA) .EQ. 0.0) GO TO 81
      IF(SUB(N7,LA) .EQ. -1.0 .OR. SUB(N7,LA) .EQ. -100.) GO TO 83
```

```
      IF(SUB(N7,LA) .EQ. -.001) GO TO 84
      SG = SUB(N7,LA)
      GO TO 82
   81 SC = CBL
      GO TO 82
   83 SG = CBM
      GO TO 82
   84 SC = CBN
   82 CONTINUE
      IF(SUB(N8,LA) .EQ. 0.0) GO TO 91
      IF(SUB(N8,LA) .EQ. -1.0 .OR. SUB(N8,LA) .EQ. -100.) GO TO 93
      IF(SUB(N8,LA) .EQ. -.001) GO TO 94
      SH = SUB(N8,LA)
      GO TO 92
   91 SH = CBL
      GO TO 92
   93 SH = CBM
      GO TO 92
   94 SH = CBN
   92 CONTINUE
      IF(SUB(N9,LA) .EQ. 0.0) GO TO 101
      IF(SUB(N9,LA) .EQ. -1.0 .OR. SUB(N9,LA) .EQ. -100.) GO TO 103
      IF(SUB(N9,LA) .EQ. -.001) GO TO 104
      SI = SUB(N9,LA)
      GO TO 102
  101 SI = CBL
      GO TO 102
  103 SI = CBM
      GO TO 102
  104 SI = CBN
  102 CONTINUE
      WRITE(6,CRB) (SVA(LA),SVB(LA),SVC(LA),SVD(LA),
     2SA,SB,SC,SD,SE,SF,SG,SH,SI)
      RETURN
      END


      SUBROUTINE DATAPS(FLXA,FLXB,FLXC,FLXD,FLXE,SUB,NP1,NP2,LA,NPACT)

C     THIS SUBROUTINE ACCOMPLISHES THE ACTUAL PRINTING OUT OF DATA ON
C     FLUXES.
C     THE SUBROUTINE USES A VARIABLE FORMAT TECHNIQUE.  IT CAN PRINT
C     DATA OUT IN A NUMERICAL FORM, OR LEAVE BLANKS OR PRINT SPECIAL
C     SYMBOLS IN THE A-FORMAT IF REQUIRED.

      IMPLICIT REAL*4 (A-H,O-Z)
      DIMENSION FLXA(1),FLXB(1),FLXC(1),FLXD(1),FLXE(1)
      DIMENSION SUB(20,40)
      DIMENSION CRB(100)
      DATA FMS/6HE10.4,/
      DATA FMT/6HA5,5X,/
      DATA FMU/6HE10.4)/
      DATA FMV/3HA5)/
      DATA FMA/3H(5A/
      DATA FMB/2H5,/
      DATA CBL/'     '/
      DATA CBM/'    **'/
      DATA CBN/'    0.'/
```

```
      CRB(1) = FMA
      CRB(2) = FMB
      NP2N = NP2 - 1
      NPIN = NP2 + 2
      NPEND = NPAGT*9
      NPENF = NPEND + 2
      NPENDM = NPEND - 1
      N1 = NP1
      N2 = NP1 +1
      N3 = NP1 + 2
      N4 = NP1 + 3
      N5 = NP1 + 4
      N6 = NP1 + 5
      N7 = NP1 + 6
      N8 = NP1 + 7
      N9 = NP1 + 8
      J = 2
      DO 10 I=NP1,NPENDM
      J = J + 1
      IF(SUB(I,LA) .EQ. -1.0 .OR. SUB(I,LA) .EQ. -100.) GO TO 11
      IF(SUB(I,LA) .EQ. 0.0) GO TO 11
      IF(SUB(I,LA) .EQ. -.001) GO TO 11
      CRB(J) = FMS
      GO TO 12
   11 CONTINUE
      CRB(J) = FMT
   12 CONTINUE
   10 CONTINUE
      I = NPEND
      IF(SUB(I,LA) .EQ. 0.0) GO TO 13
      IF(SUB(I,LA) .EQ. -1.0 .OR. SUB(I,LA).EQ. -100.) GO TO 13
      IF(SUB(I,LA) .EQ. -.001) GO TO 13
      CRB(NPENF) = FMU
      GO TO 14
   13 CRB(NPENF) = FMV
   14 CONTINUE
      IF(SUB(N1,LA) .EQ. 0.0) GO TO 21
      IF(SUB(N1,LA) .EQ. -1.0 .OR. SUB(N1,LA) .EQ. -100.) GO TO 23
      IF(SUB(N1,LA) .EQ. -.001) GO TO 24
      SA = SUB(N1,LA)
      GO TO 22
   21 SA = CBL
      GO TO 22
   23 SA = CBM
      GO TO 22
   24 SA = CBN
   22 CONTINUE
      IF(SUB(N2,LA) .EQ. 0.0) GO TO 31
      IF(SUB(N2,LA) .EQ. -1.0 .OR. SUB(N2,LA) .EQ. -100.) GO TO 33
      IF(SUB(N2,LA) .EQ. -.001) GO TO 34
      SB = SUB(N2,LA)
      GO TO 32
   31 SB = CBL
      GO TO 32
   33 SB = CBM
      GO TO 32
   34 SB = CBN
   32 CONTINUE
      IF(SUB(N3,LA) .EQ. 0.0) GO TO 41
      IF(SUB(N3,LA) .EQ. -1.0 .OR. SUB(N3,LA) .EQ. -100.) GO TO 43
      IF(SUB(N3,LA) .EQ. -.001) GO TO 44
      SC = SUB(N3,LA)
```

```
      GO TO 42
   41 SC = CBL
      GO TO 42
   43 SC = CBM
      GO TO 42
   44 SC = CBN
   42 CONTINUE
      IF(SUB(N4,LA) .EQ. 0.0) GO TO 51
      IF(SUB(N4,LA) .EQ. -1.0 .OR. SUB(N4,LA) .EQ. -100.) GO TO 53
      IF(SUB(N4,LA) .EQ. -.001) GO TO 54
      SD = SUB(N4,LA)
      GO TO 52
   51 SD = CBL
      GO TO 52
   53 SD = CBM
      GO TO 52
   54 SD = CBN
   52 CONTINUE
      IF(SUB(N5,LA) .EQ. 0.0) GO TO 61
      IF(SUB(N5,LA) .EQ. -1.0 .OR. SUB(N5,LA) .EQ. -100.) GO TO 63
      IF(SUB(N5,LA) .EQ. -.001) GO TO 64
      SE = SUB(N5,LA)
      GO TO 62
   61 SE = CBL
      GO TO 62
   63 SE = CBM
      GO TO 62
   64 SE = CBN
   62 CONTINUE
      IF(SUB(N6,LA) .EQ. 0.0) GO TO 71
      IF(SUB(N6,LA) .EQ. -1.0 .OR. SUB(N6,LA) .EQ. -100.) GO TO 73
      IF(SUB(N6,LA) .EQ. -.001) GO TO 74
      SF = SUB(N6,LA)
      GO TO 72
   71 SF = CBL
      GO TO 72
   73 SF = CBM
      GO TO 72
   74 SF = CBN
   72 CONTINUE
      IF(SUB(N7,LA) .EQ. 0.0) GO TO 81
      IF(SUB(N7,LA) .EQ. -1.0 .OR. SUB(N7,LA) .EQ. -100.) GO TO 83
      IF(SUB(N7,LA) .EQ. -.001) GO TO 84
      SG = SUB(N7,LA)
      GO TO 82
   81 SG = CBL
      GO TO 82
   83 SG = CBM
      GO TO 82
   84 SG = CBN
   82 CONTINUE
      IF(SUB(N8,LA) .EQ. 0.0) GO TO 91
      IF(SUB(N8,LA) .EQ. -1.0 .OR. SUB(N8,LA) .EQ. -100.) GO TO 93
      IF(SUB(N8,LA) .EQ. -.001) GO TO 94
      SH = SUB(N8,LA)
      GO TO 92
   91 SH = CBL
      GO TO 92
   93 SH = CBM
      GO TO 92
   94 SH = CBN
   92 CONTINUE
```

```
      IF(SUB(N9,LA) .EQ. 0.0) GO TO 101
      IF(SUB(N9,LA) .EQ. -1.0 .OR. SUB(N9,LA) .EQ. -100.) GO TO 103
      IF(SUB(N9,LA) .EQ. -.001) GO TO 104
      SI = SUB(N9,LA)
      GO TO 102
  101 SI = OBL
      GO TO 102
  103 SI = OBM
      GO TO 102
  104 SI = OBN
  102 CONTINUE
      WRITE(6,C88) (FLXA(LA),FLX3(LA),FLXC(LA),FLXD(LA),FLXE(LA),
     2SA,SB,SC,SD,SE,SF,SG,SH,SI)
      RETURN
      END
```

```
C     GENERAL CONTROL DATA CARD

   13    2    1    2
```

```
C     DATA UTILIZED IN PRINTING TITLES OF COMPARTMENTS, ETC.

 ORGANIC MATTER   CARBON(C)       ENERGY            ASH              SODIUM(NA)
 POTASSIUM(K)     CALCIUM(CA)     MAGNESIUM(MG)     MANGANESE(MN)    IRON(FE)
 ALUMINUM(AL)     ZINC(ZN)        COPPER(CU)        NITROGEN(N)      PHOSPHORUS(P)
 SULFUR(S)        SILICON(SI)
OVERSTORY LEAVES     FRUITS,FLOWERS       BRANCHES-SUM
BRANCHES-BARK        BRANCHES-WOOD        BOLE-SUM
BOLE-BARK            BOLE-WOOD            STANDING DEAD
SUM-OVERSTORY        UNDERSTORY-LEAVES    UND. FRUITS,FLOWERS
UND. BRANCHES-SUM    UND. BRANCHES-BARK   UND. BRANCHES-WOOD
UND. BOLE-SUM        UND. BOLE-BARK       UND. BOLE-WOOD
UND. STANDING DEAD   SUM-UNDERSTORY       HERBACEOUS (FIELD)
EPIPHYTES-TOTAL      TOTAL PLANTS         LIVING ROOTS-SUM
LIVING ROOTS >5 MM   LIVING ROOTS 2-5 MM  LIVING ROOTS <5 MM
DEAD ROOTS           SOIL TOP ORGANIC     ROOTING ZONE
INTENSIVE ROOTED     EXTENSIVE ROOTED     SUBSOIL
HETEROTROPHS-SUM     ABOVEGROUND CONSUMERSDECOMPOSER FAUNA
DECOMPOSER FLORA
CONSUMPTION-TOTAL          CONS.-FOLIAGE-TOTAL        CONS.-OVERSTORY
CONS.-UNDERSTORY           CONS.-HERBACEOUS           CONS.-WOOD-TOTAL
CONS.-WOOD-OVERSTORY       CONS.-WOOD-UNDERSTORY      CONS.-ROOTS-TOTAL
LITTERFALL-TOTAL           LITTERFALL-LEAF            LITTERFALL-FLOWER,FRUIT
LITTERFALL-BRANCH          LITTERFALL-BOLE            LITTERFALL-GRASS
LITTERFALL-EPIPHYTS        ATMOSPHERIC INPUT          PRECIPITATION
DRY PARTICULATES(DUST)     GASEOUS FIXATION           LEACHING
LEAF WASH                  STEM FLOW                  LEACHING IN SOIL LAYERS
OUTPUT                     OUTPUT-WIND EROSION        OUTPUT-WATER EROSION
OUTPUT-PERCOLATION
```

```
C     EXAMPLE OF A DATA SET
```

D.E.REICHLE,H.H.SHUGART OAK RIDGE, TENNESSEE
LIRIODENDRON - MESIC DECIDUOUS
LIRIODENRON TULIPIFERA, QUERCUS SP., CARYA TOMENTOSA, CORNUS FLORIDA, CERCIS CANADENSIS, PINUS ECHINATA

1968-1972

OAKRIDGERICHLE SHUGART
ALLUVIAL
DOLOMITE LIMESTONE
WELL DRAINED

48	7.12	22.1	.36	NO DATA	14090.	3370.
30	1380.	710.	N 35 55	W 80 77	230	NO DATA
12350C.	1265	13.3	220	19.5	705	NO DATA
81604	5.8	60				

PUBLISHED

95	55	42	8	10									
01	01	375.0E 00		01	02	435.0E-01	01	03	292.5E 01	01	06	107.7E 02	
01	09	833.0E 00		01	10	142.5E 02	01	11	500.0E-01	01	13	213.0E 00	
01	16	589.0E 00		01	20	852.0E 00	01	21	282.0E-01	01	24	432.3E 01	
01	29	557.0E 00		01	30	211.2E 02	01	34	326.8E-01	01	35	284.0E-03	
01	36	206.0E-01		01	37	116.0E-01	02	01	186.0E 00	02	02	216.0E-01	
02	03	145.1E 01		02	06	534.3E 01	02	09	413.2E 00	02	10	741.5E 00	
02	11	248.0E-01		02	13	105.0E 00	02	16	290.0E 00	02	20	419.8E 00	
02	21	140.0E-01		02	24	167.3E 01	02	29	237.0E 00	02	30	122.5E 02	
02	34	147.8E-01		02	35	129.0E-03	02	36	930.0E-02	02	37	520.0E-02	
03	01	176.2E 06		03	02	226.3E 05	03	03	136.2E 07	03	06	507.2E 07	
03	09	360.8E 06		03	10	699.3E 07	03	11	707.4E 05	03	13	986.4E 05	
03	16	271.1E 06		03	20	380.5E 06	03	21	125.4E 05	03	24	197.9E 07	
03	29	161.5E 06		03	30	512.0E 07	03	34	163.4E 05	03	35	140.0E 03	
03	36	104.0E 05		03	37	530.0E 04	06	01	268.0E-02	06	23	391.7E-01	
06	03	554.0E-02		06	06	335.0E-02	06	09	177.5E-01	06	10	333.2E-01	
06	11	430.0E-03		06	13	650.0E-03	06	16	740.0E-03	06	20	182.0E-02	
06	21	210.0E-03		06	24	635.0E-02	06	29	480.0E-03	06	30	563.0E-01	
06	34	936.0E-04		06	35	140.0E-05	06	36	863.0E-04	06	37	590.0E-05	
07	01	759.5E-02		07	02	352.0E-03	07	03	215.0E-01	07	06	978.0E-01	
07	09	431.0E-02		07	10	121.0E 00	07	11	730.0E-02	07	13	139.0E-02	
07	16	352.0E-02		07	20	569.6E-02	07	21	721.0E-03	07	23	129.4E 00	
07	29	105.6E-01		07	30	378.4E 00	07	34	. E	07	35	400.0E-06	
07	36	345.0E-04		07	37	000.0E 00	07	12	564.0E-04	07	24	128.0E-01	
07	25	530.0E-02		07	27	760.0E-02	07	28	189.0E-02			. E	
01	03	575.0E-01		01	06	225.4E-02	01	10	279.7E 00	01	13	200.0E-02	
01	16	800.0E-02		01	20	810.0E-02	01	24	443.0E-01	01	25	221.0E-01	
01	26	221.0E-01		01	29	160.0E-02	01	30	100.0E-01	02	03	270.0E-01	
02	06	112.0E 00		02	10	139.0E 00	02	13	100.0E-02	02	16	300.0E-02	
02	20	400.0E-02		02	24	220.0E-01	02	25	110.0E-01	02	26	110.0E-01	
02	29	800.0E-03		02	30	590.0E-02	03	03	067.7E 06	03	06	117.2E 07	
03	10	144.0E 07		03	13	930.0E 04	03	16	276.0E 05	03	20	368.0E 05	
03	24	202.8E 06		03	25	101.4E 06	03	26	101.4E 06	03	29	730.0E 04	
03	30	240.0E 05		06	03	110.0E-03	06	06	200.0E-03	06	10	310.0E-03	
06	13	000.0E-05		06	16	000.0E-05	06	20	140.0E-04	06	24	700.0E-04	
06	25	350.0E-04		06	26	350.0E-04	06	29	100.0E-05	06	30	200.0E-04	
07	03	420.0E-02		07	06	184.0E-03	07	10	026.0E-02	07	13	130.0E-04	
07	16	360.0E-04		07	20	430.0E-04	07	24	131.0E-03	07	25	660.0E-04	
07	26	000.0E-04		07	29	150.0E-04	07	30	179.0E-03			. E	
01	10	457.7E 00		01	11	375.0E 00	01	12	160.0E-01	01	13	170.0E-01	
01	14	886.0E-01		01	15	670.0E-02	02	01	800.0E-02	02	02	470.0E-02	
02	03	400.0E-02		02	04	500.0E-03	02	05	200.0E-03	02	10	227.0E 00	
02	11	157.0E 00		02	12	000.0E-02	02	13	800.0E-02	02	14	490.0E-01	
02	15	500.0E-02		02	17	137.4E 01	02	20	135.4E 01	06	01	170.0E-03	
06	11	020.0E-03		06	15	170.0E-03	06	21	178.0E-02	06	22	165.0E-02	

```
06   23 900.0E-04   06   24 380.0E-03   06   25 380.0E-03   07   01 320.0E-03
07   13 930.2E-02   07   11 777.3E-02   07   12 409.0E-03   07   13 701.0E-03
07   14 859.0E-03   07   15 320.0E-03   07   17 105.0E-02   07   18 105.1E-03
07   13 945.9E-03   07   21 144.5E-02   07   22 140.3E-02   07   23 420.0E-04
07   24 274.0E-02   07   25 274.0E-02                   . E                  . E
 1 135.4E 01    3 126.0E 00    6 242.0E 00   11 217.0E 00   16 640.0E-01
21 550.0E-01   24 780.0E 00   29 173.0E 00
 1 208.0E 00    3 810.0E-01    5 890.0E-01   11 280.0E-01   16 290.0E-01
21 100.0E-01   23 941.0E 00   24 496.0E 00   30 620.0E-01   34 460.0E 00
```

A note to the computer outprints

regarding INCREMENTS

In the data listed under INCREMENT there are uncertainties about the real nature of these data. We have to distinguish between

a) net annual increment NAI as the increase of the size of a compartment from one year to the next year. It may be calculated as the difference between the sum of all inputs - I and the sum of all outputs O of a compartment:

$$NAI = \sum I - \sum O$$

b) net annual production NAP is the sum of all metabolic inputs into a compartment

$$NAP = \sum I \text{ metabolic}$$

For example (potassium in the leaves compartment)

	July 1, 1973	July 1, 1974
compartment size	100	110

annual fluxes from July 1, 1973 to July 1, 1974 :

metabolic input NAP	150
litter fall	100
leaching with precipitation	40
NAI = 150 -(100 + 40) =	10

PROJECT REPRESENTATIVES ARE URGENTLY ASKED TO CL-ARIFY THE MEANING OF THEIR INCREMENT VALUES LISTED IN THE COMPUTER OUTPRINTS: PLEASE INFORM DE ANGELIS ON ANY NECESSARY CORRECTIONS.

THE DATA SETS PRINTED BELOW ARE THOSE REACHING GOETTINGEN BEFORE THE DEADLINE OF SEPT 1 PLUS AS MANY AS POSSIBLE OF THOSE SETS ARRIVING LATER. PARTICIPANTS ARE STRONGLY URGED TO CHECK THEIR OWN DATA IN THE TABLES BELOW SO THAT ERRORS MAY BE CORRECTED IF NECESSARY. IF YOU FIND ERRORS PLEASE LEAVE A NOTE INDICATING THE ERRORS ON THE BULLETIN BOARD ON THE 3RD FLOOR OF THE FORESTRY BUILDING

THE DATA HAVE BEEN PLACED ON PUNCHED CARDS AND MAGNETIC TAPE. THE COMPUTER PROGRAM WHICH HAS PRINTED THIS DATA WILL ALSO PERMIT A VARIETY OF REARRANGEMENTS OF DATA. FOR EXAMPLE, ONE MIGHT WANT TO LIST SEVERAL QUANTITIES, SUCH AS PRECIPITATION, TEMPERATURE, AND PRODUCTIVITY, FOR A NUMBER OF PROJECTS, SIDE-BY-SIDE FOR COMPARISON. IF THE WORKING GROUPS THINK THAT ANY SUCH REARRANGEMENTS WOULD BE USEFUL PLEASE INFORM DON DE ANGELIS

SEVERAL ABBREVIATIONS ARE USED IN THE PRINTOUT. THESE ARE LISTED BELOW

M = METERS
SQ.M = SQUARE METER
HA = HECTARES
CM = CENTIMETERS
DEG = DEGREES
MIN = MINUTES
L = LITERS
CAL = CALORIES
KCAL = KILOCALORIES

THE TERM 'NO DATA' IS USED WHEN NO DATA HAS BEEN PROVIDED OR THERE WAS NOT SUFFICIENT TIME TO OBTAIN SUCH DATA FROM THE REFERENCE LITERATURE SENT BY PARTICIPANTS

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): D.E.REICHLE,M.H.SHUGART SITE: OAK RIDGE, TENNESSEE

YEAR(S): 1968-1972

FOREST TYPE: LIRIODENDRON - MESIC DECIDUOUS

SOIL TYPE: ALLUVIAL

GEOLOGY: DOLOMITE LIMESTONE

PRINCIPLE PLANT TYPES: LIRIODENRON TULIPIFERA, QUERCUS SP., CARYA TOMENTOSA, CORNUS FLORIDA, CERCIS CANADENSIS, PINUS ECHINATA

SOIL DRAINAGE: WELL DRAINED

AGE OF STAND: 48 YEARS LEAF AREA INDEX: 7.12 SQ.M/SQ.M

BASAL AREA: 22.1 SQ.M/HA BASAL AREA INCREM.: .36 SQ.M/HA

STAND HEIGHT: 30 M STOCKING DENSITY: NO DATA STEMS/HA

STANDING CROP, ABOVEGROUND: 14090. G/SQ.M STANDING CROP, BELOWGROUND: 3370. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1360. G/SQ.M PRODUCTIVITY BELOWGROUND: 710. G/SQ.M

LATITUDE: N 35 DEG 55 MIN LONGITUDE: W 80 DEG 77 MIN

ALTITUDE: 290 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: 123600. CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 13.3 DEG C

MEAN ANNUAL PRECIPITATION: 1265 L/SQ.M

LENGTH OF GROWING SEASON: 220 DAYS

TEMPERATURE DURING GROWING SEASON: 19.5

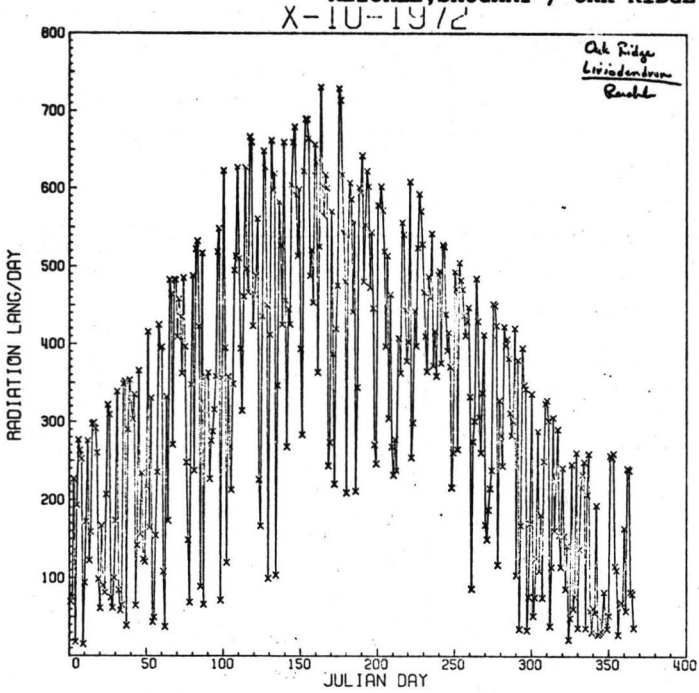
MEAN PRECIPITATION DURING GROWING SEASON: 705 L/SQ.M

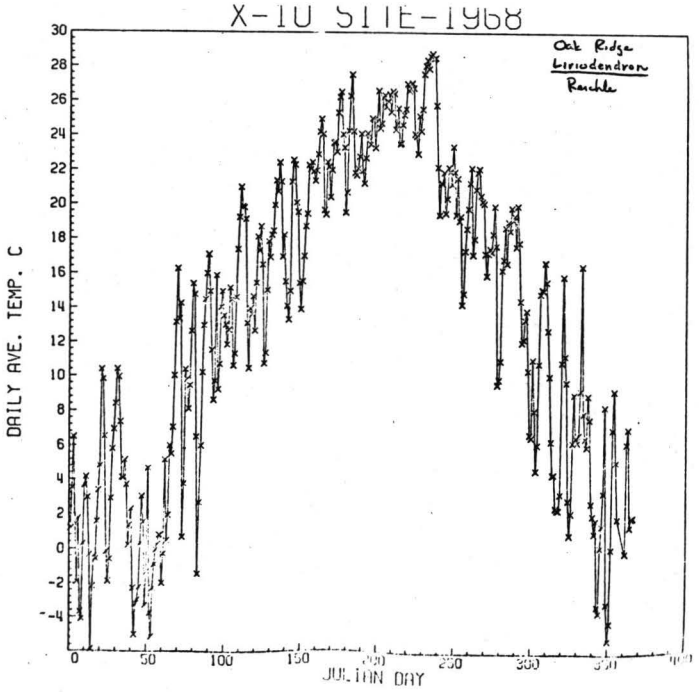
MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: 81600 CAL/SQ. CM

PH: 6.8 DEPTH OF ROOTING ZONE: 60 CM

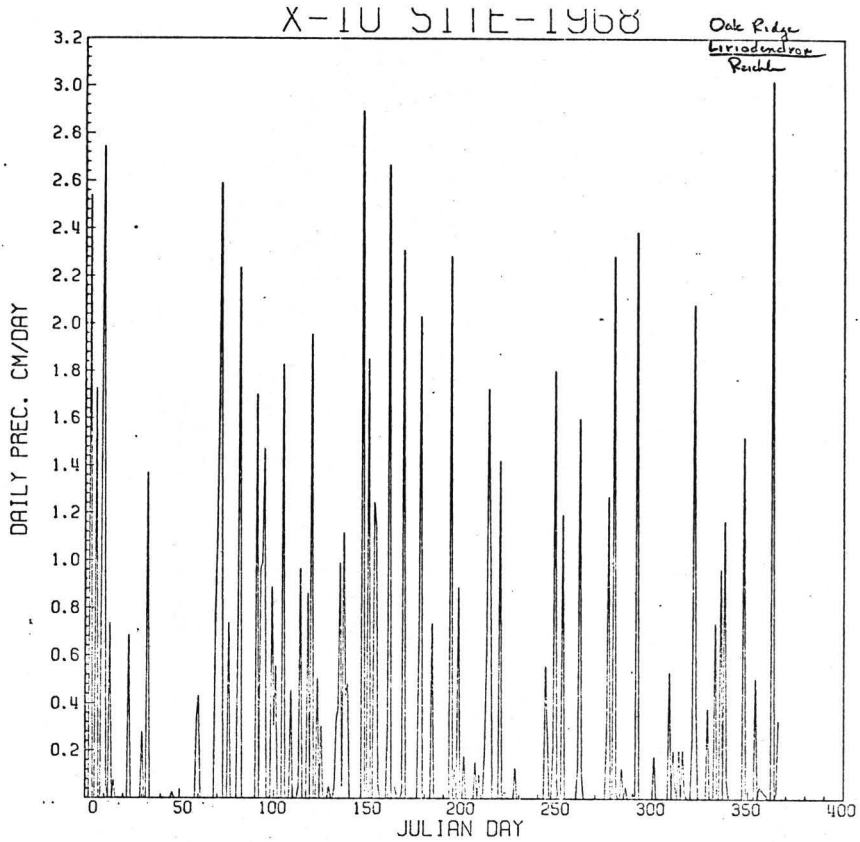
STATUS OF DATA: PUBLISHED

REICHLE, SHUGART / OAK RIDGE





REICHLE, SHUGART / OAK RIDGE



GENERAL SITE DESCRIPTIONS

RESEARCHER(S): D.L.LOUCKS, G.J.LARSON SITE: NOE WOODS (LAKE WINGRA),WISCONSIN

YEAR(S): 1970-1972

FOREST TYPE: OAK: WISCONSIN (PRAIRIE-BORDER)

SOIL TYPE: MIAMI SILT LOAM (DODGE)

GEOLOGY: LOESS,OVER PLEISTOCENE OUTWASH,OVER ORDOVICIAN LIMESTONE-DOLOMITE

PRINCIPLE PLANT TYPES: QUERCUS ALBA, QUERCUS VELUTINA, PRUNUS SEROTINA

SOIL DRAINAGE: DEEP

AGE OF STAND: 130 YEARS LEAF AREA INDEX: 4.9 SQ.M/SQ.M

BASAL AREA: 33.2 SQ.M/HA BASAL AREA INCREM.: .32 SQ.M/HA

STAND HEIGHT: 23.7 M STOCKING DENSITY: 422 STEMS/HA

STANDING CROP. ABOVEGROUND: 26935. G/SQ.M STANDING CROP. BELOWGROUND: 6619. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 819. G/SQ.M PRODUCTIVITY BELOWGROUND: 662. G/SQ.M

LATITUDE: N 43 DEG 02 MIN LONGITUDE: W 89 DEG 24 MIN

ALTITUDE: 273.6 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: 40000 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.9 DEG C

MEAN ANNUAL PRECIPITATION: 777 L/SQ.M

LENGTH OF GROWING SEASON: 171 DAYS

TEMPERATURE DURING GROWING SEASON: 19.5

MEAN PRECIPITATION DURING GROWING SEASON: 292 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 6.8 DEPTH OF ROOTING ZONE: 160 CM

STATUS OF DATA:

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): SATCHELL SITE: HEATHOP WOOD, UNITED KINGDOM

YEAR(S): 1967-1972

FOREST TYPE: MIXED DECIDUOUS

SOIL TYPE: GLACIAL DRIFT AND BROWN EARTHS

GEOLOGY: CARBONIFEROUS LIMESTONE

PRINCIPLE PLANT TYPES: QUERCUS PETRAEA, QUERCUS ROBUS, BETULA PENDULA, BETULA PUBESCENS, FRAXINUS EXCELSIOR, CORYLUS AVELLANA

SOIL DRAINAGE: FREE

AGE OF STAND: MIXED YEARS LEAF AREA INDEX: 5.3 SQ.M/SQ.M

BASAL AREA: 25.3 SQ.M/HA BASAL AREA INCREM.: 0.5 SQ.M/HA

STAND HEIGHT: 13 M STOCKING DENSITY: 759 STEMS/HA

STANDING CROP, ABOVEGROUND: 12841.5 G/SQ.M STANDING CROP, BELOWGROUND: 7521.3 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 780.4 G/SQ.M PRODUCTIVITY BELOWGROUND: 266.8 G/SQ.M

LATITUDE: 54 DEG 12.5 MIN LONGITUDE: 2 DEG 63.5 MIN

ALTITUDE: 46 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72018 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7.8 DEG C

MEAN ANNUAL PRECIPITATION: 1115 L/SQ.M

LENGTH OF GROWING SEASON: 244 DAYS

TEMPERATURE DURING GROWING SEASON: 10.0

MEAN PRECIPITATION DURING GROWING SEASON: 797 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 62287 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0-6.1 DEPTH OF ROOTING ZONE: 20-30 CM

STATUS OF DATA:

TIME DEPENDANT VARIABLES

SATCHELL / MEATHOP

Mean values 1967-1972 are quoted unless otherwise shown

Month	Solar Radiation g/cal/cm^2	Air Temp. °C	Precipitation mm.	Run of Wind km.	Soil Temperatures + 0 cm °C	10 cm °C	20 cm °C
Jan.	1061	3.6	98	8336	4.2	4.5	4.6
Feb.	2593	2.7	71	7792	3.0	3.6	3.9
Mar.	5122	4.3	89	10348	4.7	4.8	4.8
Apr.	8361	6.3	73	8643	7.5	7.4	7.1
May	9962	9.2	89	6823	10.2	9.9	9.5
June	12067	11.9	88	6996	13.0	12.5	11.9
July	11287	12.9	88	7265	13.7	13.3	12.8
Aug.	8994	13.3	99	6600	13.7	13.5	13.1
Sept.	6371	11.8	104	7230	12.6	12.5	12.4
Oct.	3553	9.7	130	10022	10.5	10.8	10.9
Nov.	1692	5.2	126	7484	6.1	6.9	7.3
Dec.	955	3.4	89	6692	4.4	5.1	5.5
Total or Mean	72018	7.8	1115	94231	8.7	8.8	8.7

+ 1967-1969

SATCHELL / MEATHOP

SEASONAL DISTRIBUTION OF TREE AND SHRUB LEAF BIOMASS

R. G. H. Bunce,
J. M. Sykes

kg/ha dry weight

1968	Oak	Ash	Birch	Hazel	Total
10.4	-	-	-	7	-
23.4	-	-	35	-	-
25.4	-	-	-	20	-
1.5	53	-	-	-	-
13.5	132	-	176	68	402
21.5	-	25	-	-	-
4.6	955	284	313	95	1647
25.6	2372	835	392	377	3977
10.7	1939	738	427	322	3427
23.7	1457	965	493	491	3407
7.8	1033	828	379	330	2569
9.9	1366	1284	423	518	3591
7.10	1755	673	264	350	3043
4.11	376		158	207	742

Annual totals 1967-71 kg/ha

	Oak	Ash	Birch	Hazel	Other shrubs	Total
May 1967-Apr. 1968	130.9	156.4	70.9	199.8	1.5	559.5
May 1968-Apr. 1969	147.3	201.9	156.3	71.8	3.5	580.8
May 1969-Apr. 1970	204.3	445.9	199.6	145.6	0.5	995.3
May 1970-Apr. 1971	172.9	381.7	98.7	256.4	2.0	911.7
$\bar{x}$	163.85	296.48	131.38	168.40	1.88	761.83
%	21.51	38.92	17.25	22.10	0.25	

Monthly means 1967-71 kg/ha

	Oak	Ash	Birch	Hazel	Other shrubs	Total	%
Jan.	11.45	20.50	10.70	23.23	0.10	65.98	8.66
Feb.	9.35	19.03	8.90	24.78	0.18	62.23	8.17
Mar.	8.23	16.73	2.83	12.20	0.08	40.05	5.26
Apr.	1.65	10.60	11.10	9.28	0.13	32.75	4.30
May.	6.93	4.65	9.10	2.20	0.23	23.10	3.03
June	3.20	6.70	5.53	3.78	0.15	19.35	2.54
July	5.75	14.80	5.83	9.78	0.48	36.62	4.81
Aug.	3.50	3.80	4.83	11.60	0.08	23.80	3.12
Sept.	40.60	67.48	14.75	11.40	0.08	134.30	17.62
Oct.	23.68	57.20	12.53	11.63	0.30	105.33	13.82
Nov.	28.25	40.13	11.48	19.55	0.00	99.40	13.04
Dec.	21.28	34.88	33.83	29.00	0.10	119.08	15.63

SATCHELL / MEATHOP

9.2

LITTER - TWIGS J. M. Sykes
(Twigs < 43 cm long collected from 30 litter traps weekly or 2 weekly)

Annual Total weights kg/ha

	1966	1967	1968	1969	1970
	1616	752	732	689	1208
Oak only	-	443.8	432.6	407.2	715.1

Seasonal distribution

Jan	15.1	17.8	65.5	6.4	43.19
Feb	8.5	83.4	12.5	35.8	68.73
Mar	6.4	12.2	55.1	117.7	4.13
Apr	697.3	8.1	5.1	26.3	79.64
May	326.9	16.8	20.3	3.6	38.93
June	23.2	70.7	37.2	20.9	51.28
July	79.9	22.8	156.1	34.0	65.55
Aug	38.6	13.2	11.4	21.3	40.41
Sept	168.5	304.6	209.0	176.0	533.70
Oct	35.6	202.7	119.3	79.7	141.57
Nov	51.4	11.3	15.4	97.3	128.96
Dec	164.8	8.4	24.6	76.0	12.05
Total	1616.2	772.0	731.5	689.0	1208.14

Species distribution

		Oak	Ash	Birch	Hazel
Jan	b)	18.06	22.78	5.53	18.97
Feb +	b)	6.72	8.41	6.21	3.70
Jun ++	b)	32.70	23.74	7.09	0.84
July	b)	41.59	73.42	18.80	2.07
Aug	b)	11.97	1.85	0.54	2.13
Sept	a)	126.97	41.49	7.31	0.82
	b)	96.61	34.75	30.37	9.27
Oct	a)	132.92	4.60	37.24	23.34
	b)	105.64	19.09	19.89	4.37
Nov	a)	19.52	1.22	16.81	6.79
	b)	10.31	0.00	4.19	2.48
Dec	a)	7.04	1.65	1.55	3.36
	b)	18.54	6.16	7.74	0.66

March-May Collections not sorted

a) = 1967
b) = 1968

+ = based on 6 days data
++ = based on 16 days data

LEAF AREA INDEX **SATCHELL / MEATHOP**

R. G. H. Bunce
J. M. Sykes

1) *Estimated from canopy samples of not less than 50 buds per species

			LAI		
1968	Oak	Ash	Birch	Hazel	Total
10.4	-	-	-	0.008	-
23.4	-	-	0.06	-	-
25.4	-	-	-	0.04	-
1.5	0.09	-	-	-	-
13.5	0.25	-	0.36	0.51	1.12
21.5	-	0.04	-	-	-
4.6	1.59	0.46	0.43	0.76	3.24
25.6	3.02	0.83	0.50	0.97	5.32
10.7	2.90	1.03	0.52	0.83	5.28
23.7	2.03	1.06	0.63	1.25	4.97
7.8	1.51	0.92	0.50	0.79	3.72
9.9	1.95	1.37	0.53	1.27	5.12
7.10	2.25	0.46	0.37	0.84	3.92
4.11	0.62		0.14	0.57	1.33

2) *Estimated from litter collections (Table 8.3.1). Number of leaves in each litter trap counted and areas measured of 30 leaves of each species from each collection

	Oak	Ash	Birch	Hazel	Total
4.8	0.047	0.038	0.002	0.002	0.088
26.7	0.010	0.001	0.002	-	0.014
12.8	0.019	0.003	0.004	0.002	0.028
23.8	0.044	0.010	0.018	0.020	0.092
6.9	0.070	0.005	0.016	0.020	0.110
20.9	0.154	0.031	0.030	0.020	0.235
4.10	0.367	0.230	0.046	0.080	0.723
18.10	0.607	0.210	0.090	0.130	1.037
1.11	0.796	0.014	0.020	0.330	1.160
15.11	0.416	0.061	0.069	0.290	0.836
29.11	0.246	0.007	0.009	0.380	0.642
13.12	0.004	-	-	0.003	0.007
30.12	0.008	0.001	-	0.001	0.011
	2.788	0.611	0.308	1.278	4.985

SATCHELL / MEATHOP

ENERGY CONTENT OF LITTER

J. K. Hibberd, M. K. Hughes, E. J. White

Collection date 1966-67	1971/72		Kj/g O.D.	Kj/g Ash free
Oak leaves	at leaf fall		20.3	20.9
Combined sample Jan-Nov.			20.1	21.3
	1 Nov.		20.1	21.6
	13 Mar.		19.9	21.7
	24 May		20.0	22.0
Combined sample June-Dec.			19.7	20.8
	25 July		19.8	21.5
	25 Sept.		19.9	21.6
		$\bar{x}$	20.0	21.4
Ash leaves	at leaf fall		19.6	20.3
June-July			20.2	21.4
Sept.			19.1	20.8
Oct.			19.0	20.8
Nov.-Dec.			19.6	21.3
May-June			20.0	21.4
July-Aug.			19.6	20.9
Sept.			19.7	21.5
Oct.			19.9	21.6
Nov.			20.0	21.5
		$\bar{x}$	19.7	21.2
Ash rachides	25 July		19.3	19.4
Combined sample Aug.-Nov.			18.0	19.4
Birch leaves	at leaf fall		21.3	22.0
	24 May		20.9	22.7
combined sample Mar.-Nov.			21.9	23.0
combined sample June-Dec.			21.7	22.6
		$\bar{x}$	21.45	22.6
Hazel leaves	at leaf fall		18.5	19.8
	24 May		19.4	21.7
combined sample May-Nov.			19.3	20.8
combined sample June-Nov.			19.2	20.6
		$\bar{x}$	19.1	20.7
Hawthorn leaves				
combined sample May-Nov.			19.7	21.3
combined sample June-Apr.			18.6	20.3
Other tree and shrub leaves	24 May		20.8	22.3
Freshly fallen green tree and shrub leaves				
	combined sample May-Sept.		20.3	21.7
Previous year's litter (pre leaf fall 1971)				
	24 May		18.4	22.0
Rubus leaves	25 July		19.3	21.2
Other ground flora	25 Sept.		19.5	20.6
Tree and shrub twigs				
combined sample June-Nov.			20.8	21.3
	25 Sept.		20.2	21.0
	1 Nov.		19.6	21.0
Rubus twigs	24 May		19.4	20.0
Fruits and seeds	3 Jan.		19.8	20.5
	13 Mar.		18.8	20.5
Buds and bud scales				
combined sample May-Nov.			20.4	21.3
Miscellaneous debris	13 Mar.		20.6	24.6
combined sample May-Nov.			20.6	21.9
combined sample May-Nov.			20.5	21.8
Mean of all samples (n = 45)			19.85	21.29

SATCHELL / MEATHOP

ENERGY CONTENT AND CHEMICAL COMPOSITION OF RUBUS VESTITUS — K. Taylor

Energy content

	Kcal/g d.w.	Kcal/g ash free	Kjoules/g d.w.	Kjoules/g ash free
Above ground parts	4.45	4.66	18.63	19.51
Roots	4.37	4.48	18.33	18.76

Chemical composition

Above ground parts

1968	17 Mar.	23 Apr.	4 June	17 July	4 Sept.	15 Oct.
Biomass kg/ha	201.74	260.77	350.56	339.00	333.08	299.70
N %	1.66	1.97	1.90	1.56	1.36	1.32
kg/ha	3.3489	5.1372	6.6606	5.2884	4.5299	3.9560
P %	0.13	0.12	0.11	0.12	0.11	0.11
kg/ha	0.2623	0.2129	0.2856	0.4068	0.3664	0.3297
K %	0.85	0.88	1.17	1.03	0.87	0.94
kg/ha	1.7148	2.2948	4.1016	3.4917	2.8978	2.8172
Ca %	0.65	0.74	0.79	0.86	1.05	1.03
kg/ha	1.3113	1.9297	2.7694	2.9154	3.4973	3.0869
Na %	0.088	0.081	0.072	0.052	0.050	0.073
kg/ha	0.1775	0.2112	0.2524	0.1763	0.1665	0.2188
Mg %	0.21	0.24	0.27	0.25	0.24	0.24
kg/ha	0.4237	0.6258	0.9465	0.8475	0.7994	0.7193

Below ground parts

		Feb.	May	Oct.
Above ground biomass kg/ha	(* interpolated)	221.3*	305.7*	299.7
Below ground biomass kg/ha	(x 1.203)	226.4	312.7	306.6
	N %	0.85	0.74	0.98
	kg/ha	1.924	2.314	3.005
	P %	0.19	0.067	0.059
	kg/ha	0.430	0.210	0.181
	K %	0.44	0.31	0.46
	kg/ha	0.996	0.969	1.410
	Ca %	0.31	0.36	0.39
	kg/ha	0.702	1.126	1.196
	Na %	0.093	0.082	0.073
	kg/ha	0.211	0.256	0.224
	Mg %	0.22	0.18	0.19
	kg/ha	0.498	0.563	0.583

SATCHELL / MEATHOP

CHEMICAL COMPOSITION OF TREE AND SHRUB STEMS — R. G. H. Bunc

BRANCHES > 1" diam.

	N	P	K	Ca	Mg
Oak wood	0.12	0.008	0.12	0.13	0.016
Oak bark	0.51	0.025	0.26	2.80	0.053
Ash wood	0.13	0.009	0.15	0.12	0.025
Ash bark	0.53	0.028	0.51	2.26	0.061
Birch wood	0.13	0.010	0.065	0.11	0.020
Birch bark	0.48	0.030	0.16	0.91	0.043
Sycamore wood	0.11	0.014	0.18	0.10	0.038
Sycamore bark	0.79	0.055	0.38	3.04	0.093
Hazel wood + bark	0.22	0.015	0.13	0.28	0.031

BRANCHES < 1" diam.

Oak (wood + bark)	0.48	0.034	0.22	0.51	0.049
Ash (wood + bark)	0.49	0.035	0.39	0.52	0.048
Birch (wood + bark)	0.55	0.039	0.17	0.35	0.043
Sycamore (wood + bark)	0.53	0.038	0.27	0.51	0.055
Hazel (wood + bark)	0.64	0.041	0.22	0.49	0.054

DEAD BRANCHES

Oak (wood + bark)	0.29	0.010	0.033	0.44	0.019
Ash (wood + bark)	0.32	0.014	0.19	0.51	0.044
Birch (wood + bark)	0.27	0.009	0.027	0.26	0.025
Sycamore (wood + bark)	0.31	0.011	0.037	0.64	0.037
Hazel (wood + bark) 5' high	0.39	0.016	0.033	0.54	0.027
Hazel (wood + bark) 5' high	0.35	0.012	0.032	0.39	0.022

CHEMICAL COMPOSITION OF DEAD ROOTS — J. K. Hibberd, S. E. Allen

Samples taken to provide a representative range of stages of decay. None of the elements showed significantly different concentrations in classes of roots representing approximately 1-4, 4-8, and 8-12 months decay.

Element	(%) n	Na	K	Ca	Mg	N	P
Oak	17	0.016	0.260	0.584	0.080	0.599	0.023
Ash	22	0.028	0.186	1.093	0.133	0.556	0.022
Birch	20	0.016	0.121	0.479	0.081	0.454	0.024
Hazel	14	0.017	0.145	0.721	0.051	0.748	0.029
Mean		0.019	0.178	0.719	0.0863	0.589	0.025

SATCHELL / MEATHOP

CHEMICAL COMPOSITION OF LEAF LITTER — A. D. Bailey

(Analysis after drying at 105°C)

Species	Month	% ash (550°C)	% K	% Ca	% Mg	% P	% N	% soluble carbo-hydrate	% holo-cellu lose	% fats
Oak	0	4.6	0.38	1.6	0.18	0.059	1.29	5.7	43	4.9
	1	4.4	0.07	1.5	0.14	0.052	1.27	4.1	48	5.1
	2	4.0	0.06	1.5	0.10	0.049	1.38	3.3	46	4.1
	3	5.8	0.08	1.6	0.11	0.060	1.49	3.7	46	4.0
	6	4.8	0.13	1.5	0.08	0.081	1.73	2.9	43	3.3
	12	7.5	0.16	1.6	0.13	0.076	1.99	2.7	34	2.9
Hazel	0	8.5	0.85	1.75	0.30	0.083	1.86	4.6	39	2.7
	1	6.5	0.11	1.84	0.21	0.089	1.99	2.5	40	2.8
	2	5.4	0.11	1.88	0.17	0.095	2.07	2.6	41	3.0
	3	5.2	0.10	1.67	0.16	0.089	2.05	2.4	39	2.6
	6	9.2	0.16	1.92	0.13	0.100	2.18	2.1	36	1.7
Ash	0	8.5	0.64	2.5	0.38	0.059	1.92	6.4	43	4.4
	1	5.9	0.09	2.0	0.17	0.068	2.14	4.20	42	4.7
	2	7.5	0.11	2.0	0.17	0.073	2.31	4.9	40	4.4
	3	8.7	0.12	1.9	0.17	0.084	2.30	4.6	38	4.1
Elm	0	11.8	0.69	2.7	0.63	0.092	2.25	6.0	40	4.4
	1	12.2	0.11	3.1	0.33	0.078	2.14	3.5	41	4.6
	2	13.9	0.13	3.0	0.31	0.085	2.29	3.2	37	4.7
	3	18.5	0.15	2.9	0.32	0.083	2.33	3.2	36	5.0
Birch	0	4.8	0.45	1.4	0.28	0.044	1.30	6.6	44	7.6
	1	3.9	0.11	1.4	0.22	0.054	1.55	3.0	48	7.5
	2	4.1	0.12	1.4	0.23	0.068	1.86	2.7	46	7.9
	3	5.6	0.12	1.4	0.23	0.064	1.82	2.8	47	7.9
	6	6.4	0.13	1.5	0.15	0.077	2.05	2.6	41	7.4
	12	8.2	0.15	1.6	0.16	0.095	2.53	2.3	35	3.6
F layer Humus	-	78.0	0.69	0.61	0.31	0.075	0.71	0.62	7.1	0.36

* Litter collected on falling — air dried — replaced in litter layer in nylon mesh bags to be retrieved at the intervals shown.

SATCHELL / MEATHOP

CHEMICAL COMPOSITION OF LITTER (see also 4.3)

S. E. Allen, J. K. Hibberd

Material	Date 1971 - 1972	Ash %	Na %	K %	Ca %	Mg %	N %	P %
Leaves								
Oak	1 Nov.	7.1	0.069	0.406	2.0	0.23	1.5	0.056
	3 Jan.	6.5	0.065	0.30	1.8	0.19	1.8	0.086
	13 Mar.	8.1	0.063	0.147	2.2	0.15	1.8	0.069
	24 May	9.2	0.022	0.234	2.1	0.14	2.0	0.091
	25 July	7.9	0.016	0.219	2.2	0.18	1.9	0.097
	25 Sept.	8.1	0.022	0.259	2.2	0.25	2.0	0.10
Ash (leaflets)	1 Nov.	9.0	0.068	0.41	2.1	0.30	2.4	0.080
	3 Jan.	10.0	0.074	0.43	2.3	0.27	2.7	0.072
Ash (rachides)	1 Nov.	5.6	0.078	0.48	1.9	0.39	0.72	0.041
	3 Jan.	6.1	0.093	0.64	2.4	0.33	0.73	0.038
	25 July	0.2	<.003	0.11	0.81	0.068	0.84	0.052
	25 Sept.	3.4	0.003	0.14	0.91	0.073	0.94	0.059
Birch	1 Nov.	8.5	0.072	0.375	1.9	0.27	2.0	0.078
	3 Jan.	6.4	0.078	0.3	2.3	0.31	1.7	0.050
	13 Mar.	5.2	0.013	0.156	1.6	0.14	2.2	0.084
	24 May	7.9	0.019	0.234	1.7	0.13	2.2	0.094
	25 July	5.3	0.072	0.391	1.6	0.23	2.2	0.11
	25 Sept.	4.4	0.059	0.359	1.4	0.26	2.0	0.088
Hazel	1 Nov.	9.7	0.078	0.438	2.5	0.34	2.0	0.084
	3 Jan.	8.6	0.093	0.50	2.7	0.43	1.8	0.072
	13 Mar.	7.9	0.019	0.156	2.4	0.14	2.2	0.095
	24 May	10.2	0.022	0.203	2.5	0.18	2.3	0.11
	25 July	8.6	0.016	0.219	1.7	0.19	2.2	0.11
	25 Sept.	7.5	0.030	0.313	1.8	0.24	2.1	0.11
Other tree and shrub leaves	1 Nov.	10.6	0.091	0.350	1.4	0.37	1.9	0.087
	3 Jan.	10.0	0.018	0.44	3.0	0.47	2.1	0.084
	13 Mar.	7.8	0.020	0.141	2.4	0.14	2.3	0.088
	24 May	6.9	0.028	0.281	2.0	0.18	2.3	0.11
	25 July							
	25 Sept.	6.5	0.035	0.808	2.0	0.35	2.8	0.15
Rubus	1 Nov.	10.2	0.066	0.422	2.2	0.30	2.0	0.097
	3 Jan.	8.5	0.081	0.48	1.9	0.30	1.8	0.078
	13 Mar.	9.4	0.028	0.172	2.0	0.19	2.1	0.11
	24 May	8.7	0.045	0.250	1.4	0.17	2.4	0.13
	25 July	8.6	0.019	0.297	1.5	0.23	2.0	0.11
	25 Sept.	7.9	0.023	0.234	2.2	0.27	2.0	0.10
Other ground flora	1 Nov.	6.2	0.056	0.45	0.86	0.15	1.3	0.080
	3 Jan.	3.7	0.049	0.37	1.1	0.18	1.1	0.065
	24 May	8.3	0.016	0.19	1.4	0.093	1.3	0.075
	25 July	5.1	0.013	0.24	0.80	0.11	1.1	0.072
	25 Sept.	5.5	0.016	0.25	0.97	0.10	1.3	0.091
Previous year's leaf litter (before 1971 leaf fall)	1 Nov.	14.5	0.050	0.375	1.6	0.24	1.9	0.10
	3 Jan.	13.0	0.056	0.35	1.7	0.22	2.2	0.11
	13 Mar.	13.8	0.022	0.23	2.0	0.16	1.9	0.094
	24 May	16.4	0.028	0.33	2.1	0.18	2.0	0.12
	25 July	17.3	0.025	0.31	2.0	0.20	1.9	0.11
	25 Sept.	12.8	0.016	0.27	2.2	0.16	2.0	0.11
1972 leaf litter *		6.5	0.013	0.81	1.81	0.44	2.8	0.17
Tree and shrub twigs <2 cm diam.	1 Nov.	6.9	0.023	0.29	1.1	0.13	0.94	0.038
	3 Jan.	3.4	0.018	0.14	0.83	0.065	0.58	0.027
	13 Mar.	5.1	0.015	0.11	1.10	0.070	0.88	0.038
	24 May	4.5	0.015	0.11	1.3	0.086	0.88	0.038
	25 July	4.4	0.017	0.12	1.3	0.084	0.90	0.038
	25 Sept.	3.9	0.014	0.10	2.2	0.079	0.99	0.036
Rubus twigs	1 Nov.	4.2	0.031	0.23	0.97	0.088	1.2	0.053
	3 Jan.	3.9	0.037	0.18	0.83	0.10	1.0	0.047
	13 Mar.	4.2	0.006	0.094	0.97	0.063	0.98	0.047
	24 May	3.2	0.0093	0.13	0.86	0.073	0.98	0.045
	25 July	3.3	<.003	0.088	0.75	0.063	0.91	0.041
	25 Sept.	3.5	<.003	0.11	0.91	0.073	1.0	0.047
Fruits and seeds	1 Nov.	5.5	0.031	0.30	1.1	0.15	1.6	0.11
	3 Jan.	3.4	0.040	0.19	0.83	0.086	0.97	0.052
	13 Mar.	8.5	0.013	0.16	1.0	0.098	1.1	0.067
	24 May	5.7	0.023	0.12	1.0	0.068	1.1	0.053
	25 July	5.4	0.011	0.23	1.2	0.12	1.2	0.069
	25 Sept.	4.7	0.028	0.40	1.0	0.11	1.3	0.078
Bark and debris	1 Nov.	8.6	0.033	0.26	1.3	0.11	1.2	0.069
	3 Jan.	5.7	0.026	0.15	2.0	0.081	1.2	0.044
	13 Mar.	16.4	0.019	0.23	2.2	0.15	1.3	0.066
	24 May	17.1	0.025	0.27	1.2	0.14	1.3	0.073
	25 July	15.8	0.016	0.20	1.5	0.14	1.3	0.063
	25 Sept.	11.0	0.040	0.19	2.3	0.13	1.3	0.064

SATCHELL / MEATHOP

CHEMICAL COMPOSITION OF TREE ROOTS J. K. Hibberd
(Means of 3 replicates)

Diameter (mm)	Ash %	Na %	K %	Ca %	Mg %	N %	P %
Birch							
2	2.97	.039	.102	.74	.140	.66	.034
2-5	2.47	.046	.133	.70	.126	.59	.032
5-20	1.82	.040	.200	.51	.101	.53	.030
20	1.37	.040	.130	.30	.074	.38	.019
Mean	2.16	.041	.141	.56	.110	.54	.029
Oak							
2	4.60	.075	.280	1.13	.160	.64	.040
2-5	4.57	.066	.250	1.49	.127	.57	.032
5-20	3.00	.047	.209	.85	.068	.65	.030
20	2.03	.066	.287	.43	.055	.66	.035
Mean	3.55	.063	.257	.97	.103	.63	.034
Ash							
2	4.53	.159	.603	.64	.142	1.26	.062
2-5	3.50	.060	.637	.69	.135	.92	.038
5-20	2.97	.018	.447	.65	.086	.71	.029
20	2.57	.009	.380	.74	.059	.43	.025
Mean	3.39	.061	.517	.68	.105	.83	.039
Ash 1 sample JMS	3.69		.41	.63	.138	.54	.026

SATCHELL / MEATHOP

4.6

CHEMICAL COMPOSITION OF DECOMPOSING WOOD

M. J. Swift

Dead branches in the litter layer sampled March 1970, relative density measured and sub-samples analysed. Tabulated in order of relative density.

Sample No.	Species	R.D.	% dry weight Ash	K	Ca	Mg	N	P
179	Oak	.048	0.82	0.021	0.41	0.034	0.75	0.029
157	Oak	.071	6.8	0.031	2.1	0.068	0.72	0.025
192	Oak	.113	4.2	0.030	1.9	0.043	0.71	0.017
172	Oak	.117	4.3	0.063	1.5	0 043	1.22	0.027
173	Oak	.13	2.9	0 048	0.88	0.024	0.89	0.022
123	Oak	.243	4.4	0.018	2.2	0.011	0.34	0.012
190	Oak	.252	0.91	0.046	0.43	0.026	0.44	0.051
161	Oak	.263	4.6	0.043	2.2	0.053	0.41	0.015
121	Oak	.272	5.0	0.019	2.5	0.018	0.32	0.011
191	Oak	.328	1.3	0.018	0.40	0.019	0.44	0.015
181	Ash	.088	4.4	0.057	0.88	0.064	0.66	0.048
111	Ash	.098	3.6	0.054	1.4	0.053	0.95	0.037
197	Ash	.12	4.7	0.097	1.4	0.073	0.71	0.029
140	Ash	.165	4.7	0.043	1.9	0.034	0.57	0.019
89	Ash	.199	3.8	0.19	1.4	0.03	0.72	0.032
152	Ash	.209	2.4	0.039	0.57	0.034	0.45	0.017
148	Ash	.269	2.6	0.021	1.3	0.038	0.31	0.011
87	Ash	.269	3.1	0.021	1.1	0.030	0.36	0.015
209	Ash	.372	3.6	0.027	1.4	0.063	0.31	0.0053
99	Ash	.392	1.2	0.039	0.48	0.050	0.31	0.018
203	Ash	.4	2.8	0.039	1.2	0.039	0.39	0.015
211	Ash	.411	3.4	0.069	1.5	0.054	0.31	0.013
163	Ash	.46	3.2	0.030	1.3	0.045	0.27	0.011
153	Ash	.481	2.6	0.027	1.2	0.049	0.29	0.011
86	Birch	.067	3.4	0.075	0.56	0.061	1.03	0.038
24	Birch	.082	14.5	0.20	1.4	0.28	1.03	0.049
94	Birch	.097	2.1	0.060	0.75	0.041	0.85	0.036
33	Birch	.104	2.8	0.066	0.24	0.036	0.56	0.030
95	Birch	.126	3.3	0.045	1.5	0.018	0.64	0.028
29	Birch	.152	<0.5	0.012	0.069	0.005	0.22	0.014
28	Birch	.265	<0.5	0.006	0.13	0.011	0.21	0.012
118	Birch	.296	6.9	0.17	3.5	0.032	0.36	0.012
74	Birch	.3	2.2	0.039	0.65	0.038	0.37	0.021
44	Birch	.301	1.1	0.015	0.58	0.016	0.36	0.018
59	Birch	.312	1.5	0.013	0.50	0.031	0.23	0.015
35	Birch	.419	1.0	0.018	0.21	0.016	0.16	0.011
78	Birch	.425	6.9	0.16	0.51	0.063	0.66	0.036
41	Birch	.523	0.34	0.009	0.19	0.027	0.14	0.0094
180	Hazel	.047	3.0	0.034	0.41	0.036	0.98	0.029
168	Hazel	.063	8.7	0.070	1.8	0.059	0.89	0.033
19	Hazel	.09	2.1	0.031	0.34	0.025	0.77	0.031
102	Hazel	.105	7.5	0.039	2.4	0.044	0.66	0.022
188	Hazel	.128	5.6	0.049	1.8	0.034	0.69	0.014
156	Hazel	.193	13	0.15	2.3	0.096	0.83	0.041
130	Hazel	.203	5.4	0.022	2.8	0.018	0.34	0.012
114	Hazel	.217	4.9	0.027	2.0	0.024	0.50	0.019
14	Hazel	.286	1.6	0.031	0.36	0.054	0.22	0.0097
174	Hazel	.324	1.2	0.013	0.61	0.013	0.43	0.0055
160	Hazel	.36	1.0	0.015	0.58	0.018	0.31	0.0093
105	Hazel	.369	2.6	0.018	1.2	0.014	0.51	0.017
125	Hazel	.403	2.2	0.018	1.0	0.0093	0.27	0.0066
159	Hazel	.475	4.0	0.018	1.9	0.024	0.40	0.011
175	Hazel	.599	1.5	0.015	1.0	0.023	0.41	0.0059

SATCHELL / MEATHOP

5.6

CHEMICAL COMPOSITION OF BACTERIA — A. F. Harrison

Bacillus cereus from mineral soil and Pseudomonas sp. from ash litter

	% d.w.					
	Na	K	Ca	Mg	N	P
B. cereus grown 5 days on soil extract	*	*	0.089	0.95	0.18	0.053
B. cereus grown 2 days on Tryptone-soya	0.41	1.6	0 081	0.17	8.6	1.5
B. cereus grown 8 days on Tryptone-soya	0.81	1.1	0.26	0.43	10	1.3
Pseudomonas grown 5 days on soil extract	0.17	1.4	0.18	0.46	4.1	0.57
Pseudomonas grown 2 days on Tryptone-soya	0.12	0.38	0.31	0.36	10	2.5
Pseudomonas grown 8 days on Tryptone-soya	*	*	0.74	1.0	2.6	0.48
$\bar{x}$	0.38	1.12	0.28	0.56	5.91	1.07

ENERGY CONTENT OF BACTERIA

	Kj/g O.D.	Kj/g Ash free
Composite sample of Bacillus cereus & Pseudomonas grown on Tryptone-soya.	20.45	21.90

CHEMICAL COMPOSITION OF CATERPILLARS — H. M. Grimshaw, D. C. Seel

Provisional data from unpublished sources.

(1) Larvae including Diprion sp. from Pinus spp. at Thetford Chase
(2) Larvae including Tortrix spp. from Quercus spp.
(3) Larvae of Philudora potatoria

	% d.w.					
	N	P	K	Ca	Mg	Na
(1)	-	0.99	2.35	0.10	-	0.067
(2)	-	1.48	2.55	0.11	-	0.038
(3)	2.30	0.95	2.75	0.14	0.16	0.038
Mean	2.30	1.14	2.55	0.12	0.16	0.048

ENERGY CONTENT OF CATERPILLARS

Mean value 23.44 kjoules/g O.D.

ENERGY CONTENT AND CHEMICAL COMPOSITION OF FUNGAL HYPHAE

J. C. Frankland, O. M. Parry and W. G. Hale

		% dry wt. C	N	P	K	Ca	Mg	Na
Bulk samples of mycelium of *Mycena galopus* hand-picked from	Hazel(1)	45	2.7	0.17	0.57	0.95		
	Hazel(2)	46.4	4.7	0.31				
	Oak	43	3.3					
Mycelia of a mixed population of soil fungi from Meathop grown on soil extract			3.8	0.17	0.55	0.57	0.01	0.06
Mean		44.8	3.63	0.22	0.56	0.76	0.01	0.06
Fruit bodies of *Mycena galopus* from Meathop			5.7	0.69	4.47	0.17	0.12	0.19
Bulk sample of fruit bodies of various small species of agarics from Meathop		44.7	5.4	0.65	4.78	0.12	0.15	0.26
Mean		44.7	5.55	0.67	4.63	0.15	0.14	0.23

		kj/g d.w.
Mycelium of *Mycena galopus* from	Hazel	17.523
	Oak	16.899
	Mean	17.211

ENERGY CONTENT OF GROWING LEAVES OF TREES AND SHRUBS

M. K. Hughes

Samples from middle strata of the canopy. Means of 3 replicates

Date	12/4	27/4	5/5	18/5	1/6	6/7	7/9	13/10
Oak								
Kj/g d.w.		19.833	19.264	19.310	19.695	20.026	19.038	20.507
Kj/g ash free		20.570	20.084	19.930	20.118	20.624	19.662	21.215
% ash		3.57	4.08	3.09	2.09	2.92	3.16	3.07
Ash								
Kj/g d.w.				21.257	20.143	20.361	20.193	20.110
Kj/g ash free				22.102	21.323	21.210	21.056	20.717
% ash				3.81	5.53	3.97	4.10	3.84
Birch								
Kj/g d.w.		23.471	22.056			19.837	18.741	
Kj/g ash free		24.128	22.688			20.411	19.390	
% ash		2.73	2.8-			2.80	3.30	
Hazel								
Kj/g d.w.	20.063	20.377		18.636			18.197	
Kj/g ash free	20.490	20.951		19.611			19.607	
% ash	2.07	2.73		4.98			7.21	

CHEMICAL COMPOSITION OF SOIL AND LITTER FAUNA

A. F. Harrison,
A. Russell-Smith, S. E. Allen

	% d.w.					
	Na	K	Ca	Mg	N	P
Millipedes						
Glomeris marginata	0.18	0.41	9.8	0.30	6.1	2.6
Polydesmus sp.	0.18	0.60	16	0.37	6.6	2.3
Iulidae	0.19	0.45	14	0.48	5.3	1.9
Isopods						
Oniscus asellus	0.74	0.75	22	0.34	5.8	1.5
Diptera						
Limonia nubeculosa larvae	0.084	*	0.45	0.24	10	0.55
Limonia nubeculosa adults	0.31	0.76	0.14	0.11	11	0.88
Bradysia sp. larvae	0.063	0.63	0.19	0.22	9.8	0.84
Bradysia sp. pupae	0.034	0.36	0.20	0.14	8.9	0.93
Bibio hortulana larvae	0.037	0.27	0.17	0.13	11	0.47
Syrrphid larvae	*	*	0.11	0.26	9.7	1.2
Tipula flavolineata larvae	0.19	0.89	0.35	0.22	10	0.69
Tipula flavolineata adults	0.15	0.84	0.080	0.09	11	1.0
Tipula flavolineata adults	0.14	0.84	0.10	0.090	11	1.0
Other arthropods						
Carabidae	*	*	1.4	0.070	6.4	0.65
Aranae	0.57	1.1	0.53	0.14	12	1.3
Lumbricidae						
L. terrestris	0.14	0.50	0.39	0.098	5.3	0.69
L. terrestris	0.34	1.1	0.61	0.26	10	1.1
A. caliginosa	0.094	0.26	0.088	0.076	3.0	0.34
O. cyaneum	0.47	*	0.39	0.40	10	0.88
Mollusca						
Arion subfuscus	0.36	0.73	2.5	0.40	9.4	1.6
Mixed sample of Retinella and Oxychilus spp.	0.11	0.28	c.40	0.13	2.5	0.3

CHEMICAL COMPOSITION OF NEMATODES

Table 1 from Myers, R. F. 1966 Osmoregulation in Panagrellus redivivus and Aphelenchus avenae. Nematologica 12, 579-586

Average inorganic ion content of P. redivivus and A. avenae incubated in Fenwick's salt solution (FSS) and distilled water (DW) for 24 hours at 22°C[1)]

Nematode	Treatment[2)]	mg element/gram dry weight					
		Na	K	Ca	P	Mg	Cl
P. redivivus	FSS	4.0	4.1	0.25	28.0	3.0	6.2
Diet-mainly bacteria	DW	1.4	3.1	0.27	17.6	2.4	2.3
	FSS	4.6	4.9	0.26	25.0	5.0	3.8
	DW	1.7	2.7	0.24	18.0	5.6	0.5
P. redivivus	FSS	5.8	13.5	1.22	-	-	-
Diet-mainly yeast	DW	1.7	7.5	0.86	-	-	-
A. avenae	FSS	3.2	4.8	0.4	-	-	-
Diet-fungus	DW	0.9	4.5	0.5	-	-	-
	FSS	3.2	3.6	0.3	8.0	1.4	4.8
	FSS	9.6	2.7	0.4	12.9	0.9	8.2

1)The range of all Na, K, Ca, Cl, P samples were within ± 5% of the averages while the range of the Mg samples were about ± 10% of the above reported averages.

2)FSS and DW treatments in each experiment are related since analyses were performed on a single population of nematodes. Na, K and Ca determinations in each experiment are related, whereas other ion analyses were made upon several separate populations of nematodes

SATCHELL / MEATHOP

ENERGY CONTENT AND CHEMICAL COMPOSITION OF SMALL MAMMALS

A. F. Harrison,
S. E. Allen

Small mammals (from Meathop or Gorswen, Wales, deep frozen on collection)

Species	Origin	Weight when frozen (g)	% dry wt.	Kj/g O.D.	Kj/g ash free	Na	K	Ca	Mg	N	P
								% dry weight			
Wood mouse	Wales	17.1	26.6	21.5	25.7	0.31	0.81	3.7	0.13	1.93	1.9
Wood mouse	Wales	16.6	25.3	21.7	24.5	0.44	1.2	2.9	0.14	2.63	2.3
Wood mouse	Meathop	16.0	24.6	20.2	24.4	0.40	1.1	4.7	0.18	2.80	3.0
Wood mouse	Wales	15.0	23.3	22.4	26.0	0.41	1.2	2.8	0.11	2.60	2.2
Wood mouse	Wales	14.6	23.6	20.5	23.9	0.46	1.2	5.2	0.16	2.55	3.1
Wood mouse	Meathop	13.5	23.0	21.4	27.0	0.31	0.81	3.2	0.11	1.78	2.1
Bank vole	Meathop	16.6	25.0	20.3	25.4	0.50	1.2	5.5	0.23	2.85	3.3
Bank vole	Meathop	15.3	24.1	20.9	26.1	0.40	1.2	4.1	0.16	2.85	2.5
Short tailed field vole	Meathop	26.6	25.3	20.3	24.9	0.39	1.2	1.7	0.16	2.55	1.7
Common shrew	Wales	7.8	23.7	20.4	24.5	0.43	1.0	4.7	0.13	2.70	2.8
Common shrew	Wales	7.1	26.6	21.1	24.3	0.43	1.1	3.3	0.12	2.80	2.4
Common shrew	Wales	7.0	23.5	19.7	24.3	0.45	1.1	4.5	0.13	2.60	2.8
Common shrew	Wales	6.7	26.9	21.9	26.4	0.48	0.93	7.2	0.20	2.35	4.1
Common shrew	Meathop	-		21.7	25.4	0.43	1.0	3.5	0.13	3.10	2.3
Common shrew	Meathop	-		22.2	26.6	0.44	1.1	3.5	0.12	3.30	2.5
		$\bar{x}$		21.08	25.29	0.42	1.08	4.08	0.15	2.63	2.60
Mole				21.15	27.10						
Rabbit				20.48	25.57						

ENERGY CONTENT OF GROUND FLORA

J. M. Sykes

Derived from above and below ground biomass data (Table 1.13) and energy content estimates (Table 1.14.1)

Kj x 10^3/ha dry weight basis

	Jan.	Feb.	Apr.	May	July	Aug.	Sept.	Dec.
Fraxinus		2837			2040	4389	4324	2844
Anemone				1897				
Oxalis				524	675		1265	
Endymion				7251				
Viola		1272		1508	1848		1131	1107
Mercurialis			727	1417	1234		863	830
Fragaria		101		192	183		212	99
Sanicula		207		523	684		370	295
Arum		35		79				
Potentilla		586		746	330		375	415
Geum		72		202	255		212	75
Primula	49	52		100	56	165	118	104

Kj x 10^3/ha ash free basis

Fraxinus		2725			1872	4070	4006	2716
Anemone				1792				
Oxalis				478	615		1153	
Endymion				6869				
Viola		1186		1335	1637		1013	1028
Mercurialis			651	1275	1100		762	756
Fragaria		95		171	166		192	84
Sanicula		185		439	584		320	266
Arum		32		71				
Potentilla		538		665	308		346	390
Geum		68		180	231		184	70
Primula	45	48		85	48	146	104	93

SATCHELL / MEATHOP

NUTRIENT TRANSFERS THROUGH THE CANOPY - ORGANIC MATTER

E. J. White

	Rainfall	Throughfall	Stem flow	Total throughfall	Enrichment
July 1966	6.05 ± 1.85	11.95 ± 5.21	1.63	13.58	7.53
Aug.	9.97 ± 1.04	14.05 ± 8.07	2.45	16.50	6.53
Sept.	11.25 ± 2.66	22.28 ±12.73	2.87	25.15	13.90
Oct.	9.06 ± 2.10	33.91 ±12.53	1.75	35.66	26.60
Nov.	7.81 ± 1.39	31.65 ±17.32	4.12	35.77	27.96
Dec.	12.07 ± 4.10	26.21 ± 8.46	7.36	33.57	21.50
Jan. 1967	4.82 ± 1.02	8.62 ± 8.55	2.51	11.13	6.31
Feb.	8.27 ± 1.14	15.67 ± 6.53	3.31	18.98	10.71
Mar.	(6.08)	23.88 ± 8.10	3.78	27.66	21.58
Apr.	(3.06)	10.40 ± 3.54	1.55	11.95	8.89
May	6.03 ± 1.44	35.33 ±10.49	2.43	37.76	31.73
June	4.73 ± 1.14	129.33 ±118.18	3.13	132.46	127.68
July	10.30 ± 3.05	177.99 ±97.29	4.95	182.94	172.64
Aug.	18.98 ± 23.14	40.76 ±12.98	2.25	42.99	24.02
Sept.	11.08 ± 6.73	35.58 ±12.41	5.21	40.79	29.71
Oct.	12.84 ± 3.57	66.41 ±10.42	6.71	72.58	59.74
Nov.	2.62 ± 0.78	24.38 ±12.16	2.23	26.61	23.99
Totals July 1966-June 1967	89.25 ± 6.49	363.28 ±122.70	36.89	400.17	310.92

NUTRIENT LOSSES IN DRAINAGE WATER

F. Farquharson

kg/ha

1971	NO_3	NH_4	Organic N	Total N	P	K	Na	Ca	Mg
July	1.26	0.05	0.07	1.38	0.002	0.33	4.89	1.46	0.54
Aug.	1.85	0.07	0.11	1.53	0.018	1.13	9.05	7.42	1.31
Sept.	0.39	<0.01	0.05	0.40	0.003	0.08	2.55	1.82	0.18
Oct.	0.93	<0.01	0.18	1.11	0.031	0.55	2.67	0.85	0.17
Nov.	1.37	0.15	0.10	1.62	0.005	0.86	6.92	5.64	0.67
Dec.	0.26	0.06	0.08	0.40	0.013	0.64	4.92	6.71	0.48
1972									
Jan.	1.80	0.34	0.26	2.40	0.034	1.40	7.41	9.33	0.68
Feb.	0.48	0.21	0.09	0.78	0.001	0.56	3.22	4.82	0.30
Mar.	0.14	0.23	0.15	0.52	0.051	1.47	6.33	6.92	0.50
Apr.	0.36	0.24	0.24	0.94	0.069	0.87	6.29	6.86	0.43
May	0.24	0.12	0.03	0.39	0.001	0.13	2.51	2.49	0.23
June	0.28	0.25	0.15	0.68	0.007	0.29	4.34	5.48	0.38
Annual total	9.36	1.73	1.47	12.65	0.235	8.31	61.10	59.80	5.97

NUTRIENT TRANSFERS THROUGH THE CANOPY

E. J. White

kg/ha

	N					P					K				
	Rainfall	Throughfall	Stem flow	Total throughfall	Enrichment	Rainfall	Throughfall	Stem flow	Total throughfall	Enrichment	Rainfall	Throughfall	Stem flow	Total throughfall	Enrichment
July 1966	0.42±0.11	0.75±0.14	0.03	0.78	0.36	0.020±0.01	0.072±0.032	0.002	0.074	0.053	0.16±0.08	1.71±0.27	0.29	2.00	1.84
Aug.	0.65±0.14	0.74±0.37	0.04	0.78	0.13	0.01±0.01	0.056±0.030	0.004	0.060	0.056	0.15±0.05	2.07±0.59	0.36	2.43	2.28
Sept.	0.48±0.19	0.84±0.09	0.04	0.88	0.40	0.01±0.03	0.057±0.027	0.004	0.061	0.048	0.36±0.26	2.98±0.77	0.53	3.51	3.15
Oct.	0.75±0.00	0.82±0.41	0.03	0.85	0.10	0.02±0.00	0.058±0.035	0.002	0.060	0.041	0.22±0.05	5.89±3.75	0.44	6.33	6.11
Nov.	0.28±0.02	0.81±0.18	0.03	0.84	0.56	0.01±0.00	0.039±0.016	0.004	0.043	0.029	0.47±0.13	4.73±1.22	0.75	5.48	5.01
Dec.	0.63±0.29	0.72±0.20	0.06	0.78	0.15	0.02±0.01	0.040±0.023	0.006	0.046	0.029	0.59±0.08	1.66±0.71	0.87	2.53	1.94
Jan. 1967	0.32±0.05	0.57±0.09	0.01	0.58	0.26	0.01±0.01	0.018±0.006	0.001	0.019	0.007	0.12±0.02	0.90±0.47	0.30	1.2	1.08
Feb.	0.32±0.14	0.44±0.06	0.02	0.46	0.14	0.02±0.00	0.023±0.006	0.002	0.025	0.009	0.20±0.04	0.62±0.33	0.25	0.87	0.67
Mar.	0.38±0.16	0.41(±0.07)	0.02	0.43	0.05	0.02±0.00	0.022±0.005	0.001	0.023	0.006	0.41±0.06	0.89±0.14	0.25	1.14	0.73
Apr.	0.37±0.04	0.38(±0.09)	0.02	0.40	0.03	0.02±0.01	0.030±0.012	0.001	0.031	0.008	0.12±0.02	0.71±0.28	0.15	0.86	0.74
May	0.89±0.12	1.27±0.15	0.04	1.31	0.42	0.03±0.01	0.119±0.044	0.001	0.120	0.093	0.25±0.05	3.09±1.34	0.32	3.41	3.16
June	0.37±0.11	1.01(±0.11)	0.04	1.05	0.68	0.03±0.01	0.199±0.024	0.003	0.202	0.169	0.16±0.02	5.08±1.17	0.31	5.39	5.23
July	1.09±0.12	1.03±0.09	0.07	1.10	0.01	0.04±0.03	0.105±0.020	0.005	0.110	0.066	0.39±0.28	4.56±0.43	0.63	5.19	4.80
Aug.	1.03±0.06	0.81±0.18	0.04	0.85	-0.18	0.01±0.01	0.071±0.032	0.003	0.074	0.062	0.36±0.14	3.16±0.58	0.34	3.50	3.14
Sept.	0.53±0.10	0.79±0.14	0.08	0.87	0.34	0.07±0.02	0.089±0.042	0.006	0.095	0.026	0.37±0.07	5.97±1.42	0.77	6.74	6.37
Oct.	1.36±0.56	1.17±0.51	0.11	1.28	-0.08	0.04±0.01	0.109±0.051	0.014	0.123	0.081	0.86±0.43	11.85±2.67	1.26	13.11	12.25
Nov.	0.68±0.22	0.64±0.20	0.02	0.66	-0.02	0.03±0.02	0.042±0.028	0.001	0.043	0.011	0.17±0.07	5.05±1.19	0.53	5.58	5.41
Total July 1966 – June 1967	5.86±1.05	8.76±1.06	0.38	9.14	3.28	0.23±0.03	0.733±0.079	0.031	0.764	0.538	3.21±0.34	30.33±4.55	4.82	35.15	31.94

NUTRIENT TRANSFERS THROUGH THE CANOPY

E. J. White

	Ca					Mg					Na				
	Rainfall	Through-fall	Stem flow	Total through-fall	Enrich-ment	Rainfall	Through-fall	Stem flow	Total through-fall	Enrich-ment	Rainfall	Through-fall	Stem flow	Total through-fall	Enrich-ment
July 1966	0.33±0.03	0.92±0.00	0.06	0.98	0.65	0.12±0.01	0.29±0.04	0.02	0.31	0.19	0.80±0.07	1.20±0.29	0.12	1.32	0.52
Aug.	0.32±0.04	1.34±0.27	0.11	1.45	1.13	0.08±0.00	0.37±0.11	0.04	0.41	0.33	0.37±0.25	0.99±0.32	0.14	1.13	0.76
Sept.	0.58±0.26	2.29±0.70	0.21	2.50	1.92	0.39±0.09	0.84±0.08	0.07	0.91	0.52	2.91±0.20	4.74±0.54	0.44	5.18	2.27
Oct.	0.37±1.23	3.43±2.52	0.22	3.65	3.28	0.13±0.04	1.23±0.50	0.09	1.32	1.19	0.87±1.23	2.38±0.67	0.21	2.59	1.72
Nov.	0.59±0.98	3.09±2.21	0.78	3.87	3.28	0.84±0.10	1.64±0.75	0.22	1.86	1.02	6.72±0.75	11.54±4.18	2.08	13.62	6.90
Dec.	1.09±0.18	2.61±2.25	1.49	4.10	3.01	1.37±0.10	2.24±0.94	0.86	3.10	1.73	10.82±0.78	16.93±7.42	11.30	28.23	17.41
Jan. 1967	0.50±0.11	1.70±1.48	0.61	2.31	1.81	0.20±0.01	0.56±0.34	0.16	0.72	0.52	1.50±0.04	2.55±1.17	0.47	3.02	1.52
Feb.	0.52±0.11	1.64±1.31	0.61	2.25	1.73	0.44±0.04	0.92±0.41	0.18	1.10	0.66	3.50±0.30	7.53±3.42	1.99	9.52	6.02
Mar.	0.81±0.09	1.85±0.74	0.55	2.40	1.59	1.18±0.11	2.14±0.41	0.52	2.66	1.48	8.85±0.70	16.19±3.95	2.38	18.57	9.72
Apr.	0.51±0.05	0.73±0.52	0.19	0.92	0.41	0.18±0.02	0.46±0.19	0.08	0.54	0.36	1.19±0.26	2.96±1.76	0.67	3.63	2.44
May	0.83±0.13	1.84±0.65	0.22	2.06	1.23	0.23±0.02	0.75±0.18	0.09	0.84	0.61	1.23±0.18	3.04±1.83	0.50	3.54	2.31
June	0.47±0.26	1.39±0.26	0.18	1.57	1.10	0.22±0.13	0.51±0.09	0.05	0.56	0.34	0.87±0.07	1.62±0.52	0.31	1.93	1.06
July	0.79±0.13	1.99±0.22	0.22	2.21	1.42	0.19±0.02	0.65±0.10	0.07	0.72	0.53	0.98±0.20	2.35±0.27	0.33	2.68	1.70
Aug.	0.52±0.06	2.05±0.53	0.12	2.17	1.65	0.17±0.03	0.58±0.14	0.04	0.62	0.45	1.38±0.22	1.89±0.31	0.19	2.08	0.70
Sept.	0.71±0.12	3.81±0.74	0.43	4.24	3.53	0.79±0.03	1.45±0.29	0.15	1.60	0.81	6.13±0.27	8.06±1.25	0.99	9.05	2.92
Oct.	1.51±0.19	7.85±1.02	0.81	8.66	7.15	1.58±0.11	3.72±0.28	0.33	4.05	2.47	12.05±1.24	21.97±1.90	2.48	24.45	12.40
Nov.	0.50±0.09	2.97±2.23	0.53	3.50	3.00	0.25±0.04	1.34±0.60	0.17	1.51	1.26	1.99±0.43	5.03±2.39	0.66	5.69	3.70
Totals															
June 1966 July 1967	6.92±1.67	22.83±4.70	5.23	28.06	21.14	5.38±1.08	11.95±1.50	2.38	14.33	8.95	39.63±1.90	71.67±10.43	20.61	92.28	52.65

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): LOSSAINT, RAPP SITE: NOUGUET, FRANCE

YEAR(S): 1966-1970

FOREST TYPE: EVERGREEN

SOIL TYPE: BRUNIFIC

GEOLOGY: PORTLANDIEN-KIMMERIDGIEN LIMESTONE

PRINCIPLE PLANT TYPES: QUERCUS ILEX, VIBURNUM TINUS, ARBUTUS UNEUS, PHYLLEREA MEDIA, JUNIPERDS OXYCEDIUS

SOIL DRAINAGE: GOOD

AGE OF STAND: 150 YEARS LEAF AREA INDEX: 4.5 SQ.M/SQ.M

BASAL AREA: 31.2 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 11 M STOCKING DENSITY: 1440 STEMS/HA

STANDING CROP, ABOVEGROUND: 26200. G/SQ.M STANDING CROP, BELOWGROUND: 5000. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 650. G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 48.56 DEG MIN LONGITUDE: 1.61 DEG MIN

ALTITUDE: 180 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 340.5 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 13.4 DEG C

MEAN ANNUAL PRECIPITATION: 987. L/SQ.M

LENGTH OF GROWING SEASON: 365 DAYS

TEMPERATURE DURING GROWING SEASON: 13.4

MEAN PRECIPITATION DURING GROWING SEASON: 987. L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 340.5 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 7.5-7.8 DEPTH OF ROOTING ZONE: VARIABLE CM

STATUS OF DATA:

TABLEAU XXXII

Le bilan hydrique au Rouquet (1967) selon la méthode de TURC (Réserve d'eau du sol = 57 mm)

IgA : énergie de la radiation qui atteindrait le sol si l'atmosphère n'existait pas (petit cal/cm²/jour); H : durée astronomique du jour en heures; h : durée d'insolation en heures; Ig : radiation globale (petit cal/cm²/jour); T °C : température moyenne mensuelle; P : précipitation/mm/mois; ETP : évapotranspiration; Δ : déficit du sol en eau évaporable au début du mois; réserve : réserve du sol en eau utilisable sur 40 cm de profondeur.

IgA	J	F	M	A	M	J	J	A	S	O	N	D	Année
	312,6	446,1	632,8	808,0	935,3	984,3	950,09	837,0	672,7	488,2	337,9	271,2	
H 43° 37'	288,9	293,1	369,2	401,7	454,8	460,2	465,4	430,8	373,8	340,2	289,3	277,4	
h	135,6	123,9	173,2	230,8	246,2	311,0	333,3	275,0	175,5	156,3	111,4	153,0	2427,2
Ig (cal/cm²/jour)	147	201,5	298	431	481,5	598	595,5	482,5	317,0	227	142,5	141,0	
T°C (moy. mens.)	6.3	8,0	11,2	13,2	15,5	19,7	24,7	23,1	19,0	17,2	11,3	6,2	
E.T.P. (mm/mois)	23,2	32,2	59,2	89,9	108,9	145,7	160,1	128,9	81,8	59,6	32,9	22,1	943,9
P (mm/mois)	157,5	203,5	61,9	9,3	65,8	20,5	50,5	43,0	39,0	25,0	63,0	9,5	748,5
ET = 0,9 ETP	20,9	29,0	53,3	80,9	98,0	131,1	144,1	116,0	73,6	53,1	29,6	19,9	
Variation réserve	-	-	-	– 53	-	-	-	-	-	-	13,4	– 10,4	
Réserve	53,0	53,0	53,0	0	0	0	0	0	0	0	23,4	23,0	
Δ	0	0	0	– 53	– 53	– 53	– 53	– 53	– 53	– 53	– 19,6	– 30,0	
ET = *p* + 53 – Δ	210,5	256,5	114,9	9,3	65,8	20,5	50,5	43,0	39,0	25,0	96,4	32,5	
ETR (mm/mois)	20,9	29,0	53,3	9,3	65,8	20,5	50,5	43,0	39,0	25,0	29,0	19,9	405,8
Drainage	136,6	174,5	8,6	-	-	-	-	-	-	-	-	-	319,7
Déficit ETP – (P + R)	-	-	-	80,6	43,1	125,2	109,6	85,9	42,8	34,0			521,2

TABLEAU XXXIII

Le bilan hydrique au Rouquet (1968) selon la méthode de TURC (Réserve d'eau du sol = 53 mm)

Signification des symboles : voir tableau XXXII.

IgA	J	F	M	A	M	J	J	A	S	O	N	D	Année
	312,6	446,1	632,8	808	935,3	984,3	950,8	837,0	672,7	488,2	337,9	271,2	
H 43° 37'	288,9	293,1	369,2	401,7	454,8	460,2	465,4	430,8	373,8	340,2	289,3	277,4	
h	181,1	100,5	213,8	203,7	244,5	299,4	360,7	274,8	190,9	170,4	91,0	98,1	2428,9
Ig (cal/cm²/jour	178,5	171,5	341,5	401	481,5	571	625	432,5	334	239	126	107,5	
T°C (moy. mens.)	7,2	7,8	10,2	12,8	15,9	19,8	22,5	21,5	18,7	17,8	10,5	7,0	
E.T.P. (mm/mois)	29,5	27,9	63,0	83,0	108,9	141,6	162,0	125,1	84,8	62,7	28,8	19,9	937,5
P (mm/mois)	4,0	97,9	5,6	116,2	113,4	73,0	25,9	142,0	96,7	23,5	115,0	42,3	855,5
ET = 0,9 ETP	26,5	25,1	56,7	74,7	98,0	127,4	145,8	112,6	76,3	56,4	25,9	17,0	
Variation réserve	– 22,5	+ 52,5	– 51,1	+ 41,5	+ 9,6	– 53	-	+ 29,4	+ 20,4	– 32,9	+ 36,1	-	
Réserve	0,5	53,0	1,9	43,4	53	0	0	29,4	49,8	16,9	53	53	
Δ	2,5	0	– 51,1	– 9,6	0	– 53	– 53	– 23,6	– 3,2	– 36,1	0	0	
ET = *p* + 53 – Δ	4,5	97,9	7,5	159,6	166,4	73,0	25,9	171,4	145,5	40,4	168,0	95,3	
ETR (mm/mois)	4,5	25,1	7,5	74,7	98,0	73,0	25,9	112,6	76,3	40,4	25,9	17,0	580,9
Drainage	-	20,3	-	-	5,8	-	-	-	-	-	53	25,3	104,4
Déficit ETP – (P + R)	25,0	-	55,5	-	-	68,6	136,1	-	-	22,3	-	-	307,5

TABLEAU XXXIV LOSSAINT, RAPP / ROUQUET

Le bilan hydrique au Rouquet (1969) selon la méthode de TURC (Réserve d'eau du sol = 53 mm)

Signification des symboles : voir tableau XXXII.

IgA	J	F	M	A	M	J	J	A	S	O	N	D	Année
	312,6	446,1	632,8	808	935,3	984,3	950,8	837,0	672,7	488,2	337,9	271,2	
H 43° 37'	288,9	293,1	369,2	401,7	454,8	460,2	465,4	430,8	373,8	340,2	289,3	277,4	
h	139,7	172,3	129,8	198,6	241,0	272,2	347,2	271,2	185,8	182,7	147,6	141,6	2429,[illegible]
Ig (cal/cm²/jour)	149	243,5	251	391	476	537	613,5	477,5	329,5	266,5	167,5	134,5	
T°C (moy. mens.)	8,5	5,2	9,2	12,2	15,6	18,4	23,1	22,3	18,9	16,7	10,5	5,1	
E.T.P. (mm/mois)	28,6	27,9	45,7	78,9	106,8	129,1	160,6	126,1	84,[illegible]	66,5	30,9	18,6	904,3
P (mm/mois)	161,1	172,8	238,3	114,8	49,0	37,3	65,0	77,2	201,7	323,9	115,5	71,0	1628,1
ET = 0,9 ETP	25,7	25,1	41,1	71,0	96,1	116,2	144,5	113,5	76,1	59,8	27,8	16,7	
Variation réserve	-	-	-	-	– 47,1	5,9	-	-	+ 53	-	-	-	
Réserve	53	53	53	53	5,9	0	0	0	53	53	53	53	
Δ	0	0	0	0	– 47,1	–53	– 53	– 53	0	0	0	0	
ET = p + 53 – Δ	214,1	225,8	291,8	167,8	54,9	37,3	65,0	77,2	254,7	376,9	168,5	124,0	
ETR (mm/mois)	25,7	25,1	41,1	71,0	54,9	37,3	65,0	77,2	76,1	59,8	27,8	16,7	577,7
Drainage	135,4	147,7	197,7	43,8	-	-	-	-	72,6	264,1	87,7	54,3	1003,3
Déficit ETP - (P + R)	-	-	-	-	51,9	91,8	95,6	48,9	-	-	-	-	288,2

TABLEAU XXXV

Le bilan hydrique au Rouquet (1970) selon la méthode de TURC (Réserve d'eau du sol = 53 mm)

IgA	J	F	M	A	M	J	J	A	S	O	N	D	Année
	312,6	446,1	632,8	808,0	935,3	984,3	950,8	837,0	672,7	488,2	337,9	271,2	
H 43° 37'	288,9	293,1	369,2	401,7	454,8	460,2	465,4	430,8	373,5	340,2	289,3	277,4	
h	99,4	143,3	198,[illegible]	258,7	271,0	272,0	352,6	271,5	240,4	99,8	142,6	128,4	2578,4
Ig (cal/cm²/jour	122,0	215,8	325,7	465,4	516,3	537,0	619,0	477,6	387,2	266,4	162,9	126,1	
T°C (moy. mens.)	8,0	8,1	7,6	11,8	16,1	21,7	23,8	22,5	20,9	15,4	12,3	6,0	
E.T.P. (mm/mois)	24,0	34,6	48,9	87,5	113,2	135,0	160,5	126,5	101,8	63,9	38,3	20,1	954,3
P (mm/mois)	183,4	14,8	54,7	18,5	65,2	10,6	0,5	118,9	4[illegible] 7	95,0	50,1	65,5	718,9
ET = 0,9 ETP	21,6	31,1	44,0	78,7	101,9	121,5	144,4	113,8	91,6	57,5	34,5	18,1	
Variation réserve	-	– 16,3	+ 10,7	– 47,4	-	-	-	+ 5,1	– 5,1	+ 37,5	+ 15,6	-	
Réserve	53	36,7	47,4	0	0	0	0	5,1	0	37,5	53	53	
Δ	0	– 16,3	– 5,6	– 53	– 53	–53	– 53	– 47,9	– 53	– 15,5	0	0	
ET = p + 53 – Δ	236,4	51,5	102,1	18,5	65,2	10,6	0,5	124,0	41,7	132,5	103,1	118,5	
ETR (mm/mois)	21,6	31,1	44,0	18,5	65,2	10,6	0,5	113,8	41,7	57,5	34,5	18,1	457,2
Drainage	161,8	-	-	-		-	-	-	-	-	-	47,4	209,2
Deficit ETP – (p + R)	-	-	-	69,0	48,0	184,4	160,0	2,5	60,1	-	-	-	464,0

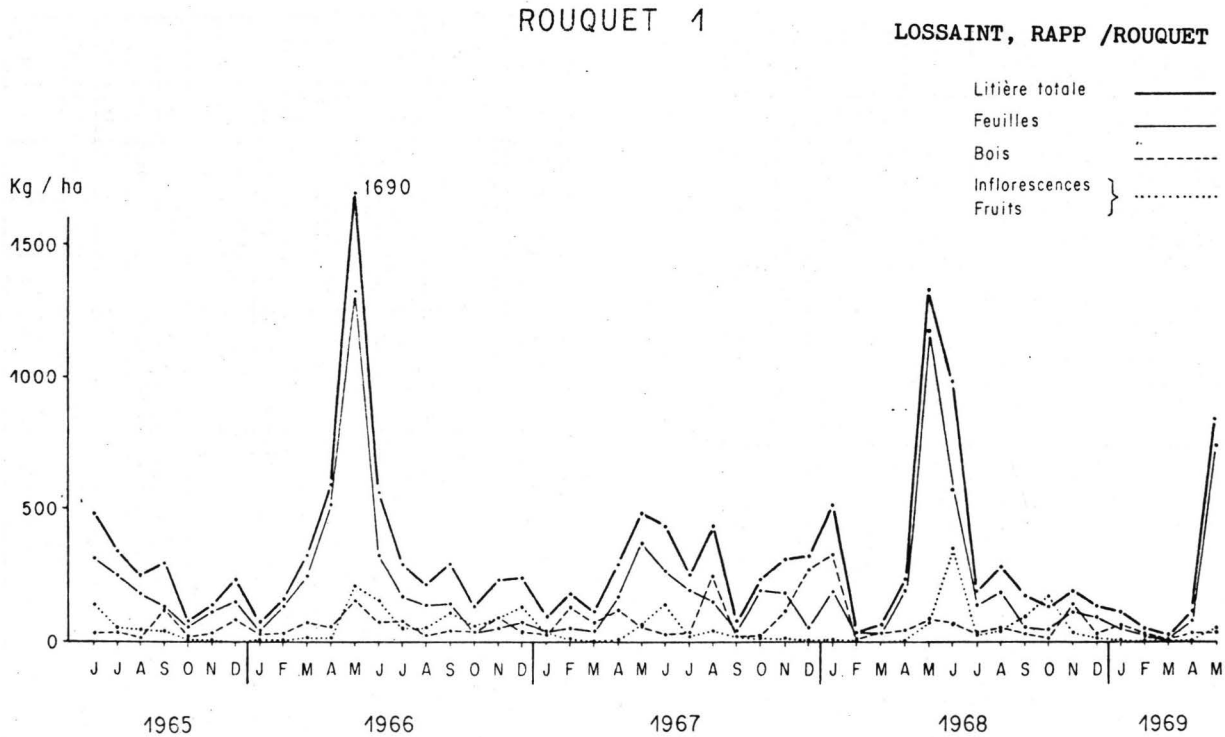


Fig 1 _ Variations mensuelles des retombées de litière (Kg/Ha) sous chêne vert de 1965 à 1969

CYCLE DE LA MATIÈRE ORGANIQUE ET DES ÉLÉMENTS MINÉRAUX

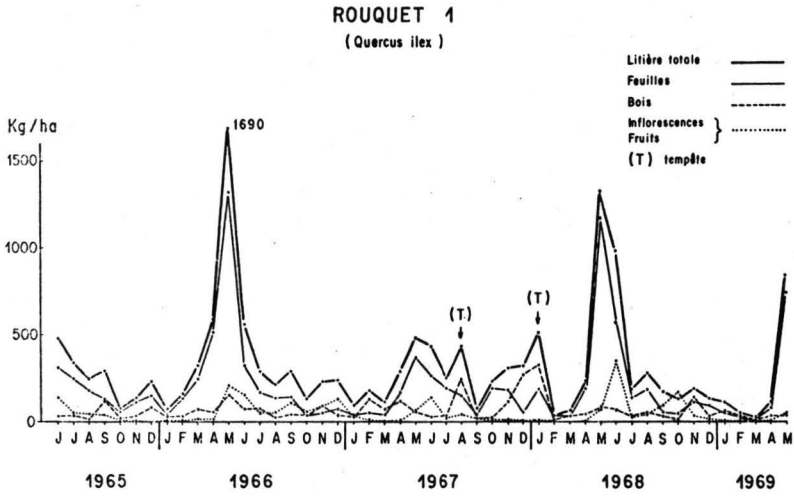


FIGURE 9. — Retombées mensuelles de la litière au Rouquet de juin 1965 à mai 1969.

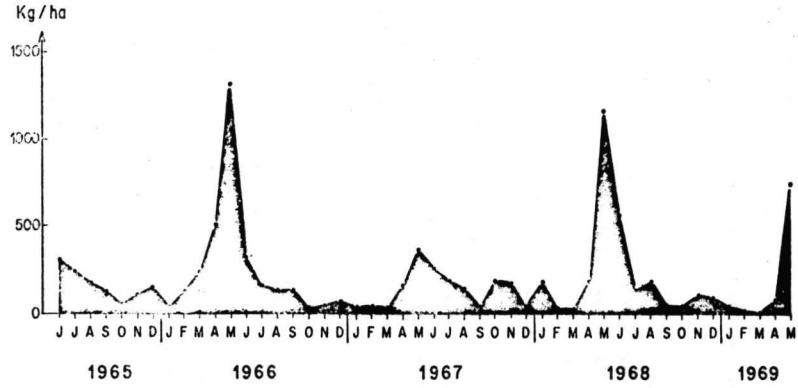


FIGURE 10. — Rouquet : variations mensuelles de la retombée des feuilles seules.

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): LOSSAINT, RAPP SITE: MADELAINE, FRANCE

YEAR(S):

FOREST TYPE:

SOIL TYPE: RENDZINA

GEOLOGY: HARD LIMESTONE

PRINCIPLE PLANT TYPES: QUERCUS ILEX

SOIL DRAINAGE: NO DATA

AGE OF STAND: NO DATA YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 34.11 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 15 M STOCKING DENSITY: 527 STEMS/HA

STANDING CROP, ABOVEGROUND: NO DATA G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: NO DATA G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 48 DEG 36 MIN LONGITUDE: 1 DEG 65 MIN

ALTITUDE: 10 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 14.1 DEG C

MEAN ANNUAL PRECIPITATION: 754 L/SQ.M

LENGTH OF GROWING SEASON: NO DATA DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 7.8 DEPTH OF ROOTING ZONE: 100 CM

STATUS OF DATA:

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): A.GALOUX SITE: VIRELLES-BLAIMONT,BELGIUM

YEAR(S): 1964-1968-69

FOREST TYPE: MIXED OAK FOREST

SOIL TYPE: CALCEROUS BROWN SOIL

GEOLOGY: JEVON CHALK

PRINCIPLE PLANT TYPES: QUERCUS ROBUR, CARPINUS BETULUS, FAGUS SILVATICA, ACER CAMPESTRIS, PRUNUS AVIUM

SOIL DRAINAGE: 454.2 MM

AGE OF STAND: >60 YEARS LEAF AREA INDEX: 6.8 SQ.M/SQ.M

BASAL AREA: 21.2 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 16-17 M STOCKING DENSITY: 1250 STEMS/HA

STANDING CROP, ABOVEGROUND: 12100. G/SQ.M STANDING CROP, BELOWGROUND: 3500. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1224. G/SQ.M PRODUCTIVITY BELOWGROUND: 233. G/SQ.M

LATITUDE: 50 DEG 4 MIN LONGITUDE: 4 DEG 22 MIN

ALTITUDE: 245 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 93131 , RAD. BALANCE: 40475 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 8.5 DEG C

MEAN ANNUAL PRECIPITATION: 965.9 L/SQ.M

LENGTH OF GROWING SEASON: 155 DAYS

TEMPERATURE DURING GROWING SEASON: 13.8

MEAN PRECIPITATION DURING GROWING SEASON: 450 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 67198 , RAD. BALANCE: 27815 CAL/SQ. CM

PH: 7.0-7.5 DEPTH OF ROOTING ZONE: 30-60 CM

STATUS OF DATA:

In mm V.3. 4a

Site: Virelles-Blaimont

Forest type: Mixed oak forest

WATER BALANCE

Level (m)		Period								
		Year 1964	Foliated phenoph. 1964 1.5-31.10 (184j)	Defol. phenoph. 1964	Year 1965	Foliated phenoph. 1965 1.5-31.10 (184j)	Defol. phenoph. 1965	Year 1966	Foliated phenoph. 1966 1.5.-14.11 (198j)	Defol. phenoph. 1966
	Precipitations (mm H_2O)	700,7	357,2	343,5	1.159,5	497,0	662,5	1.219,3	586,4	632,9
+16,00	Kist (mm H_2O)	2,7	0,0	2,7	4,1	0,0	4,1	1,9	1,3	0,6
	ΔH_2O (data of 1968)	+1,2	+1,8	-0,6	+1,2	+1,8	-0,6	+1,2	+1,8	-0,6
+0,30	Throughf. Woody layer	484,8	232,7	252,1	892,6	361,7	530,9	963,2	448,5	514,7
	Throughf. herbaceous layer	480,8	228,7	252,1	886,3	355,4	530,9	958,4	443,7	514,7
0,0	St. flow	34,5	9,4	25,1	88,9	23,5	65,4	97,2	25,9	71,3
	Surface run off	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Soil										
	Infiltration	515,3	238,1	277,2	975,2	378,9	596,3	1.055,6	469,6	586,0
	Intern run off	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	$\Delta(H_2O)$	0,0	-9,6	+9,6	+15,7	+12,3	+3,4	-8,0	-15,6	+7,6
-0,50	Drainage	263,8	35,4	228,4	591,6	51,5	540,1	650,5	146,9	503,6

In mm V.B. 4b

Site: Virelles-Blaimont

Forest type: Mixed oak forest

WATER BALANCE

Level (m)		Period: Year 1967	Foliated phenoph. 1967 8.5-13.11 (190j)	Defol. phenoph. 1967	Year 1968	Foliated phenoph. 1968 1.5-11.11 (188j)	Defol. phenoph. 1968
	Precipitations (mm H_2O)	864,8	459,9	404,9	866,3	551,2	315,1
+16,00	Mist (mm H_2O)	2,8	0,0	2,8	7,4	0,0	7,4
	ΔH_2O (data of 1968)	+1,2	+1,8	-0,6	+1,2	+1,8	-0,6
+0,30	Throughf. Woody layer	661,4	335,6	325,8	708,3	431,2	277,1
	Throughf. herbaceous layer	656,8	331,0	325,8	703,1	426,0	277,1
0,0	St. flow	63,2	21,1	42,1	38,8	16,7	22,1
	Surface run off	0,0	0,0	0,0	0,0	0,0	0,0
Soil							
	Infiltration	720,0	352,1	367,9	741,9	442,7	299,2
	Intern run off	0,0	0,0	0,0	0,0	0,0	0,0
-0,50	$\Delta (H_2O)$	+19,4	-10,1	+29,5	-8,7	+20,3	-29,0
	Drainage	372,2	96,8	275,4	392,9	117,9	275,0

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): N.DONITA,C.BINDIU,V.MUCANU SITE: BABADAG,RUMANIA, SITE 1

YEAR(S): 1960-19

FOREST TYPE: SUBMEDITERANEAN DECIDUOUS FOREST

SOIL TYPE: RENDZINA

GEOLOGY: CRETACIC CALCAR

PRINCIPLE PLANT TYPES: QUERCUS PUBESCENS, COTINUS COGGYGZIA, GALIUM DASYPODUM, PAEONIA PEREGZINA

SOIL DRAINAGE: MAINLY VERTICAL

AGE OF STAND: 37 YEARS LEAF AREA INDEX: 2.54 SQ.M/SQ.M

BASAL AREA: 22.74 SQ.M/HA BASAL AREA INCREM.: 0.52 SQ.M/HA

STAND HEIGHT: 6.8 M STOCKING DENSITY: 2730 STEMS/HA

STANDING CROP, ABOVEGROUND: 6019.5 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 437.9 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 44 DEG 54 MIN LONGITUDE: 28 DEG 43 MIN

ALTITUDE: 170 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 10.6 DEG C

MEAN ANNUAL PRECIPITATION: 480 L/SQ.M

LENGTH OF GROWING SEASON: 176 DAYS

TEMPERATURE DURING GROWING SEASON: 17.9

MEAN PRECIPITATION DURING GROWING SEASON: 181 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 7.0 DEPTH OF ROOTING ZONE: 30 CM

STATUS OF DATA:

RESEARCHER(S): N.DONITA,C.BINDIU,V.MOCANU SITE: BABADAG,RUMANIA, SITE 2

FOREST TYPE: SUBMEDITER.-CONTINENTAL DECIDUOUS YEAR(S): 1960-1.

SOIL TYPE: LEACHED CHERNOZEM
GEOLOGY: LOESS
SOIL DRAINAGE: MAINLY VERTICAL

PRINCIPLE PLANT TYPES: QUERCUS PEDUNCULIFLORA, ACER TATARICUM, BRACHIPODIUM PINNATUM, CENTAUZEA STENOLEPIS

AGE OF STAND: 37 YEARS LEAF AREA INDEX: 3.43 SQ.M/SQ.M

BASAL AREA: 19.06 SQ.M/HA BASAL AREA INCREM.: .75 SQ.M/HA

STAND HEIGHT: 8.6 M STOCKING DENSITY: 1070 STEMS/HA

STANDING CROP, ABOVEGROUND: 5305.6 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 626.8 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 44 DEG 54 MIN LONGITUDE: 28 DEG 43 MIN
ALTITUDE: 178 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 10.2 DEG C

MEAN ANNUAL PRECIPITATION: 500 L/SQ.M

LENGTH OF GROWING SEASON: 163 DAYS

TEMPERATURE DURING GROWING SEASON: 17.2

MEAN PRECIPITATION DURING GROWING SEASON: 189 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.4 DEPTH OF ROOTING ZONE: 30 CM

STATUS OF DATA:

RESEARCHER(S): P.JAKUCS, L.PAPP SITE: SIKFOKUT,HUNGARY

FOREST TYPE: OAK-WOOD, QU.PETR.-CERR. YEAR(S): 1972-

SOIL TYPE: BROWN FOREST SOIL
GEOLOGY: MIOCENE GRAVEL
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: QU.PETREA,QU.CERRIS,CORNUS MAS,ACER CAMPESTRE,A.TATARICUM,CRATAEGUS,ELONYMUS, CAREX MONTANA,FESTUCA HETEROPH.

AGE OF STAND: 60-65 YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 15.11 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 17.3 M STOCKING DENSITY: 906 STEMS/HA

STANDING CROP, ABOVEGROUND: 22191.0 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: NO DATA G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 40 DEG 90 MIN LONGITUDE: 20 DEG 46 MIN
ALTITUDE: 250-300 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 9.9 DEG C

MEAN ANNUAL PRECIPITATION: 560 L/SQ.M

LENGTH OF GROWING SEASON: 180-200 DAYS

TEMPERATURE DURING GROWING SEASON: 16.0

MEAN PRECIPITATION DURING GROWING SEASON: 335 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.8-5.7 DEPTH OF ROOTING ZONE: 130 CM

STATUS OF DATA:

RESEARCHER(S): BISKUPSKY SITE: BAD, CZECHOSLOVAKIA

FOREST TYPE: FAGETO-QUERCETUM, PRIMULAE VERRIS CA YEAR(S): 1972

SOIL TYPE: PARABRAUNERDE
GEOLOGY: LOESS
SOIL DRAINAGE: VERY GOOD

PRINCIPLE PLANT TYPES: CARPINUS BETULA, ACER CAMPESTRIS, QUERCUS,CERRIS, QUERCUS PETRAEA, CORNUS MAS, CRATAEGUS OXYRRANTHA, ULMUS CAMPESTRIS, ROSA CANINA

AGE OF STAND: 50-70 YEARS LEAF AREA INDEX: 5.19-6.42 SQ.M/SQ.M

BASAL AREA: 25.58 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 19 M STOCKING DENSITY: 733 STEMS/HA

STANDING CROP, ABOVEGROUND: 16048. G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: G/SQ.M PRODUCTIVITY BELOWGROUND: G/SQ.M

LATITUDE: 48 DEG 10 MIN LONGITUDE: 17 DEG 53 MIN
ALTITUDE: 150-210 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: .110 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 9.35 DEG C

MEAN ANNUAL PRECIPITATION: 577.8 L/SQ.M

LENGTH OF GROWING SEASON: 295 DAYS

TEMPERATURE DURING GROWING SEASON: 13.39

MEAN PRECIPITATION DURING GROWING SEASON: 443.8 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: .326 , RAD. BALANCE: .144 CAL/SQ. CM

PH: 5.8-6.1 DEPTH OF ROOTING ZONE: 150 CM

STATUS OF DATA:

RESEARCHER(S): J.B.FALINSKI SITE: GEOBOTANICAL STATION,BIALOWIEZA, POLAND

FOREST TYPE: QUERCO-CARPINUTEM YEAR(S): 1966-1970

SOIL TYPE: LESSIVE SOIL TYPE
GEOLOGY: GROUND MORAINE
SOIL DRAINAGE: 1.3M 3000

PRINCIPLE PLANT TYPES: CARPINUS BETULUS, TILIA CORDATA, PICEA EXCELSA, ACER PLATANOIDES, QUERCUS ROBUR, ULMUS CAMPESTRIS, FRAXINUS EXCELSIOR

AGE OF STAND: 120/210/ YEARS LEAF AREA INDEX: 3.29 SQ.M/SQ.M

BASAL AREA: 33.23 SQ.M/HA BASAL AREA INCREM.: .28 SQ.M/HA

STAND HEIGHT: NO DATA M STOCKING DENSITY: 367 STEMS/HA

STANDING CROP, ABOVEGROUND: NO DATA G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: NO DATA G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 52 DEG 45 MIN LONGITUDE: 23 DEG 52 MIN
ALTITUDE: 157.5 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 97144 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 5.8/5.3/ DEG C

MEAN ANNUAL PRECIPITATION: 715/649/ L/SQ.M

LENGTH OF GROWING SEASON: 197/190/ DAYS

TEMPERATURE DURING GROWING SEASON: 13.8/13.6/

MEAN PRECIPITATION DURING GROWING SEASON: 430/413/ L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 79107 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.2 DEPTH OF ROOTING ZONE: 20. CM

STATUS OF DATA:

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING B1, WEST GERMANY

FOREST TYPE: LUZULO-FAGETUM YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: FAGUS SYLVATICA

AGE OF STAND: 122 YEARS LEAF AREA INDEX: 5.83 SQ.M/SQ.M

BASAL AREA: 28.29 SQ.M/HA BASAL AREA INCREM.: .56 SQ.M/HA

STAND HEIGHT: 26.5 M STOCKING DENSITY: 243 STEMS/HA

STANDING CROP, ABOVEGROUND: 27435.7 G/SQ.M STANDING CROP, BELOWGROUND: 3710.8 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1121.5 G/SQ.M PRODUCTIVITY BELOWGROUND: 250.0 G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 500 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.2 DEPTH OF ROOTING ZONE: 70. CM

STATUS OF DATA: PUBLISHED

Monthly values of rain input, litter fall, mineralization, canopy-drip, and output.
June 1969 - May 1970 (from:ULRICH et al.Gött.Bod.Ber.29,1973) All values in kg . $ha^{-1}.yr^{-1}$

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
rain input	Na	.23	.96	.91	1.05	.42	.23	.22	.77	.23	.97	1.00	.31	7.30
	K	.1	.0	.0	.0	.20	.17	.13	.34	.28	.34	.34	.10	2.00
F01	Ca	.4	1.7	1.6	3.5	1.1	.7	.5	.9	.6	.50	.6	.3	12.40
	Mg	.09	.25	.19	.27	.15	.09	.07	.17	.09	.16	.18	.08	1.79
	Al	.21	.40	.49	.68	.08	.16	.11	.32	.22	.14	.15	.09	3.05
	P	.020	.015	.018	.049	0.058	.052	.041	.096	.064	.042	.019	.007	.481
	N	2.34	1.08	1.14	3.24	2.25	2.21	0.86	2.65	1.40	2.35	3.34	1.06	23.92
litter fall	Na	.0	.0	.0	.0	.0	.0	.03	.04	.06	.75	.02	.0	.90
	K	.0	.0	.0	.0	.0	.2	.5	.7	1.2	14.3	.4	.0	17.30
F14	Ca	.0	.0	.0	.0	.0	.3	.6	1.1	1.5	18.8	.4	.0	22.70
	Mg	.0	.0	.0	.0	.0	.02	.04	.08	.11	1.38	.03	.0	1.66
	Al	.0	.0	.0	.0	.0	.0	.02	.03	.06	.65	.02	.0	.78
	P	.0	.0	.0	.0	.0	.056	.140	.196	.337	4.014	.112	.0	4.855
	N	.0	.0	.0	.0	.0	.55	1.64	2.19	3.83	45.37	1.09	.0	64.67
mineralization	Na	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.4	.2	.90
	K	2.49	1.85	1.37	1.05	.72	.56	.48	.40	.32	.24	4.50	3.32	17.30
F43	Ca	2.16	2.01	1.95	1.91	1.80	1.68	1.62	1.51	1.41	1.39	2.94	2.32	22.70
	Mg	.15	.15	.14	.14	.13	.13	.12	.11	.11	.10	.21	.17	1.66
	Al	.08	.07	.07	.07	.06	.06	.06	.05	.05	.04	.09	.08	.78
	P	.573	.500	.451	.388	.330	.281	.262	.237	.208	.188	.767	.670	4.855
	N	6.49	5.94	5.44	4.94	4.49	4.14	3.79	3.48	3.21	2.96	2.74	2.54	50.16
Canopy-drip	Na	.93	.63	2.20	1.93	.50	.81	1.94	1.66	1.58	.74	.40	.28	13.6
+ stem flow	K	1.6	.5	.6	1.3	2.3	2.5	1.6	4.9	3.2	4.9	1.5	.7	25.6
	Ca	3.1	3.0	3.2	5.6	1.8	2.0	1.8	4.3	3.0	2.9	1.3	.4	32.4
F13	Mg	.52	.49	.39	.39	.30	.29	.18	.36	.26	.46	.40	.10	4.14
	Al	.55	.33	.29	.44	.09	.12	.11	.33	.17	.25	.25	.12	3.05
	P	.031	.059	.043	.087	.045	.008	.033	.088	.077	.110	.013	.011	.605
	N	4.75	2.34	2.63	2.44	1.85	1.32	0.78	2.34	1.23	1.62	2.35	1.36	25.10
output	Na	.53	.26	.26	2.97	.70	.59	.33	.45	.04	.22	.40	.36	7.11
	K	.24	.05	.05	.48	.18	.27	.18	.27	.03	.17	.22	.16	2.30
F90	Ca	.80	.70	.70	3.05	1.18	.55	.40	.64	.05	.31	.58	.54	9.50
	Mg	.18	.07	.07	.86	.22	.14	.08	.10	.01	.06	.12	.12	2.03
	Al	.58	.16	.16	3.65	.85	.73	.31	.30	.02	.13	.37	.38	7.64
	P	.0003	.0003	.0003	.0019	.0003	.0006	.0016	.0031	-	.0003	.0003	-	.009
	N	.40	.14	.15	2.98	.82	.30	.16	.20	.02	.12	.25	.27	5.82

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING 33, WEST GERMANY

FOREST TYPE: LUZULO-FAGETUM YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: FAGUS SYLVATICA

AGE OF STAND: 80 YEARS LEAF AREA INDEX: 6.72 SQ.M/SQ.M

BASAL AREA: 25.19 SQ.M/HA BASAL AREA INCREM.: .76 SQ.M/HA

STAND HEIGHT: 20.3 M STOCKING DENSITY: 1190 STEMS/HA

STANDING CROP, ABOVEGROUND: 15968.4 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1007.8 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 470. METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.2 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING 34, WEST GERMANY

FOREST TYPE: LUZULO-FAGETUM YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: FAGUS SYLVATICA

AGE OF STAND: 59 YEARS LEAF AREA INDEX: 6.51 SQ.M/SQ.M

BASAL AREA: 30.44 SQ.M/HA BASAL AREA INCREM.: 1.36 SQ.M/HA

STAND HEIGHT: 15.1 M STOCKING DENSITY: 3620 STEMS/HA

STANDING CROP, ABOVEGROUND: 15493.2 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1224.4 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 430 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.2 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): THAMDRUP ET AL SITE: HESTEHAVEN, DENMARK

FOREST TYPE: TEMPERATE DECIDUOUS - BEECH YEAR(S): 1970

SOIL TYPE: PARABRAUNERDE (GREY BROWN PODZOLIC)
GEOLOGY: WURM MORAINE
SOIL DRAINAGE: MAINLY VERTICAL

PRINCIPLE PLANT TYPES: FAGUS SILVATICA, ANEMONE NEMOROSA, MELICA UNIFLORA, ASPERULA ODORATA, CAREX SILVATICA

AGE OF STAND: 85-90 YEARS LEAF AREA INDEX: 5.0 SQ.M/SQ.M

BASAL AREA: 28.32 SQ.M/HA BASAL AREA INCREM.: .67 SQ.M/HA

STAND HEIGHT: 28(OVRSTY) M STOCKING DENSITY: 396 STEMS/HA

STANDING CROP, ABOVEGROUND: 22170. G/SQ.M STANDING CROP, BELOWGROUND: 4230. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1480. G/SQ.M PRODUCTIVITY BELOWGROUND: 275. G/SQ.M

LATITUDE: 56 DEG 18 MIN LONGITUDE: 10 DEG 29 MIN
ALTITUDE: 11-23 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 88362. , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7.3 DEG C

MEAN ANNUAL PRECIPITATION: 569 L/SQ.M

LENGTH OF GROWING SEASON: 145-152 DAYS

TEMPERATURE DURING GROWING SEASON: 14.1

MEAN PRECIPITATION DURING GROWING SEASON: 277 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 65520 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.6-5.3 DEPTH OF ROOTING ZONE: CM

STATUS OF DATA: PRELIMINARY

Participant/Author	Site	Forest type	Beech Fagus	Year
Thamdrup et al.	Hestehaven	Temp.deciduous	silvatica	197o

Global radiation (cal/cm^2/month and /year); calculations based on numbers of sun hours recorded at the meteorological station, Ödum.

Month	Ödum 197o	Ödum 1966-71
January	1o35	1o35
February	277o	27o8
March	48o4	7oo4
April	7237	1o963
May	138o6	1299o
June	19o2o	15912
July	114o9	14539
August	1336o	13o16
September	7925	78o4
October	4153	3865
November	1534	1766
December	13o9	98o
Year	88362	92582

Leaf area index, Hestehaven

1967	5.7
1968	6.7
1969	6.1
197o	5.o
1971	6.9

Annex 1. Site description, Table 3

Participant	Site	Forest type	Beech Fagus	Year
Thamdrup et al	Hestehaven	Temp. deciduous	silvatica	1970

Precipitation 1970 mm.

month	Ulstrup Met.st.	Ødum/Tirstrup Met.st. mean +)	Hestehave site +) incident	throughfall	stem-flow	retension
Jan	20	-	-	-	0	-
Feb.	32	24.7	-	23.7	0	-
March	48	72.7	-	47.0	0	-
April	74	66.7	-	44.3	3.6	-
May	40	36.0	41.1	21.2	1.7	18.2
June	48	36.4	46.5	30.1	5.2	11.2
July	107	71.1	70.1	41.1	6.4	22.6
Aug.	37	39.7	33.3	15.5	2.8	15.0
Sept.	73	88.0	36.0	49.4	8.1	28.5
Oct.	76	57.3	44.1	25.5	4.9	13.7
Nov.	113	123.8	115.1	74.6	21.2	19.3
Dec.	39	24.0	14.7	11.7	2.5	0.5
Total	707					

+): Values from monthly periods not exactly coinciding with calendar months.

Ulstrup Meteorological Station: ca. 10 km SE of Hestehaven
Tirstrup " " : ca. 10 km NE of Hestehaven
Ødum " " : ca. 20 km W of Hestehaven

Annex 1: Site description, Table 4

Participant/Author	Site	Forest type	Beech Fagus	Year
Thamdrup et al.	Hestehaven	Temp. deciduous	silvatica	197o

Precipitation recorded at meteorological stations near the research site in Hestehaven.

Month	Tirstrup 197o	Ödum (1917 - 1945)
January	21	44
February	22	31
March	4o	35
April	58	28
May	54	4o
June	37	5o
July	79	54
August	37	62
September	72	52
October	75	65
November	11o	41
December	33	67
Year	638	569

Annex 1: Site description, Table 5

Participant/Author	Site	Forest type	Beech Fagus silvatica	Year
Thamdrup et al.	Hestehaven	Temp.deciduous		197o

The mean monthly temperature (°C) at site (197o) compared with temperature data (mean monthly) from the Meteorological Stations Tirstrup and Ödum (about 1o km and 2o km from Hestehaven, respectively).

Month	Hestehaven (litter and + o - 6 cm)	Hestehaven 2 m	Tirstrup 197o	Ödum (1917-45)
January	o.6	-	-1.8	o.o
February	-o.1	-	-4.o	-o.2
March	o.2	-	o.2	1.8
April	-1.7	4.5	3.2	5.6
May	8.7	1o.6	11.o	1o.1
June	13.2	16.8	16.3	13.6
July	14.1	14.9	15.5	15.9
August	13.7	16.2	15.6	15.3
September	12.1	12.2	11.7	12.o
October	7.7	-	9.o	7.8
November	5.7	-	5.o	3.8
December	3.9	-	3.7	1.3
Year	6.5	-	7.1	7.3

Annex 1: Site description, Table 6

Participant/Author	Site	Forest type	Beech Fagus	Year
Thamdrup et al.	Hestehaven	Temp. deciduous	silvatica	197o

Mean temperature (°C), precipitation (mm) and global radiation (cal/cm^2) during the growing season, defined as days with a mean tp. > 1o°C.

	Mean air temperature (°C)	Precipitation (mm)	Radiation (cal/cm^2)
Hestehaven 197o	14.1 *)	ca. 277	-
Tirstrup 197o	14.o	ca. 279	-
Ödum 197o	-	-	65,52o
Ödum 1917-45 (mean)	ca. 13.4	ca. 258	-
Ödum 1966-71 **)	-	-	ca. 64, 261

*) level 2 m
**) (mean)

Annex 1: Site description, Table 7

Participant/Author	Site	Forest type	Beech Fagus	Year
Thamdrup et al.	Hestehaven	Temp. deciduous	silvatica	1970

Soil profile

Summary of observations in squares J 3 and H 20 representing fairly welldrained areas.

Diagnosis:

5(2)-0 cm	A_{oo}	Surface litter, mainly beech leaves.
0-14 cm	A_1	Mull horizon. Colour: very dark - grayish brown (10 YR 3/2). Loss on ignition (L):5.7%. Clay (C): 12.4%. Dense penetration of fine roots. pH 5.3.
14-30 cm	A_2	Colour: dark brown to brown (10 YR 4/3). L 3.0%, C12.7%, pH 5.6.
30-60 cm	A/B	Transitional horizon. Colour: Strong brown (7.5 YR 4/6) smaller parts with dark grayish brown (10 YR 4/2). L 2.6%, C 22.2% pH 5.8. Coarser roots concentrated to this part of the profile. (B)horizon vagely developed at 50-60 cm.
60-85 cm		Inhomogeneous horizon. Colour from strong brown (7.5 YR 4/6) in the upper part to yellow brown (10 YR 5/4) and brownish yellow (10 YR 6/6) in the lower parts. L 2.5%, C 18.6 - 14.2%, pH 6.6.
85 cm	C	Parent material of coarser texture. Colour: yellow brown (10 YR 5/4) to brownish yellow (10 YR 6/6). Evidence of $CaCO_3$.

Colour given according to: Munsell Soil Color Charts.
pH determined in water extract (proportion soil/water 1:1).

Annex 1: Site description, Table 8.

Participant/Author	Site	Forest type	Beech Fagus	Year
Thamdrup et.al.	Hestehaven	Temp.deciduous	silvatica	1970

Soil moisture 1970

Water content as percentage of weight of dry soil

Month	date	depth in cms									
		0 - 10			10 - 20		20-40		40-60		
		0-3	3-6	6-9	9-12	12-15	15-30	30-45	45-60	60-80	80-100
1	21	40.1	38.0	25.5	24.1	23.9	-	-	-	-	-
2	23	72.1	42.8	-	-	-	-	-	-	-	-
3	20	53.1	38.4	-	-	-	-	-	-	-	-
4	20	28.1	23.4	-	-	-	-	-	-	-	-
5	20	39.9	30.4	-	-	-	-	-	-	-	-
6	10	24.5					14.7	16.1	15.7	17.3	14.5
	22	27.3	21.1	-	-	-	-	-	-	-	-
7	20	37.1	26.5	-	-	-	-	-	-	-	-
8	20	36.7	26.5	-	-	-	-	-	-	-	-
9	21	33.9	23.1	-	-	-	-	-	-	-	-
10	5	35.0			18.6		12.4		15.3	12.1	8.4
	20	42.9	29.1	-	-	-	-	-	-	-	-
11	19	47.2	33.2	-	-	-	-	-	-	-	-

RESEARCHER(S): LINDGREN AND NIHLGARD SITE: LANGAROD, SWEDEN

FOREST TYPE: BEECH: DESCHAMPSIA-TYPE YEAR(S): 1966-1969

SOIL TYPE: PODSOL
GEOLOGY: CAMBRIAN SANDSTONE, OVERLAID BY PRIMARY ROCK MORAINE, DOMIN. BY SAND.
SOIL DRAINAGE: GOOD(DRY)

PRINCIPLE PLANT TYPES: FAGUS SILVATICA, DESCHAMPSIA FLEXUOSA

AGE OF STAND: 100 YEARS LEAF AREA INDEX: 3.2 SQ.M/SQ.M

BASAL AREA: 29.7 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 22 M STOCKING DENSITY: 320 STEMS/HA

STANDING CROP, ABOVEGROUND: 22600. G/SQ.M STANDING CROP, BELOWGROUND: 3660. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1060. G/SQ.M PRODUCTIVITY BELOWGROUND: 170. G/SQ.M

LATITUDE: 55 DEG 45 MIN LONGITUDE: 13 DEG 55 MIN
ALTITUDE: 150 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 85-90000 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6 DEG C

MEAN ANNUAL PRECIPITATION: 900 L/SQ.M

LENGTH OF GROWING SEASON: 220 DAYS

TEMPERATURE DURING GROWING SEASON: 12

MEAN PRECIPITATION DURING GROWING SEASON: 400 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70000 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0-4.5 DEPTH OF ROOTING ZONE: 70 CM

STATUS OF DATA: FINAL FORM

RESEARCHER(S): B.NIHLGARD SITE: KONGALUND, SWEDEN

FOREST TYPE: BEECH FOREST, STELLARIA-LAMIUM-TYPE YEAR(S): 1966-1969

SOIL TYPE: BROWN FOREST SOIL (ACID)
GEOLOGY: CAMBRIAN SHALES AND SANDSTONE, STONEY-SANDY MORAINE
SOIL DRAINAGE: GOOD

PRINCIPLE PLANT TYPES: FAGUS SILVATICA, STELLARIA NEMORUM, LAMIUM GALEOBDOLON, OXALIS ACETOSELLA, ANEMONE NEMOROSA

AGE OF STAND: 45-130 YEARS LEAF AREA INDEX: 3.4 SQ.M/SQ.M

BASAL AREA: 31.4 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 25. M STOCKING DENSITY: 240 STEMS/HA

STANDING CROP, ABOVEGROUND: 32400. G/SQ.M STANDING CROP, BELOWGROUND: 5100. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1540. G/SQ.M PRODUCTIVITY BELOWGROUND: >240. G/SQ.M

LATITUDE: 55 DEG 59 MIN LONGITUDE: 13 DEG 10 MIN
ALTITUDE: 120 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 90000 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7 DEG C

MEAN ANNUAL PRECIPITATION: 800 L/SQ.M

LENGTH OF GROWING SEASON: 230 DAYS

TEMPERATURE DURING GROWING SEASON: 12.9

MEAN PRECIPITATION DURING GROWING SEASON: 350 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70000 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0-4.5 DEPTH OF ROOTING ZONE: 70 CM

Tab. 6. Climatic data, average values. Estimated precipitation at Södervidinge and Norrvidinge within ( ). The potential evapotranspiration from a grass surface and the total global solar radiation are from Wallén (1966). The actual evapotranspiration is calculated according to Aslyng (1965). In the water balances, ETA is from 1931-60 and P from the mentioned precipitation periods.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Apr Sep	Year
Precipitation (mm)														
Svalöv 1931-1960	62	47	33	41	43	56	88	76	68	66	57	59	372	696
Svalöv 1920-1971	59	42	35	44	47	59	85	80	71	67	61	61	386	711
Kävlinge 1960-1971	56	35	34	48	46	56	69	64	59	58	68	67	342	660
Örtofta 1946-1971	45	32	29	40	43	52	73	65	57	52	62	53	330	603
Arlöv 1945-1971	44	34	30	39	40	44	64	66	52	48	52	50	305	563
Norrvidinge and Södervidinge 1969-1971	(54)	(36)	(32)	40	51	51	61	54	(62)	(59)	(63)	(60)	319	(523)
Air temperature (°C)														
Svalöv 1931-1960	-1.5	-1.7	0.7	5.6	11.0	14.8	16.9	16.2	12.7	7.9	3.9	1.0	12.9	7.3
Global solar radiation (cal x cm^{-2})														
Svalöv 1931-1960, per month	1395	2800	6045	9300	14415	14400	14105	11315	7800	3255	1350	775	71,335	86,935
per day	45	100	195	310	465	480	455	365	260	105	45	25	389	238
Evapotranspiration, potential, ETP (mm)														
Svalöv 1931-1960	0	7	21	50	94	108	106	85	51	12	2	-7	494	536
Evapotranspiration, actual, ETA (mm)														
Svalöv 1931-1960	0	7	21	50	78	71	75	72	46	12	2	-7	392	434
Water balance, P - ETA (mm)														
Svalöv 1931-1960	62	40	12	-9	-35	-15	13	4	22	54	55	59	-20	262
Svalöv 1920-1971	59	35	14	-6	-31	-12	10	8	25	55	59	61	-6	277
Kävlinge 1960-1971	56	28	13	-2	-32	-15	-6	-8	13	46	65	67	-50	226
Örtofta 1946-1971	45	25	8	-10	-35	-19	-2	-7	11	40	60	53	-62	169
Norrvidinge and Södervidinge 1969-1971	(54)	(29)	(11)	-10	-27	-20	-14	-18	(16)	(47)	(61)	(60)	-73	(189)

CLIMATIC DATA, BIOMASS, BIOELEMENTS

RESEARCHER(S): F. ANDERSSON SITE: LINNEBJER, SWEDEN

FOREST TYPE: OAK-HAZEL, CONVALLARIA-OXALIS YEAR(S): 1964-1968

SOIL TYPE: BROWN FOREST SOIL OF GLEY TYPE
GEOLOGY: SILURIAN SLATE
SOIL DRAINAGE: GOOD(ZONAL)

PRINCIPLE PLANT TYPES: QUERCUS ROBUR, TILIA CORDATA, SORBUS AUCUPARIA, CORYLUS AVELLANA, ANEMONE NEMOROSA, OXALIS ACETOSELLA, CONVALLARIA MAJALIS

AGE OF STAND: 12-180 YEARS LEAF AREA INDEX: 5.4 SQ.M/SQ.M

BASAL AREA: 31.1 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 2-20 M STOCKING DENSITY: 4725 STEMS/HA

STANDING CROP, ABOVEGROUND: 20100. G/SQ.M STANDING CROP, BELOWGROUND: 3900. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1290 G/SQ.M PRODUCTIVITY BELOWGROUND: 230 G/SQ.M

LATITUDE: 55 DEG 44 MIN LONGITUDE: 13 DEG 18 MIN
ALTITUDE: 60 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 85-90000 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7-8 DEG C

MEAN ANNUAL PRECIPITATION: 700 L/SQ.M

LENGTH OF GROWING SEASON: 230 DAYS

TEMPERATURE DURING GROWING SEASON: 13

MEAN PRECIPITATION DURING GROWING SEASON: 350 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70000 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0-4.5 DEPTH OF ROOTING ZONE: 60 CM

STATUS OF DATA: PUBLISHED(BIOMASS),PRELIMINARY(MINERAL)

RESEARCHER(S): H.PERSSON,H.HYTTEBORN,T.PERSON SITE: ANDERSBY,ANGSBACKAR III,SWEDEN

FOREST TYPE: DECIDUOUS, QUERCUS-BETULA-CORYLUS YEAR(S): 1968-72

SOIL TYPE: BROWN EARTH WITH MULL AND MODER
GEOLOGY: TILL AND CLAY
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: TREE LAYER: QUERCUS ROBUR,BETULA PUBESCENS AND VERRUCOSA HIGH BUSH LAYER: CORYLU AVELLANA LOW BUSH LAYER: LONICERA XYLOSTEUM,RIBES ALPINUM FIELDLAYER: FRAGARIA VESCA,ANEMONE NEMOROSA,A.HEPATICA,CONVALLARIA MAJ.,GERANIUM SILVATICUM,LATHYRUS MONTANUS,RUBUS SAXATILIS,TRIFOLIUM M EDIUM,CALAMAGROSTIS ARUNDINAEA,DESCHAMPSIA FLEXUOSA,LUZULA PILOSA

AGE OF STAND: UNEVEN YEARS LEAF AREA INDEX: 4.0-5.4 SQ.M/SQ.M

BASAL AREA: 12.3 SQ.M/HA BASAL AREA INCREM.: .24 SQ.M/HA

STAND HEIGHT: 15.-20. M STOCKING DENSITY: 452 STEMS/HA

STANDING CROP, ABOVEGROUND: 9760 G/SQ.M STANDING CROP, BELOWGROUND: 1884 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 670 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 60 DEG MIN LONGITUDE: 17 DEG MIN
ALTITUDE: 30. METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 84560 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 5.3 DEG C

MEAN ANNUAL PRECIPITATION: 566 L/SQ.M

LENGTH OF GROWING SEASON: 204 DAYS

TEMPERATURE DURING GROWING SEASON: 11.3

MEAN PRECIPITATION DURING GROWING SEASON: 347 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70445 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.4 DEPTH OF ROOTING ZONE: 40-70 CM

STATUS OF DATA: PRELIMINARY

Further Data.

2. Length of vegetation period (>+3°C) : 204 days

" " foliated phenophase of main trees and bush

	Quercus robur	Betula pubescens and verrucosa	Corylus avellana
Datum begin of foliation	31.5	15.5	23.5.
midth " "	9.6	long shoots 29.5 short " 23.5	2.6
end of complete "	20.6.	long shoots 20.7 short " 6.6	15.7.

Datum of yellowing ?

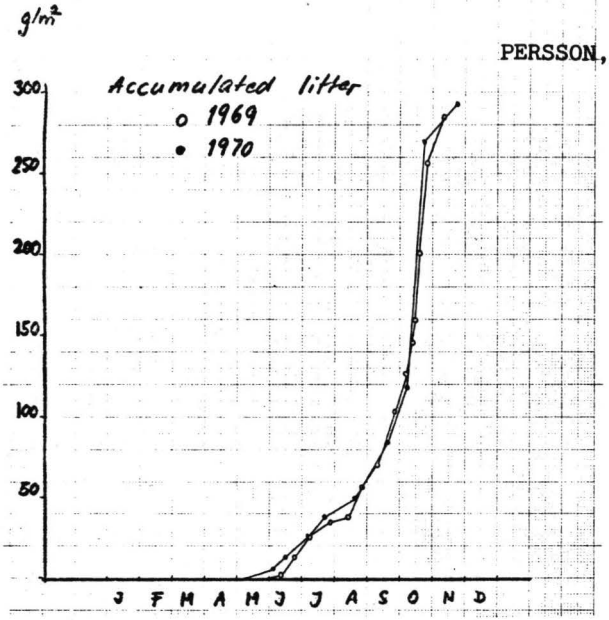
Datum of begin of defoliation: nearly immediatly after foliation start

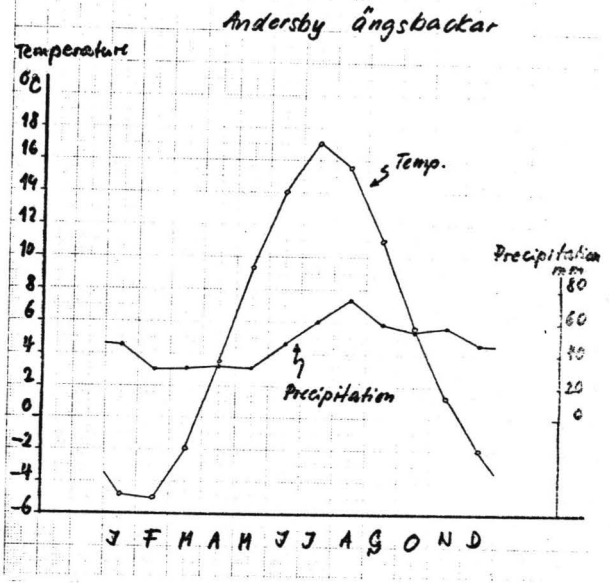
10% "	28.9	15.9	17.8
1/2 "	17.10	15.10	8.10
3/4 "	21.10	20.10	14.10
quasi complete "	30.10	4.11	22.10

Site: Andersby ängsbackar; Forest type: Deciduous; Further identification:

Quercus-Betula-Corylus.

Håkan Hytteborn
Institute of Ecological Botany
Uppsala





Site: Andersby ängsbackar Forest type: Deciduous, Quercus-Betula-Corylus

Mean values 1931-60.

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Global radiation, cal/cm²	775	2240	5735	9750	14105	14850	14880	11160	6750	3100	750	465	84560
Precipitation, mm	45.5	30.3	30.8	32.1	33.7	46.4	60.4	73.6	58.6	54.2	56.5	46.0	566
Temperature, °C	-4.8	-5.0	-1.9	3.5	9.3	14.0	17.0	15.5	11.0	5.6	1.3	-2.0	+5.3

RESEARCHER(S): LINDGREN, NIHLGARD SITE: OVED, SWEDEN

FOREST TYPE: BEECH: MERCURIALIS-TYPE YEAR(S): 1966-1969

SOIL TYPE: BROWN FOREST SOIL WITH CLEY HORIZON
GEOLOGY: SILURIAN SLATE OVERLAID BY CLAY+SLATE AND PRIMARY ROCK MORAINE
SOIL DRAINAGE: POOR

PRINCIPLE PLANT TYPES: TAGUS SILVATICA, MERCURIALIS PERENNIS, ALLIUM URSINJM, ANEMONE NEMOROSA, ANEMONE RANUNCULAIDES

AGE OF STAND: 80-100 YEARS LEAF AREA INDEX: 4.3 SQ.M/SQ.M

BASAL AREA: 31.1 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 26-32 M STOCKING DENSITY: 180 STEMS/HA

STANDING CROP, ABOVEGROUND: 31500. G/SQ.M STANDING CROP, BELOWGROUND: 4340. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1670. G/SQ.M PRODUCTIVITY BELOWGROUND: 230. G/SQ.M

LATITUDE: 55 DEG 42 MIN LONGITUDE: 13 DEG 38 MIN
ALTITUDE: 60 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 85-90000 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7. DEG C

MEAN ANNUAL PRECIPITATION: 650. L/SQ.M

LENGTH OF GROWING SEASON: 230 DAYS

TEMPERATURE DURING GROWING SEASON: 13

MEAN PRECIPITATION DURING GROWING SEASON: 350 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70000 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 6.5-7.5 DEPTH OF ROOTING ZONE: 70 CM

STATUS OF DATA: PRELIMINARY

RESEARCHER(S): C.BINDIU,V.MOCANU SITE: SINAIA,RUMANIA, SITE 1

FOREST TYPE: BEECH-FIR FOREST YEAR(S): 1967-1970

SOIL TYPE: BROWN FOREST SOIL EUBASIC
GEOLOGY: CONGLOMERATES COVERED BY LOAM
SOIL DRAINAGE: MAINLY VERTICAL

PRINCIPLE PLANT TYPES: FAGUS SILVATICA(65 PER CENT), ABIES ALBA(35 PER CENT), PULMONARIA RUBRA, DENTAARIA G
LANDULOSA, SYMPHYTUM CORDATUM, ASPERULA ODORATA, OXALIS ACETOSELLA

AGE OF STAND: 1-450 YEARS LEAF AREA INDEX: 9.74 SQ.M/SQ.M

BASAL AREA: 41.96 SQ.M/HA BASAL AREA INCREM.: 1.08 SQ.M/HA

STAND HEIGHT: 38.5-42.5 M STOCKING DENSITY: 842 STEMS/HA

STANDING CROP, ABOVEGROUND: 29494.7 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 925. G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 45 DEG 23 MIN LONGITUDE: 23 DEG 15 MIN
ALTITUDE: 950 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 117 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 5.7 DEG C

MEAN ANNUAL PRECIPITATION: 895 L/SQ.M

LENGTH OF GROWING SEASON: 155-175 DAYS

TEMPERATURE DURING GROWING SEASON: 10.7

MEAN PRECIPITATION DURING GROWING SEASON: 645 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 83.5 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 70 DEPTH OF ROOTING ZONE: 120 CM

STATUS OF DATA:

RESEARCHER(S): C.BINDIU SITE: SINAIA,RUMANIA, SITE 2

FOREST TYPE: FIR FOREST YEAR(S): 1968-1970

SOIL TYPE: BROWN FOREST SOIL EUBASIC
GEOLOGY: FLYSCH
SOIL DRAINAGE: MAINLY VERTICAL

PRINCIPLE PLANT TYPES: ABIES ALBA, OXALIS ACETOSELLA, PLEUROSIUM SCHREBERI

AGE OF STAND: 110 YEARS LEAF AREA INDEX: 12. SQ.M/SQ.M

BASAL AREA: 76.62 SQ.M/HA BASAL AREA INCREM.: 1.48 SQ.M/HA

STAND HEIGHT: 36. M STOCKING DENSITY: 485 STEMS/HA

STANDING CROP, ABOVEGROUND: 47009. G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1130. G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 45 DEG 23 MIN LONGITUDE: 23 DEG 15 MIN
ALTITUDE: 960-1010 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 117 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 5.1 DEG C

MEAN ANNUAL PRECIPITATION: 1025 L/SQ.M

LENGTH OF GROWING SEASON: 175 DAYS

TEMPERATURE DURING GROWING SEASON: 10.4

MEAN PRECIPITATION DURING GROWING SEASON: 718 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 83.5 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 6.8-6.2 DEPTH OF ROOTING ZONE: 80 CM

STATUS OF DATA:

RESEARCHER(S): GRIER SITE: ANDREWS EXPER.FOR.,WATRSHD 10,SEATTLE

FOREST TYPE: PSEUDOTSUGA MENZIELI YEAR(S): 1972

SOIL TYPE: REGASOL-REDDISH BROWN LATERITIC INTERGRADE
GEOLOGY: MIOCENE TUFFS AND BRECIAS
SOIL DRAINAGE: GOOD

PRINCIPLE PLANT TYPES: PSEUDOTSUGA MENZIELI, TSUGA HETEROPHYLLA, CASTANOPSIS CHRYSOPHYLLA, THUJA PLICATA, P
INUS LAMBERTIANA

AGE OF STAND: 450 YEARS LEAF AREA INDEX: 12.5 SQ.M/SQ.M

BASAL AREA: 62.1 SQ.M/HA BASAL AREA INCREM.: .25 SQ.M/HA

STAND HEIGHT: 70 M STOCKING DENSITY: 290 STEMS/HA

STANDING CROP, ABOVEGROUND: 53648. G/SQ.M STANDING CROP, BELOWGROUND: 8249. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 193.1 G/SQ.M PRODUCTIVITY BELOWGROUND: 19.3 G/SQ.M

LATITUDE: 44 DEG 15 MIN LONGITUDE: 122 DEG 20 MIN
ALTITUDE: 430-670 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: NO DATA DEG C

MEAN ANNUAL PRECIPITATION: 2250 L/SQ.M

LENGTH OF GROWING SEASON: NO DATA DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.5-6.0 DEPTH OF ROOTING ZONE: 100. CM

STATUS OF DATA:

RESEARCHER(S): S.P.GESSEL, P.SOLLINS SITE: THOMPSON RESEARCH CENTER, SEATTLE

FOREST TYPE: DOUGLAS FIR PLANTATION YEAR(S): 1961-PRESENT

SOIL TYPE: TYPIC HAPLORTHOD, EVERETT GRAVELLY SANDY LOAM
GEOLOGY: RIVER TERRACES
SOIL DRAINAGE: WELL DRAINED

PRINCIPLE PLANT TYPES: PSEUDOTSUGA MENZIESII, TSUGA HETEROPHYLLA

AGE OF STAND: 30(1967) YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 3.77 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 10. M STOCKING DENSITY: 2223 STEMS/HA

STANDING CROP, ABOVEGROUND: 17430. G/SQ.M STANDING CROP, BELOWGROUND: 3070. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1436. G/SQ.M PRODUCTIVITY BELOWGROUND: 363. G/SQ.M

LATITUDE: N 47 DEG 23 MIN LONGITUDE: W 121DEG 57 MIN
ALTITUDE: 210 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 99280 , RAD. BALANCE: 70557 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: NO DATA DEG C

MEAN ANNUAL PRECIPITATION: 1360 L/SQ.M

LENGTH OF GROWING SEASON: 214 DAYS

TEMPERATURE DURING GROWING SEASON: 14

MEAN PRECIPITATION DURING GROWING SEASON: 670 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.5 DEPTH OF ROOTING ZONE: 00-100 CM

STATUS OF DATA: PARTLY PUBLISHED

RESEARCHER(S): C.E.MURPHY, C.WELLS SITE: DUKE FOREST, N. CAROLINA

FOREST TYPE: PINE PLANTATION YEAR(S): 1968

SOIL TYPE: GRANVILLE COARSE SANDY LOAM
GEOLOGY: APPALACHIAN PIEDMONT
SOIL DRAINAGE: MODERATELY WELL DRAINED

PRINCIPLE PLANT TYPES: PINUS TAEDA

AGE OF STAND: 16 YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 49. SQ.M/HA BASAL AREA INCREM.: 2.18 SQ.M/HA

STAND HEIGHT: 15.0 M STOCKING DENSITY: 2243 STEMS/HA

STANDING CROP, ABOVEGROUND: 15600 G/SQ.M STANDING CROP, BELOWGROUND: 3630 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 130. G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 36 DEG MIN LONGITUDE: 79 DEG MIN
ALTITUDE: 149 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 15.6 DEG C

MEAN ANNUAL PRECIPITATION: 1150 L/SQ.M

LENGTH OF GROWING SEASON: 231 DAYS

TEMPERATURE DURING GROWING SEASON: 20.3

MEAN PRECIPITATION DURING GROWING SEASON: 749.3 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.5 DEPTH OF ROOTING ZONE: 40 CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): C.E.MURPHY AND OTHERS SITE: TRIANGLE-EDFB,SAXAPAHAW,N.CAROLINA

FOREST TYPE: PINE PLANTATION YEAR(S): 1972

SOIL TYPE: APPLING SANDY LOAM
GEOLOGY: APPALACHIAN PIEDMONT
SOIL DRAINAGE: SOMEWHAT RESTRICTD. PERCHD WATR TABLE(30 CM) ABV B-HORIZ AT TIMES IN WINTER.

PRINCIPLE PLANT TYPES: PINUS TAEDA

AGE OF STAND: 15 YEARS LEAF AREA INDEX: 3.9-6.6 SQ.M/SQ.M

BASAL AREA: 41.3 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 11.58 M STOCKING DENSITY: 1470 STEMS/HA

STANDING CROP, ABOVEGROUND: 9263. G/SQ.M STANDING CROP, BELOWGROUND: 2184. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1063. G/SQ.M PRODUCTIVITY BELOWGROUND: 165. G/SQ.M

LATITUDE: 35 DEG MIN LONGITUDE: 79 DEG MIN
ALTITUDE: 144 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 15.6 DEG C

MEAN ANNUAL PRECIPITATION: 1150 L/SQ.M

LENGTH OF GROWING SEASON: 231 DAYS

TEMPERATURE DURING GROWING SEASON: 20.3

MEAN PRECIPITATION DURING GROWING SEASON: 749.3 L/SQ.M

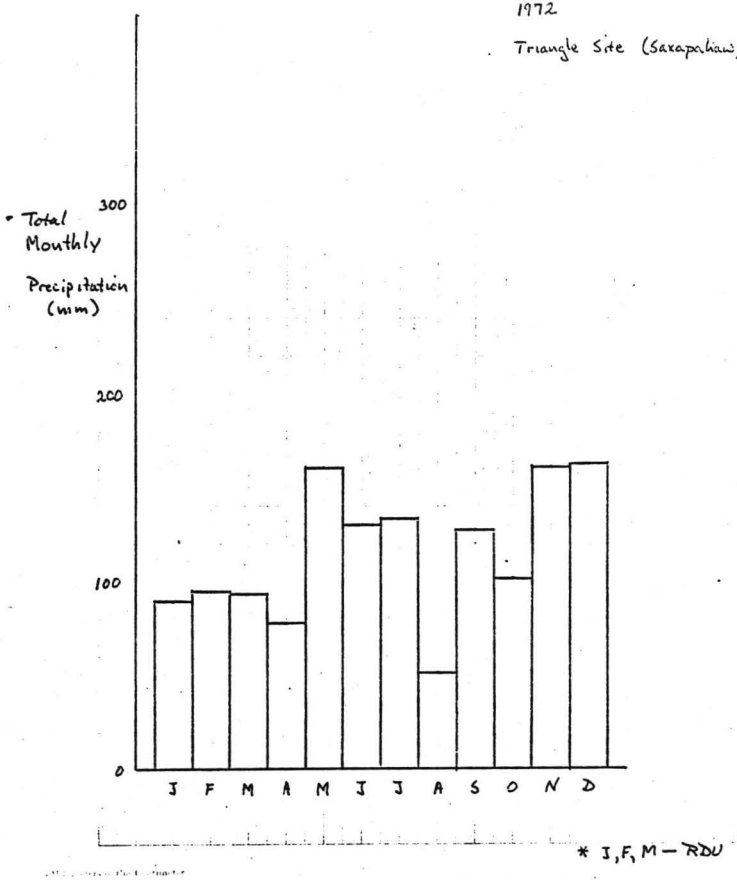
MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

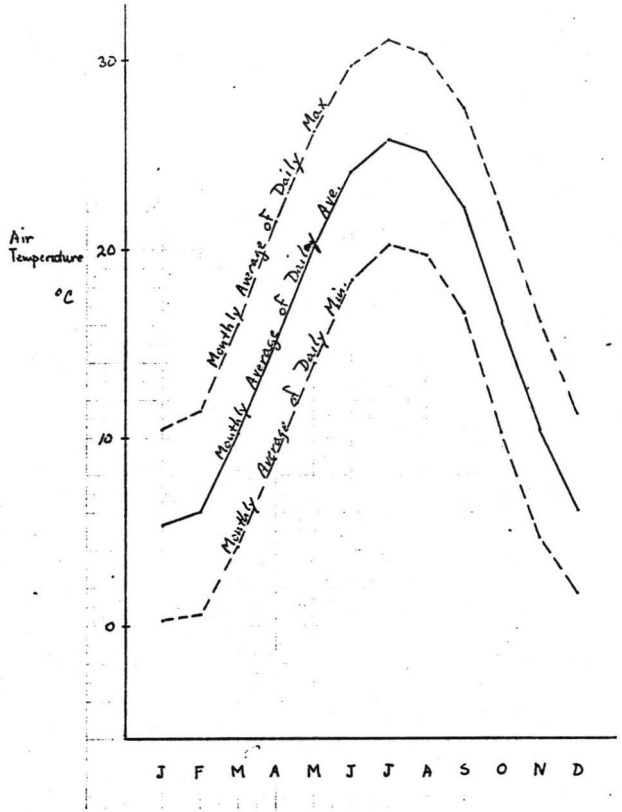
PH: 4.5 DEPTH OF ROOTING ZONE: 40 CM

MURPHY / TRIANGLE

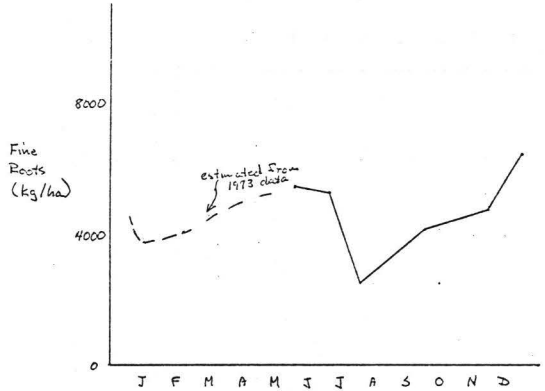
1972

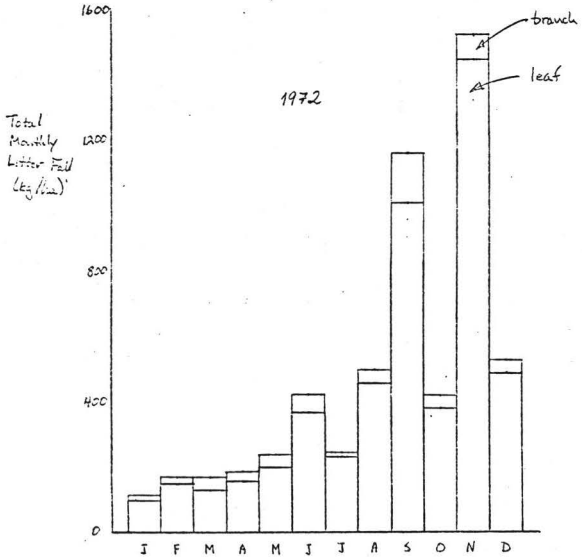
Triangle Site (Sarapahaw, N.C.)*

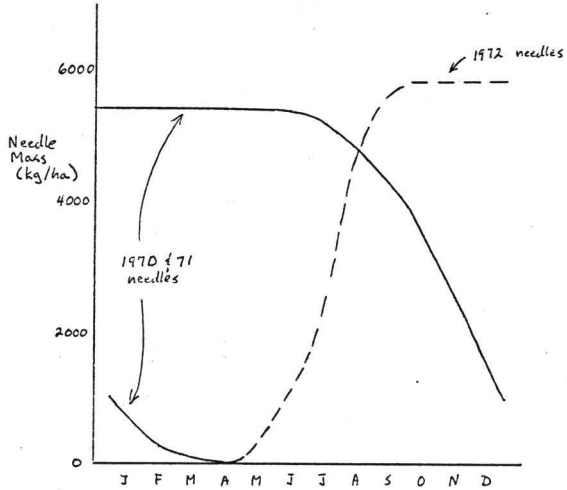




MURPHY / TRIANGLE







RESEARCHER(S): Y. KITAZAWA SITE: SHIGAYAMA, JAPAN

FOREST TYPE: CONIFEROUS-SUBALPINE YEAR(S): 1968-1972

SOIL TYPE: WET(HUMID) PODSOLIC SOIL
GEOLOGY: VOLCANIC LAVA FLOW OF PLEISTOCENE
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: TSUGA DIVERSIFOLIA, ABIES MARIESII, BETULA ERMANI

AGE OF STAND: 290 YEARS LEAF AREA INDEX: 6.8 SQ.M/SQ.M

BASAL AREA: 53.1 SQ.M/HA BASAL AREA INCREM.: .04 SQ.M/HA

STAND HEIGHT: 18 M STOCKING DENSITY: 1199 STEMS/HA

STANDING CROP, ABOVEGROUND: 19250. G/SQ.M STANDING CROP, BELOWGROUND: 6410. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 610 G/SQ.M PRODUCTIVITY BELOWGROUND: 140. G/SQ.M

LATITUDE: 36 DEG 40 MIN LONGITUDE: 138 DEG 30 MIN
ALTITUDE: 1790 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: 117377 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 4.2 DEG C

MEAN ANNUAL PRECIPITATION: 1455 L/SQ.M

LENGTH OF GROWING SEASON: 180 DAYS

TEMPERATURE DURING GROWING SEASON: 11.7

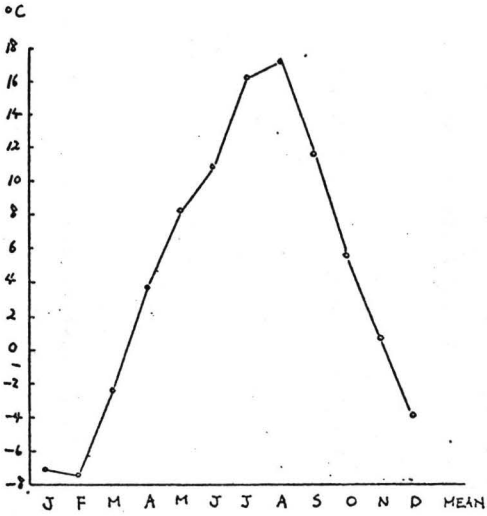
MEAN PRECIPITATION DURING GROWING SEASON: 922 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: 59984 CAL/SQ. CM

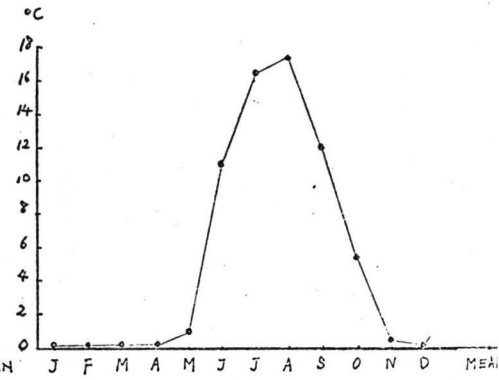
PH: 3.6-4.2 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA: PUBLISHED

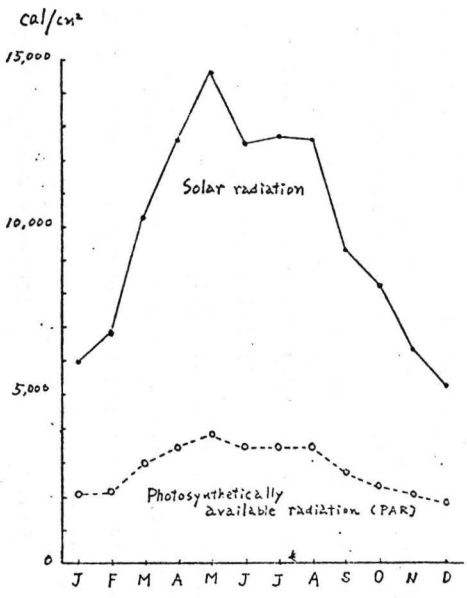
KITAZAWA / SHIGAYAMA



(Air temperature
Shigayama 1968~1972)

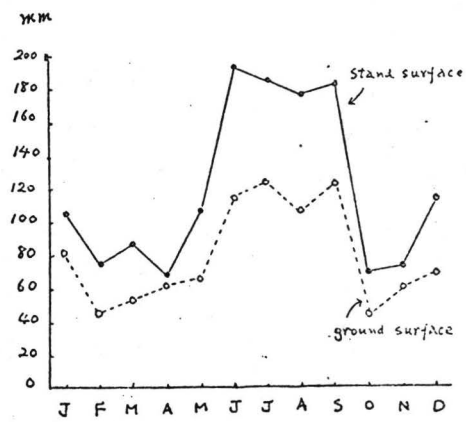


(Soil temperature at 2.5 cm depth
Shigayama 1968~1972)



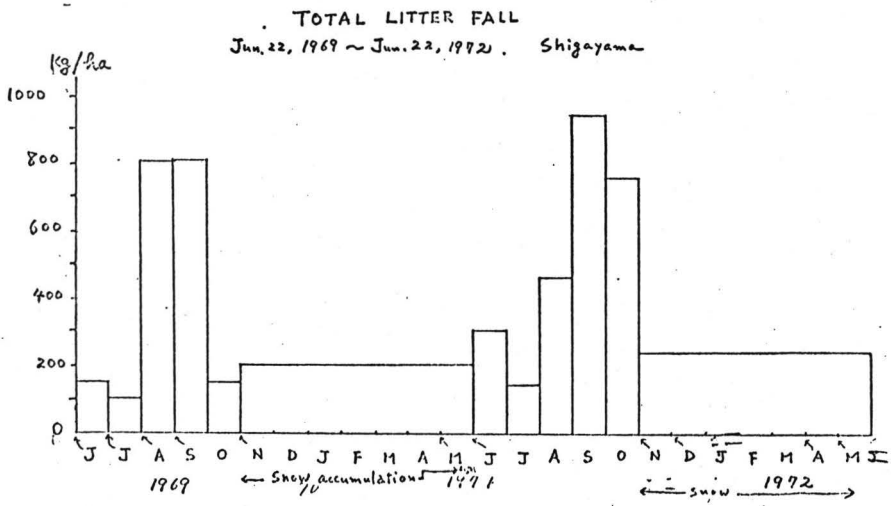
Monthly solar radiation
Shigayam 1968~1972

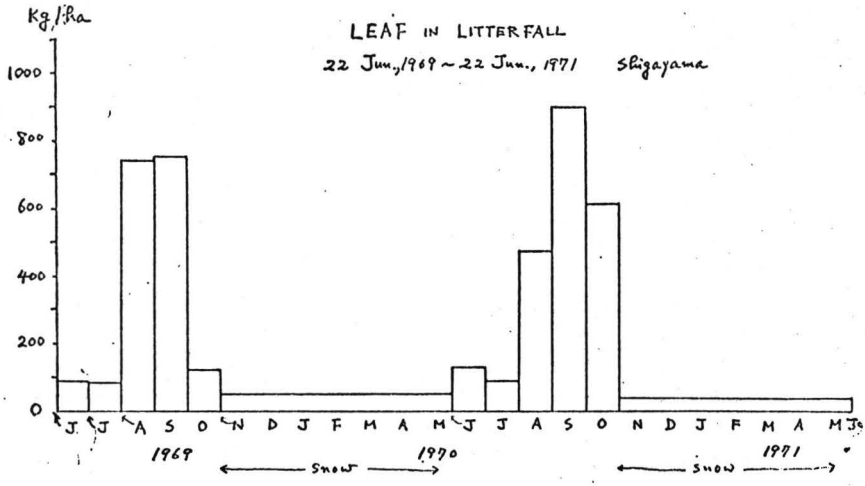
$PAR = 1.6 \times Q^{0.709}$

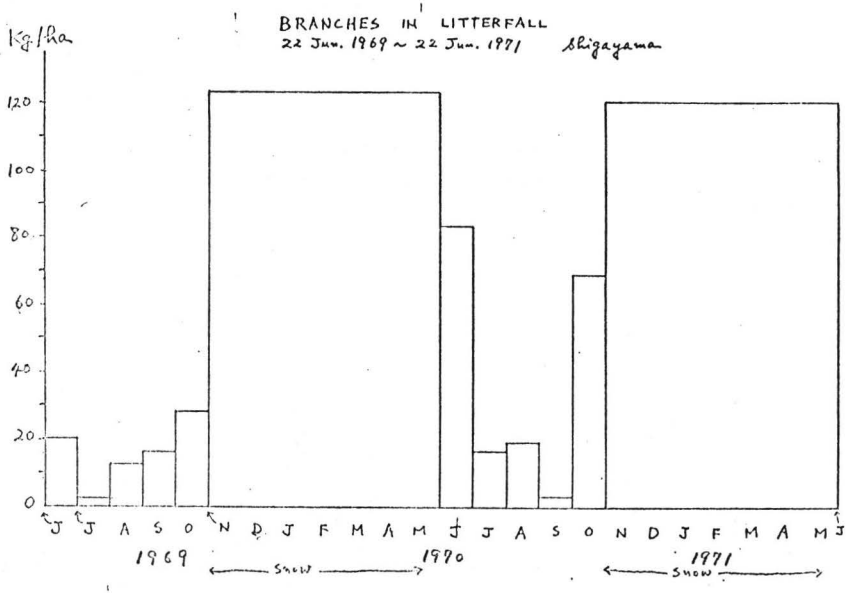


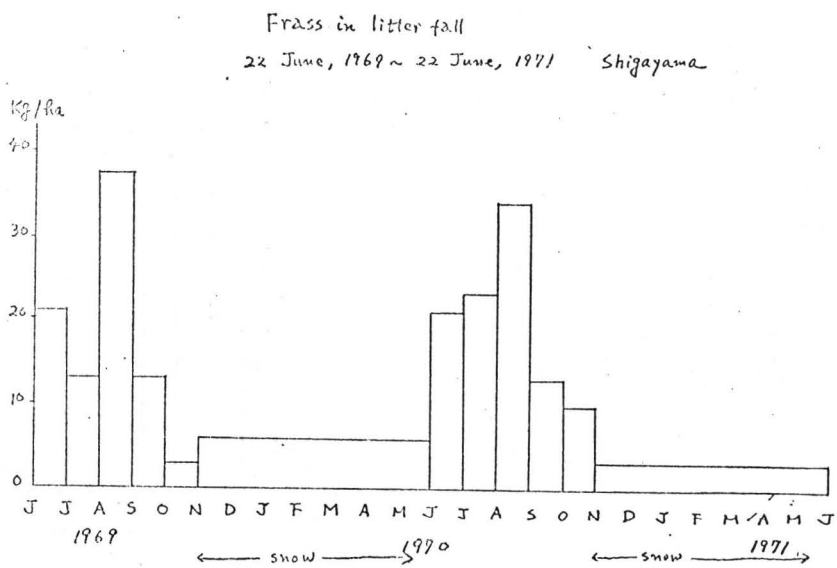
Monthly precipitation, Shigayama
1968~1972

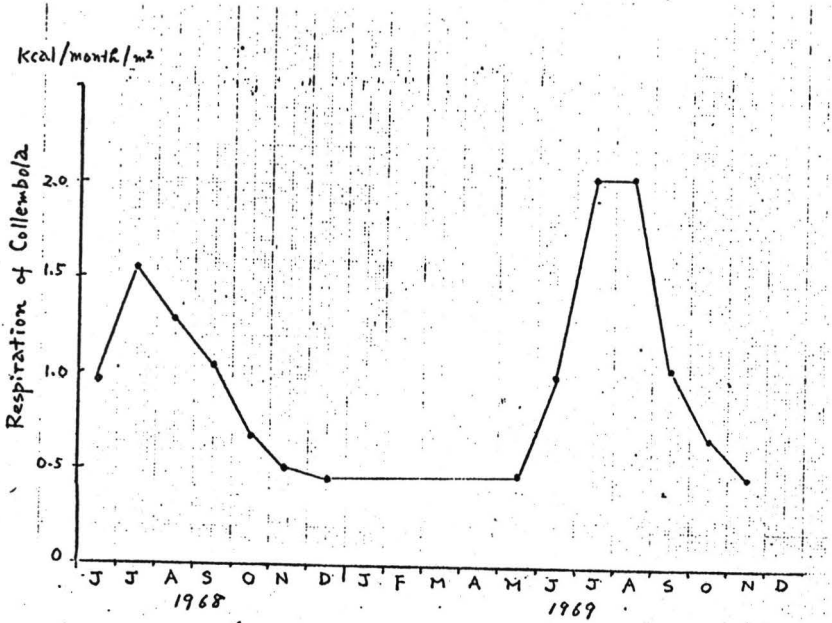
KITAZAWA / SHIGAYAMA






BRANCHES IN LITTERFALL
22 Jun. 1969 ~ 22 Jun. 1971 Shigayama
Kg/ha
120
100
80
60
40
20
0
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
1969
1970
1971
SNOW
SNOW


Frass in litter fall
22 June, 1969 ~ 22 June, 1971 Shigayama
Kg/ha
40
30
20
10
0
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
1969
1970
1971
SNOW
SNOW



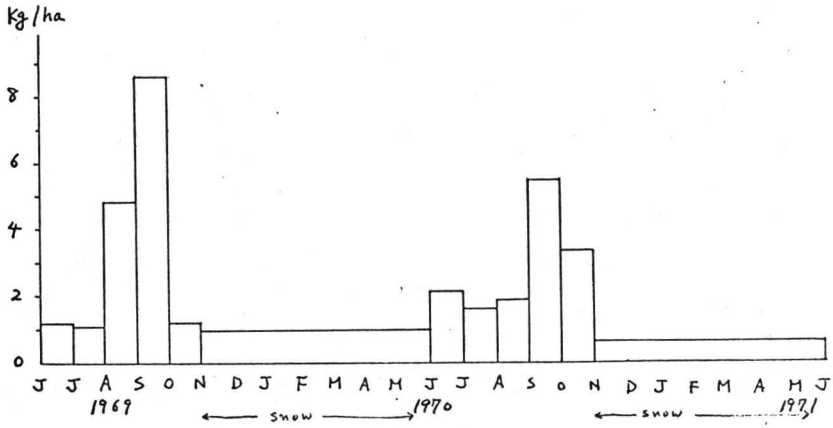
(Respination of Collembola, Shigayama)

Respination. CO_2-C Kg/ha/month
Shigayama (1969~1972)

	J	J	A	S	O	Method
A Soil top organic	745	1209	1351	1036	571	Field study ($CO_2 \rightarrow NaOH$)
B decomposer fauna / decomposer flora	410	804	914	663	271	Laboratory study ($CO_2 \rightarrow NaOH$)
C living roots sum	335	405	437	373	300	A-B

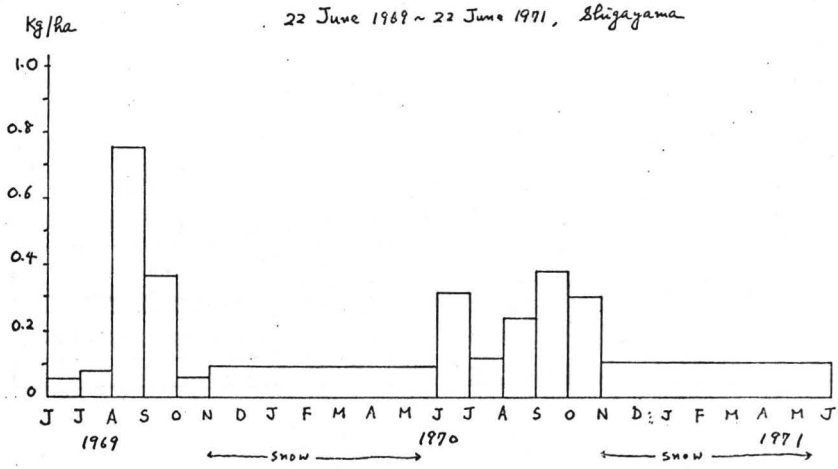
N in litter fall

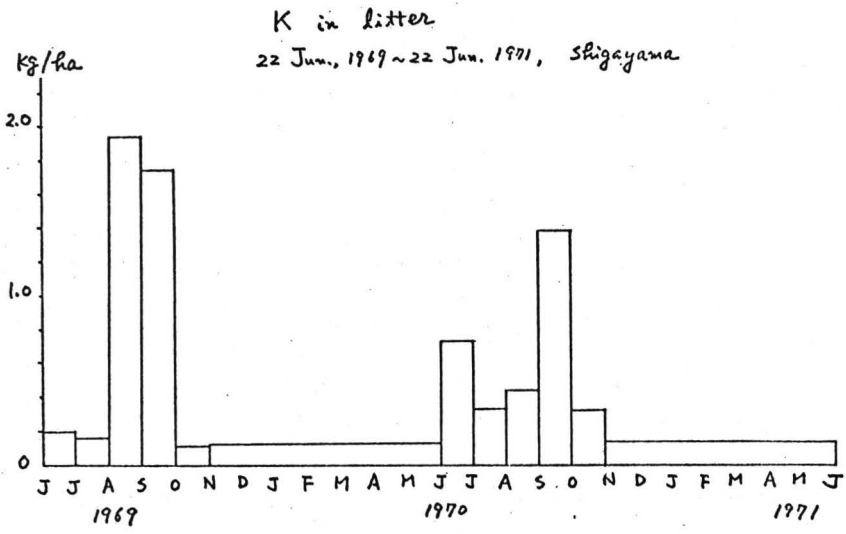
22 June 1969 ~ 22 June 1971 Shigayama

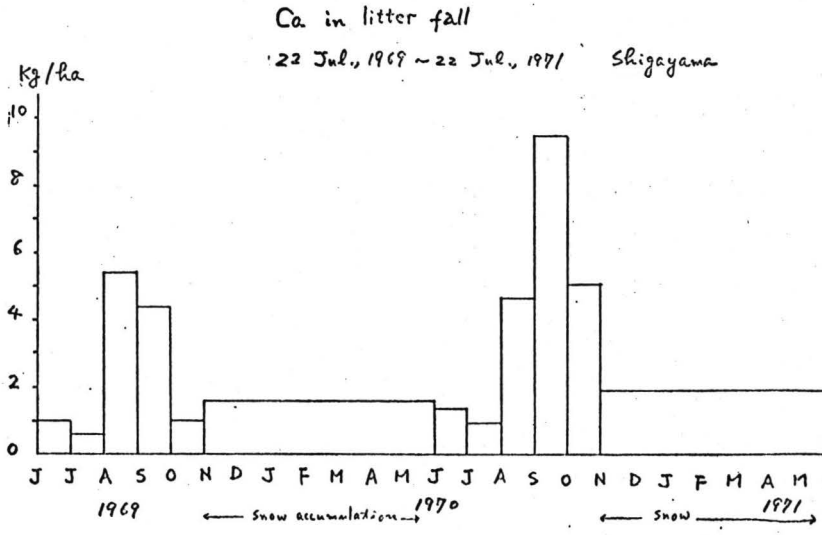


P in litter

22 June 1969 ~ 22 June 1971, Shigayama




K in litter
22 Jun., 1969 ~ 22 Jun. 1971, Shigayama
Kg/ha
2.0
1.0
0
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
1969
1970
1971


Ca in litter fall
22 Jul., 1969 ~ 22 Jul., 1971 Shigayama
Kg/ha
10
8
6
4
2
0
J J A S O N D J F M A M J J A S O N D J F M A M
1969
1970
1971
Snow accumulation
Snow

Element flux through soil horizon in Kg/ha. Shigayama

Soil type Horizon		1971					1972				
		J	J	A	S	O	J	J	A	S	O
Pw(h)III B1	Ca	3.4	1.3	>3.6	2.2	0.3	—*	>2.4	2.9	>5.4	0.05
	Mg	1.7	0.3	>1.8	1.1	0.2	0.01	>2.4	1.7	>2.4	0.01
	K	41.5	17.9	>42.0	13.7	1.4	0.1	>0.4	2.1	>3.0	0.03
	N**	5.7	2.8	>10.8	2.2	0.2	0.05	>42	2.5	>0.6	0.02
Pw(h)II A2	Ca	3.0	1.5	3.2	0.8	0.9	0.4	>3.0	1.3	>2.4	—
	Mg	1.3	1.1	0.9	0.1	0.3	0.1	>1.2	0.6	>1.2	—
	K	3.0	1.5	1.5	0.2	0.3	0.2	>0.6	0.1	>0.6	—
	N**	1.0	2.6	1.8	0.2	0.4	0.4	>3.0	0.3	>0.6	—*

* No sample ** Inorganic N (NO_3-N + NH_4-N)

RESEARCHER(S): BAUMGARTNER, HAGER SITE: FA EGLHARTING ABT.27A, WEST GERMANY

FOREST TYPE: ARTIFICIAL SPRUCE (NAT. HARDWOODS) YEAR(S): 1964-1972

SOIL TYPE: PARABRAUNERDE
GEOLOGY: OLD WURMGRAVEL
SOIL DRAINAGE: AVERAGE

PRINCIPLE PLANT TYPES: SPRUCE

AGE OF STAND: 60 YEARS LEAF AREA INDEX: 21.6 SQ.M/SQ.M

BASAL AREA: 57.42 SQ.M/HA BASAL AREA INCREM.: 1.03 SQ.M/HA

STAND HEIGHT: 30.09 M STOCKING DENSITY: 800 STEMS/HA

STANDING CROP, ABOVEGROUND: 32200. G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1551.0 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 48 DEG MIN LONGITUDE: 12 DEG MIN
ALTITUDE: 552 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7.0 DEG C

MEAN ANNUAL PRECIPITATION: 875 L/SQ.M

LENGTH OF GROWING SEASON: 160-170 DAYS

TEMPERATURE DURING GROWING SEASON: 15

MEAN PRECIPITATION DURING GROWING SEASON: 475 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: CAL/SQ. CM

PH: 4.6-6.5 DEPTH OF ROOTING ZONE: 65 CM

STATUS OF DATA: PUBLISHED

BAUMGARTNER, HAGER / EGLHARTING

Monatssummen der Strahlungsbilanz Q, des latenten Wärmestroms V, der aktuellen Verdunstung V_a sowie das Verhältnis V/Q

	Jan.	Feb.	März	Apr.	Mai	Juni	
Q	1333	2044	2449	6000	9393	7680	cal/cm^2
V	1212	1820	1500	4020	7502	6531	cal/cm^2
V/Q	0.91	0.89	0.61	0.67	0.80	0.85	
V_a	20.6	30.4	25.4	62.5	128.0	111.0	mm

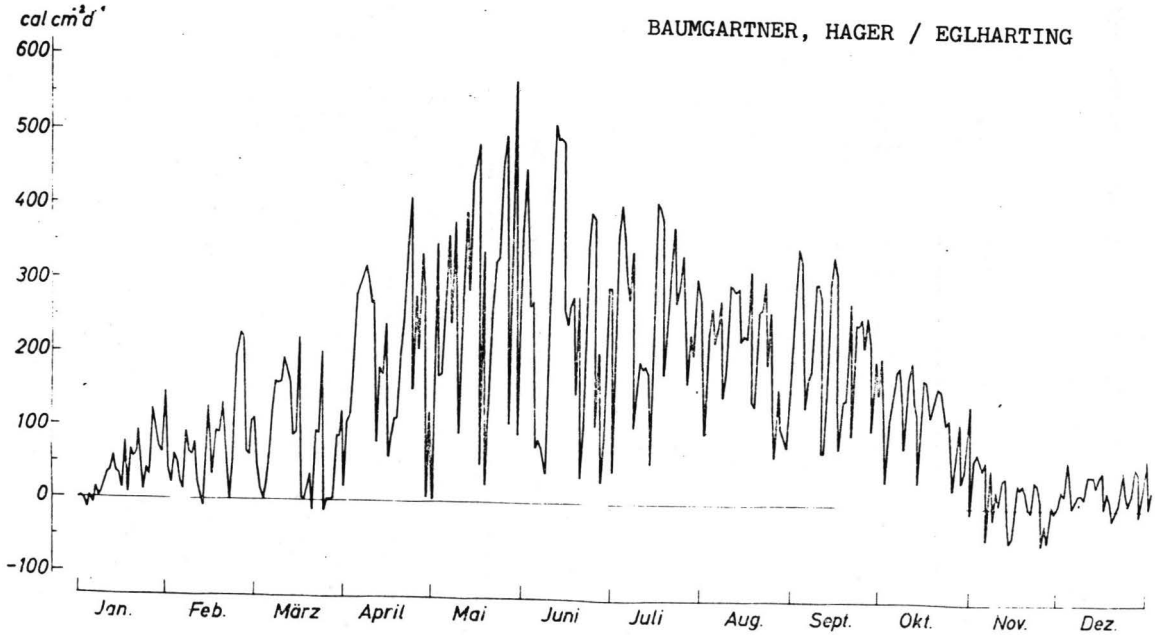
	Juli	Aug.	Sep.	Okt.	Nov.	Dez.	
Q	7963	6758	6180	3627	360	837	cal/cm^2
V	6435	5394	4650	3689	210	741	cal/cm^2
V/Q	0.81	0.80	0.75	1.02	0.58	0.89	
V_a	109.5	92.0	79.5	62.5	3.5	12.4	mm

BAUMGARTNER, HAGER / EGLHARTING

Monatsmittel der Energiebilanz des Waldes 1969
Einheiten in cal/cm^2 d

	Jan.	Feb.	März	Apr.	Mai	Juni
Q	43.8	73.0	79.4	200.0	303.0	256.1
V	- 39.1	- 65.0	- 48.4	-134.0	-242.0	-217.7
L	- 4.7	- 9.5	- 32.1	- 62.0	- 60.0	- 36.3
B	.	.	.	- 3.8	- 1.1	1.1
P	0.5	1.5	1.1	- 0.2	0.1	- 1.0

	Juli	Aug.	Sep.	Okt.	Nov.	Dez.
Q	256.3	218.0	206.9	117.2	12.0	27.5
V	-207.6	-174.0	-155.6	-119.3	- 7.0	- 24.7
L	- 44.1	- 40.6	- 50.1	- 1.0	- 6.5	- 2.8
B	- 1.6	- 2.8	- 1.3	2.5	.	.
P	- 3.0	- 0.6	0.1	0.6	1.5	0.0



Jahresgang der Tagessummen der Strahlungsbilanz 1969

Tabelle IX: Monatliche Summen der Globalstrahlung und der Wärmehaushaltskomponenten

Monat	G calcm^{-2}	Q/G %	Q calcm^{-2}	B_p calcm^{-2}	V calcm^{-2}	L calcm^{-2}	-V/Q %
Mai	9033	68	6156	7	- 4256	- 1907	69
Juni	13029	72	9399	-142	- 6675	- 2582	71
Juli	11701	75	8737	- 52	- 5610	- 3075	64
August	11432	71	8090	23	- 4933	- 3180	61
September	8768	61	5353	93	- 3601	- 1845	67
Gesamtsumme	53963		37735	- 71	-25075	-12589	
Verhältnis der Gesamtsummen		69,9					66,5

Tabelle X: Monatliche Summen der Wasserhaushaltskomponenten des Waldes
Monthly sums of the components of the water balance

Monat	N mm	EIT mm	(E+T) mm	I mm	-EIT/ N %	(E+T)/EIT %	I/EIT %	-(N+EIT) mm
Mai	183,9	- 72,9	- 41,3	- 31,6	40	57	43	-111,0
Juni	209,1	-114,0	- 86,4	- 27,6	55	76	24	- 95,1
Juli	155,9	- 95,7	- 51,9	- 43,8	61	54	46	- 60,2
August	77,5	- 83,9	- 65,4	- 18,5	108	78	22	6,4
September	98,3	- 59,9	- 39,3	- 20,6	61	66	34	- 38,4
Gesamtsumme	724,7	-426,4	-284,3	-142,1				-298,3
Das Verhältnis d.Gesamtsumme					58,9	66,8	33,3	

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING F1, WEST GERMANY

FOREST TYPE: SPRUCE FOREST YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 87 YEARS LEAF AREA INDEX: SQ.M/SQ.M

BASAL AREA: 44.79 SQ.M/HA BASAL AREA INCREM.: .88 SQ.M/HA

STAND HEIGHT: 24.9 M STOCKING DENSITY: 595 STEMS/HA

STANDING CROP, ABOVEGROUND: 24446.5 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 886.9 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 505 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 3.8 DEPTH OF ROOTING ZONE: 60. CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING F2, WEST GERMANY

FOREST TYPE: SPRUCE FOREST YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 115 YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 37.07 SQ.M/HA BASAL AREA INCREM.: .56 SQ.M/HA

STAND HEIGHT: 31.3 M STOCKING DENSITY: 300 STEMS/HA

STANDING CROP, ABOVEGROUND: 23303.4 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 651.4 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 440 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 3.8 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): SOLLING PROJECT SITE: SOLLING F3, WEST GERMANY

FOREST TYPE: SPRUCE FOREST YEAR(S): 1969

SOIL TYPE: ACID BRAUNERDE
GEOLOGY: BUNTSANDSTEIN
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 34 YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 35.47 SQ.M/HA BASAL AREA INCREM.: 1.47 SQ.M/HA

STAND HEIGHT: 17.5 M STOCKING DENSITY: 1490 STEMS/HA

STANDING CROP, ABOVEGROUND: 14277.9 G/SQ.M STANDING CROP, BELOWGROUND: NO DATA G/SQ.M

PRODUCTIVITY ABOVEGROUND: 849.2 G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 51 DEG 45 MIN LONGITUDE: 9 DEG 35 MIN
ALTITUDE: 390 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 6.2 DEG C

MEAN ANNUAL PRECIPITATION: 1039 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 3.8 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): B.NIHLGARD SITE: KONGALUND, SWEDEN

FOREST TYPE: PLANTED SPRUCE: OXALIS TYPE YEAR(S): 1966-1968

SOIL TYPE: BROWN FOREST SOIL (ACID)
GEOLOGY: CAMBRIA SHALES AND SANDSTONE, STONY-SANDY MORAINE
SOIL DRAINAGE: GOOD

PRINCIPLE PLANT TYPES: PICEA ABIES, OXALIS ACETOSOLLA, RUBUS IDAEUS

AGE OF STAND: 60 YEARS LEAF AREA INDEX: 11.5 SQ.M/SQ.M

BASAL AREA: 55.6 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 25 M STOCKING DENSITY: 880 STEMS/HA

STANDING CROP, ABOVEGROUND: 30800. G/SQ.M STANDING CROP, BELOWGROUND: 5900. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1370. G/SQ.M PRODUCTIVITY BELOWGROUND: 260. G/SQ.M

LATITUDE: 55 DEG 59 MIN LONGITUDE: 13 DEG 10 MIN
ALTITUDE: 120 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 80000 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 7 DEG C

MEAN ANNUAL PRECIPITATION: 800 L/SQ.M

LENGTH OF GROWING SEASON: 230 DAYS

TEMPERATURE DURING GROWING SEASON: 12.9

MEAN PRECIPITATION DURING GROWING SEASON: 350 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 70000 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0 DEPTH OF ROOTING ZONE: 70 CM

STATUS OF DATA: PUBLISHED

RESEARCHER(S): RUDNEVA,TONKONOGOV,DOROCHOVA SITE: KOINAS,ARKANGELSK REGION, USSR

FOREST TYPE: NORTH TAIGA: PICEETUM HYLOCOMIOSUM YEAR(S): 1966

SOIL TYPE: CLEY PODSOL LOAMY
GEOLOGY: SAND ON THE MORAINE WITH STONY CLAY
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: PICEA ABIES, JUNIPERUS COMMUNIS, VACCINIUM MYRTILLUS, VACCINIUM VITIS-IDAEA, HYLOCOMIUM PROLIFERUM

AGE OF STAND: 125 YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: NO DATA SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 15 M STOCKING DENSITY: 1050 STEMS/HA

STANDING CROP, ABOVEGROUND: 13284. G/SQ.M STANDING CROP, BELOWGROUND: 4070. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 537. G/SQ.M PRODUCTIVITY BELOWGROUND: 60. G/SQ.M

LATITUDE: 64 DEG 40 MIN LONGITUDE: 47 DEG 30 MIN
ALTITUDE: NO DATA METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: 27000 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: -1.2 DEG C

MEAN ANNUAL PRECIPITATION: 493 L/SQ.M

LENGTH OF GROWING SEASON: 70 DAYS

TEMPERATURE DURING GROWING SEASON: 13.5

MEAN PRECIPITATION DURING GROWING SEASON: 171 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 3.4-4.6 DEPTH OF ROOTING ZONE: NO DATA CM

STATUS OF DATA:

RESEARCHER(S): V.G.KARPOV SITE: CENTRAL FOREST RESERVE: USSR

FOREST TYPE: TAIGA: PICEETUM-MYRTILLOSOS-OXALIDOS YEAR(S): 1967-1973

SOIL TYPE: CLAYED WEAK PODZOL
GEOLOGY: MORAINE DEBRIS, CLAY SILTY LOAM
SOIL DRAINAGE: ADEQUATE

PRINCIPLE PLANT TYPES: PICEA ABIES, VACCINIUM MYRTILLUS, LINNAEA BOREALIS, OXALIS ACETOSELLA, MAJANTHEMUM IFOLIUM, TRIENTALIS EUROPAEA, RAMISHIA SECUNDA, RUBUS SAXATILIS, LUSULA PILOSA, DRYOPTERIS AUSTRIACA, THELIPTERIS PHEGOPTERIS, STELLARIA HOLOSTEA

AGE OF STAND: 110 YEARS LEAF AREA INDEX: 9.7 SQ.M/SQ.M

BASAL AREA: NO DATA SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 26.5 M STOCKING DENSITY: 678 STEMS/HA

STANDING CROP, ABOVEGROUND: 20550. G/SQ.M STANDING CROP, BELOWGROUND: 7420. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 530. G/SQ.M PRODUCTIVITY BELOWGROUND: 115. G/SQ.M

LATITUDE: 56 DEG 30 MIN LONGITUDE: 32 DEG 40 MIN
ALTITUDE: 200 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: 35000 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 3.4 DEG C

MEAN ANNUAL PRECIPITATION: 640 L/SQ.M

LENGTH OF GROWING SEASON: 128 DAYS

TEMPERATURE DURING GROWING SEASON: 14.4

MEAN PRECIPITATION DURING GROWING SEASON: 353 L/SQ.M

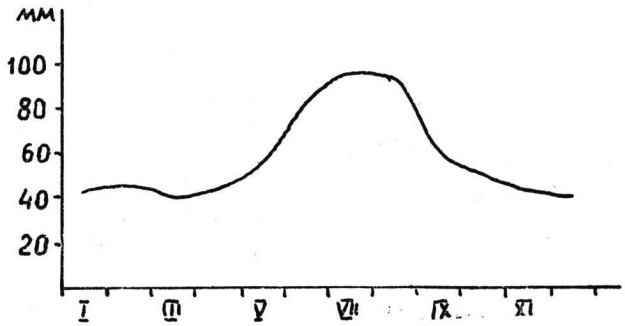
MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.0-4.5 DEPTH OF ROOTING ZONE: 20 CM

STATUS OF DATA:

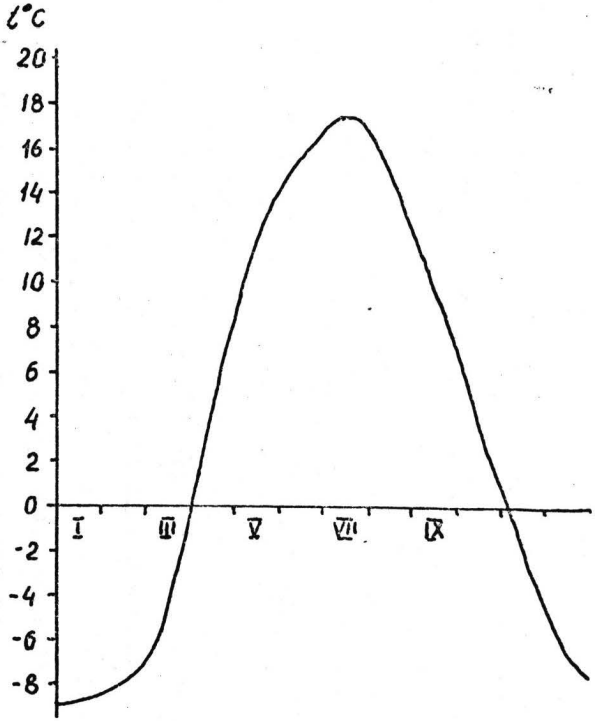
Annex 6.
V.G.Karpov

Mean month precipitation in region of Central Forest Reserve



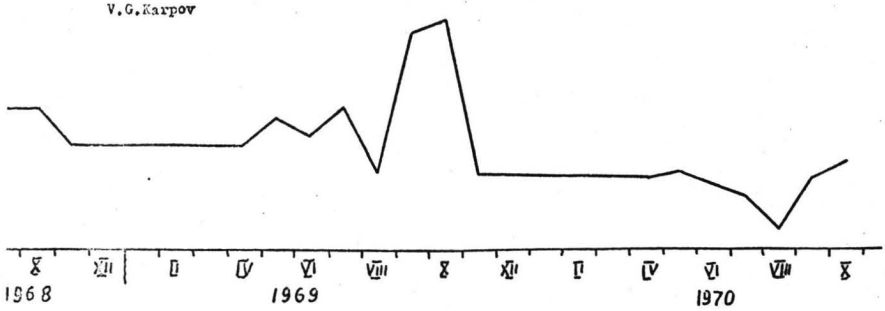
Annex 6.
V.G.Karpov

Mean temperature of months in region of Central Forest Reserve.

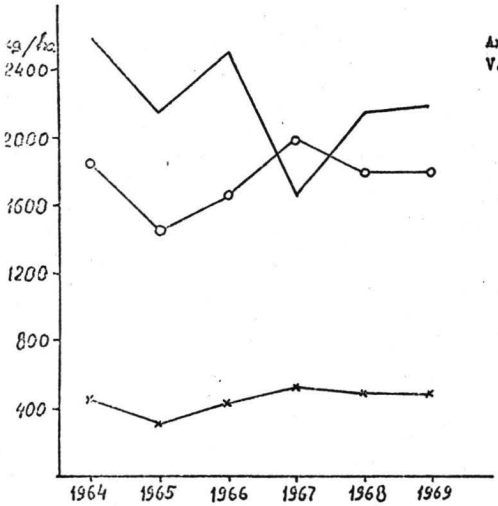


KARPOV / CENTRAL FOREST RESERVE USSR

Annex G.
V.G.Karpov



Litter fall



Annex G.
V.G.Karpov

Increment (production) components of spruce stand

—— wood of bole
o—o needle
x--x annual twigs

RESEARCHER(S): N.I.KAZIMIROV,R.M.MOROZOVA SITE: SITE 1, USSR

FOREST TYPE: CLADINOSUM SAXATILE YEAR(S): 1965-69

SOIL TYPE: ELUVIUM DEBRIS
GEOLOGY: CRYSTALLINE BASE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 37 YEARS LEAF AREA INDEX: 1.8 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 4.2 M STOCKING DENSITY: 9010 STEMS/HA

STANDING CROP, ABOVEGROUND: 2828. G/SQ.M STANDING CROP, BELOWGROUND: 661. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 287. G/SQ.M PRODUCTIVITY BELOWGROUND: 43. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 200 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNJAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

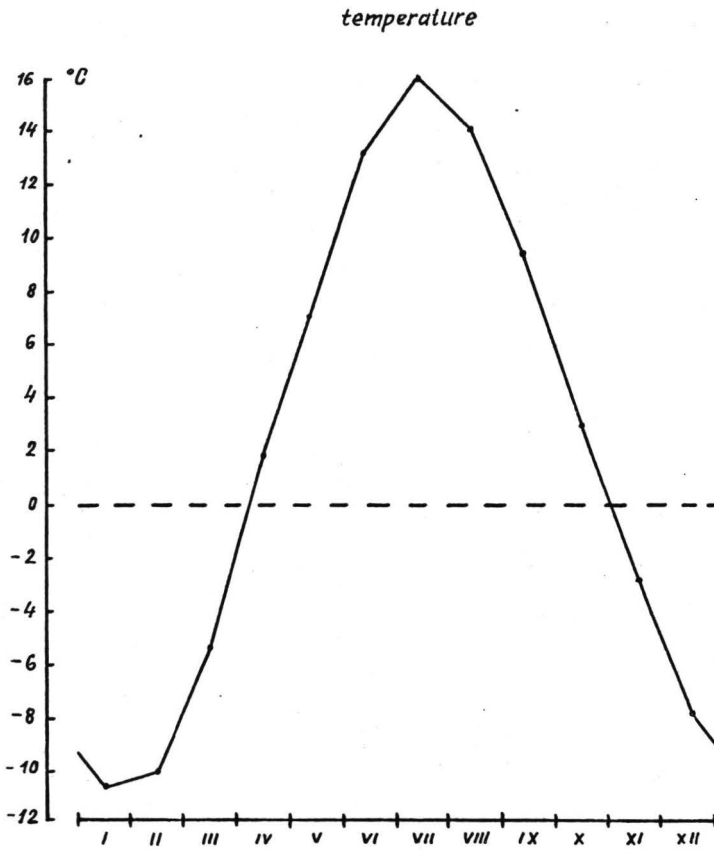
MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

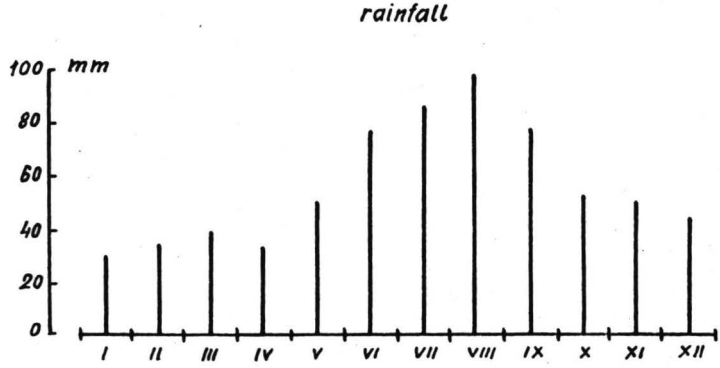
PH: 3.3 DEPTH OF ROOTING ZONE: 7-10 CM

STATUS OF DATA:

Annex 6: Graph size for time dependent variables

СССР - Н.И. Казимиров, Р.М. Морозова site: 1-17





RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 2, USSR

FOREST TYPE: VACCINIOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 45 YEARS LEAF AREA INDEX: 2.6 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 6.9 M STOCKING DENSITY: 9620 STEMS/HA

STANDING CROP, ABOVEGROUND: 4592. G/SQ.M STANDING CROP, BELOWGROUND: 1014. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 473. G/SQ.M PRODUCTIVITY BELOWGROUND: 70. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 170 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.5

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 3.8 DEPTH OF ROOTING ZONE: 40-45 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 3, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY:
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 38 YEARS LEAF AREA INDEX: 3.4 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 7.8 M STOCKING DENSITY: 9980 STEMS/HA

STANDING CROP, ABOVEGROUND: 6966. G/SQ.M STANDING CROP, BELOWGROUND: 1461. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 629. G/SQ.M PRODUCTIVITY BELOWGROUND: 93. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 130 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.2 DEPTH OF ROOTING ZONE: 50-55 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 4, USSR

FOREST TYPE: OXALIDOSO-MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: SAND PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE: GOOD

PRINCIPLE PLANT TYPES: PPICEA AGIES

AGE OF STAND: 43 YEARS LEAF AREA INDEX: 4.3 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 9.0 M STOCKING DENSITY: 6310 STEMS/HA

STANDING CROP, ABOVEGROUND: 7938. G/SQ.M STANDING CROP, BELOWGROUND: 1675. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 715. G/SQ.M PRODUCTIVITY BELOWGROUND: 104. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 150 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.4 DEPTH OF ROOTING ZONE: 60-65 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 5, USSR

FOREST TYPE: OXALIDOSUM YEAR(S): 1965-1969

SOIL TYPE: SAND PODSOL
GEOLOGY: MORAINE
SOIL DRAINAGE: GOOD

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 38 YEARS LEAF AREA INDEX: 4.4 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 12.2 M STOCKING DENSITY: 4480 STEMS/HA

STANDING CROP, ABOVEGROUND: 8748. G/SQ.M STANDING CROP, BELOWGROUND: 1827. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 779. G/SQ.M PRODUCTIVITY BELOWGROUND: 117. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 160 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.6 DEPTH OF ROOTING ZONE: 70-75 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 6, USSR

FOREST TYPE: POLITRICHOSUM YEAR(S): 1965-1969

SOIL TYPE: PEAT
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 42 YEARS LEAF AREA INDEX: 2.0 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 5.8 M STOCKING DENSITY: 9410 STEMS/HA

STANDING CROP, ABOVEGROUND: 3450. G/SQ.M STANDING CROP, BELOWGROUND: 798. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 368. G/SQ.M PRODUCTIVITY BELOWGROUND: 52. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 100 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 3.6 DEPTH OF ROOTING ZONE: 40-50 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 7, USSR

FOREST TYPE: ULIGINIO-HERBOSUM YEAR(S): 1965-1969

SOIL TYPE: PEAT
GEOLOGY: PEAT ON CLAY MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 41 YEARS LEAF AREA INDEX: 2.4 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 6.7 M STOCKING DENSITY: 9930 STEMS/HA

STANDING CROP, ABOVEGROUND: 4176. G/SQ.M STANDING CROP, BELOWGROUND: 9470. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 432. G/SQ.M PRODUCTIVITY BELOWGROUND: 63. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 80 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 6.0 DEPTH OF ROOTING ZONE: 40-50 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 8, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 22 YEARS LEAF AREA INDEX: 1.8 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 2.6 M STOCKING DENSITY: 34800 STEMS/HA

STANDING CROP, ABOVEGROUND: 2490. G/SQ.M STANDING CROP, BELOWGROUND: 620. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 350. G/SQ.M PRODUCTIVITY BELOWGROUND: 65. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 130 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650. L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.3 DEPTH OF ROOTING ZONE: 50. CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 3, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 37 YEARS LEAF AREA INDEX: 3.0 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 6.8 M STOCKING DENSITY: 13750 STEMS/HA

STANDING CROP, ABOVEGROUND: 6200. G/SQ.M STANDING CROP, BELOWGROUND: 1410. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 539. G/SQ.M PRODUCTIVITY BELOWGROUND: 90. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 110 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.1 DEPTH OF ROOTING ZONE: 60. CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 10, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 45 YEARS LEAF AREA INDEX: 3.2 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 3.8 M STOCKING DENSITY: 9240. STEMS/HA

STANDING CROP, ABOVEGROUND: 7820. G/SQ.M STANDING CROP, BELOWGROUND: 1580. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 535. G/SQ.M PRODUCTIVITY BELOWGROUND: 104. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 140 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.2 DEPTH OF ROOTING ZONE: 60 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 11, USSR

FOREST TYPE: MYRITLLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 54 YEARS LEAF AREA INDEX: 3.6 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 11.1 M STOCKING DENSITY: 4820 STEMS/HA

STANDING CROP, ABOVEGROUND: 9810. G/SQ.M STANDING CROP, BELOWGROUND: 2160. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 621. G/SQ.M PRODUCTIVITY BELOWGROUND: 110. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 130 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650. L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.4 DEPTH OF ROOTING ZONE: 65-70 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMOROV, R.M.MOROZOVA SITE: SITE 12, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 68 YEARS LEAF AREA INDEX: 3.8 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 14.2 M STOCKING DENSITY: 2336 STEMS/HA

STANDING CROP, ABOVEGROUND: 13260. G/SQ.M STANDING CROP, BELOWGROUND: 2910. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 617.0 G/SQ.M PRODUCTIVITY BELOWGROUND: 116.0 G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 120 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 330 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 54100 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.3 DEPTH OF ROOTING ZONE: 80. CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 13, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 82 YEARS LEAF AREA INDEX: 3.8 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 17.1 M STOCKING DENSITY: 1398 STEMS/HA

STANDING CROP, ABOVEGROUND: 14420. G/SQ.M STANDING CROP, BELOWGROUND: 3320. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 570. G/SQ.M PRODUCTIVITY BELOWGROUND: 104. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 140 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650. L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.1 DEPTH OF ROOTING ZONE: 50. CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 14, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 80 YEARS LEAF AREA INDEX: 3.6 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 19.6 M STOCKING DENSITY: 1319 STEMS/HA

STANDING CROP, ABOVEGROUND: 18530. G/SQ.M STANDING CROP, BELOWGROUND: 4100. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 481. G/SQ.M PRODUCTIVITY BELOWGROUND: 92. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 110. METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 6500 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 4.0 DEPTH OF ROOTING ZONE: 90. CM

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 15, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 109 YEARS LEAF AREA INDEX: 3.2 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 20.0 M STOCKING DENSITY: 1080 STEMS/HA

STANDING CROP, ABOVEGROUND: 19230. G/SQ.M STANDING CROP, BELOWGROUND: 4500. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 409.0 G/SQ.M PRODUCTIVITY BELOWGROUND: 72.0 G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 110 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 3.9 DEPTH OF ROOTING ZONE: 80 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMOROV, R.M.MOROZOVA SITE: SITE 16, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 126 YEARS LEAF AREA INDEX: 2.7 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 22.6 M STOCKING DENSITY: 856 STEMS/HA

STANDING CROP, ABOVEGROUND: 20870. G/SQ.M STANDING CROP, BELOWGROUND: 4600. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 309.0 G/SQ.M PRODUCTIVITY BELOWGROUND: 56.0 G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 120 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 390 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 3.8 DEPTH OF ROOTING ZONE: 80.0 CM

STATUS OF DATA:

RESEARCHER(S): N.I.KAZIMIROV, R.M.MOROZOVA SITE: SITE 17, USSR

FOREST TYPE: MYRTILLOSUM YEAR(S): 1965-1969

SOIL TYPE: HUMUS IRON PODSOL
GEOLOGY: SAND MORAINE
SOIL DRAINAGE:

PRINCIPLE PLANT TYPES: PICEA ABIES

AGE OF STAND: 139 YEARS LEAF AREA INDEX: 2.4 SQ.M/SQ.M

BASAL AREA: SQ.M/HA BASAL AREA INCREM.: SQ.M/HA

STAND HEIGHT: 22.8 M STOCKING DENSITY: 1087 STEMS/HA

STANDING CROP, ABOVEGROUND: 20050. G/SQ.M STANDING CROP, BELOWGROUND: 4750. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 255. G/SQ.M PRODUCTIVITY BELOWGROUND: 45. G/SQ.M

LATITUDE: 62 DEG MIN LONGITUDE: 34 DEG MIN
ALTITUDE: 130 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 72100 , RAD. BALANCE: 31500 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 2.2 DEG C

MEAN ANNUAL PRECIPITATION: 650 L/SQ.M

LENGTH OF GROWING SEASON: 150 DAYS

TEMPERATURE DURING GROWING SEASON: 11.9

MEAN PRECIPITATION DURING GROWING SEASON: 380 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 51400 , RAD. BALANCE: 30000 CAL/SQ. CM

PH: 3.9 DEPTH OF ROOTING ZONE: 90 CM

STATUS OF DATA:

RESEARCHER(S): P. HAVAS SITE: OULU, FINLAND

FOREST TYPE: HYLOCOMIUM-MYRTILLUS TYPE YEAR(S): 4-5

SOIL TYPE: PODSOL
GEOLOGY: QUARTZITE (DOLOMITE)
SOIL DRAINAGE: LOW

PRINCIPLE PLANT TYPES: PICEA EXCELSA, VACCINIUM MYRTILLUS, VACCINIUM VITIS-IDAEA, HYLOCOMIUM SPLENDENS, PL
URDZIUM SCHREBERI

AGE OF STAND: 200 YEARS LEAF AREA INDEX: 4.9 SQ.M/SQ.M

BASAL AREA: 22.2 SQ.M/HA BASAL AREA INCREM.: 0.0 SQ.M/HA

STAND HEIGHT: 16.2 M STOCKING DENSITY: 550 STEMS/HA

STANDING CROP, ABOVEGROUND: 10194.3 G/SQ.M STANDING CROP, BELOWGROUND: 3755.7 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 420.8 G/SQ.M PRODUCTIVITY BELOWGROUND: 20.0 G/SQ.M

LATITUDE: 66 DEG 22 MIN LONGITUDE: 29 DEG MIN
ALTITUDE: 270 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 75139 , RAD. BALANCE: 15630 CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 0.0 DEG C

MEAN ANNUAL PRECIPITATION: 500 L/SQ.M

LENGTH OF GROWING SEASON: 120 DAYS

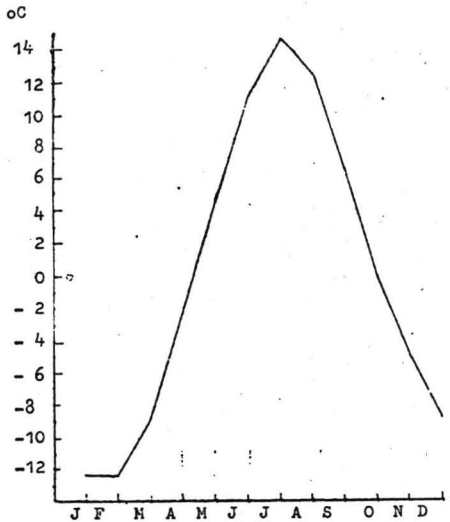
TEMPERATURE DURING GROWING SEASON: 11.1

MEAN PRECIPITATION DURING GROWING SEASON: 250 L/SQ.M

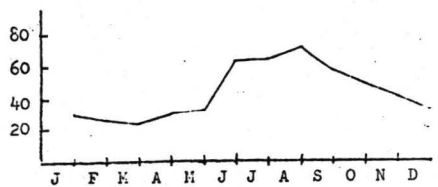
MEAN RADIATION OF GROWING SEASON, GLOBAL R: 46800 , RAD. BALANCE: 18300 CAL/SQ. CM

PH: 4.7 DEPTH OF ROOTING ZONE: 15 CM

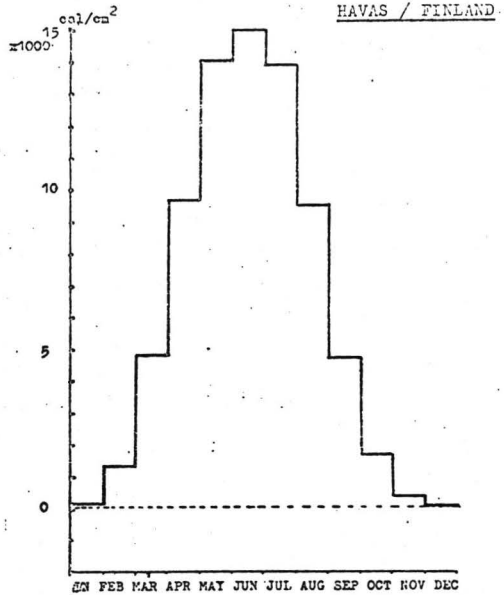
STATUS OF DATA: PRELIMINARY



Mean temperature in KUUSAMO (1931-1960)



Mean precipitation in KUUSAMO (1931-1960)

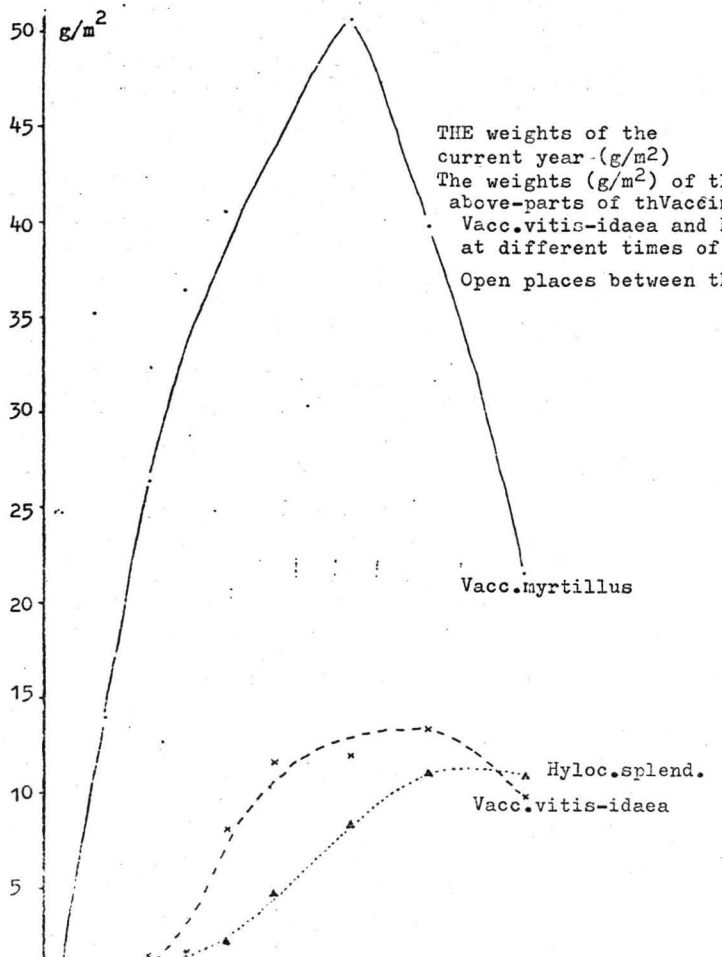


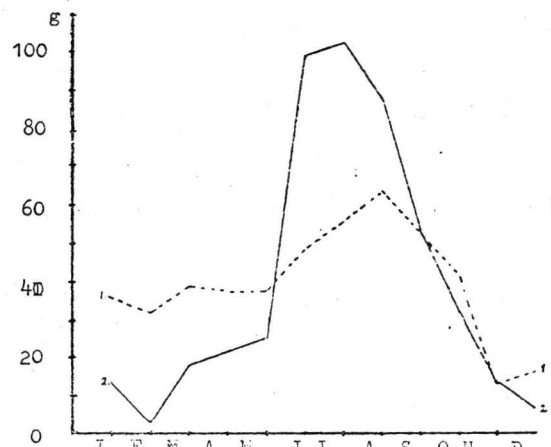
Global radiation in Sodankylä
(ca. 100 km north of site)

HAVAS / FINLAND

THE weights of the current year (g/m2)
The weights (g/m2) of the above-parts of thVaccimium myrtillus, Vacc.vitis-idaea and Hylocomium splendens at different times of the summer.

Open places between the trees.





Monthly loss of dry matter during the dark respiration on the forest floor (open places,HMT)
1=respiration of soil organic matter,roots and rhizo
2=respiration of above humus biomass (excl.trees)

RESEARCHER(S): J.A. BULLOCK SITE: PASOH, W.MALAYSIA

FOREST TYPE: EQUATORIAL- LOWLAND DIPTEROCARP YEAR(S): 1971-1972

SOIL TYPE: SANDY CLAY LOAM/CLAY
GEOLOGY: SHALE/GRANITE
SOIL DRAINAGE: POOR-MEDIUM

PRINCIPLE PLANT TYPES: FAMILIES: DIPTEROCARPACEAE, FAGACEAE, BURSERACEAE, LEGUMIMOSAE, EUPHORBIACEAE, MYRTACEAE

AGE OF STAND: MATURE YEARS LEAF AREA INDEX: 8-10 SQ.M/SQ.M

BASAL AREA: 27.34 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 35-40 M STOCKING DENSITY: 590.7 STEMS/HA

STANDING CROP, ABOVEGROUND: 35360.8 G/SQ.M STANDING CROP, BELOWGROUND: 2652.0 G/SQ.M

PRODUCTIVITY ABOVEGROUND: NO DATA G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: N 2 DEG 59 MIN LONGITUDE: 102 DEG 18 MIN
ALTITUDE: 100 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 130140 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 26. DEG C

MEAN ANNUAL PRECIPITATION: 1800 L/SQ.M

LENGTH OF GROWING SEASON: 365 DAYS

TEMPERATURE DURING GROWING SEASON: 26.

MEAN PRECIPITATION DURING GROWING SEASON: 1800 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 4.3-4.8 DEPTH OF ROOTING ZONE: 100 CM

STATUS OF DATA:

RESEARCHER(S): F.MALAISSE SITE: LUBUMBASWI (ZAIRE)

FOREST TYPE: MIOMBO-WOODLAND YEAR(S): 1968-1972

SOIL TYPE: LATOSOL
GEOLOGY: NO DATA
SOIL DRAINAGE: MEDIUM

PRINCIPLE PLANT TYPES: MARQUESIA MACROURA

AGE OF STAND: 120 YEARS LEAF AREA INDEX: 3.47 SQ.M/SQ.M

BASAL AREA: 21.96 SQ.M/HA BASAL AREA INCREM.: .14 SQ.M/HA

STAND HEIGHT: 14-18 M STOCKING DENSITY: 446 STEMS/HA

STANDING CROP, ABOVEGROUND: 16955. G/SQ.M STANDING CROP, BELOWGROUND: 2547. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 1113. G/SQ.M PRODUCTIVITY BELOWGROUND: 150. G/SQ.M

LATITUDE: S 11 DEG 29 MIN LONGITUDE: 27 DEG 36 MIN
ALTITUDE: 1238 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: 168265 , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 20.3 DEG C

MEAN ANNUAL PRECIPITATION: 1273 L/SQ.M

LENGTH OF GROWING SEASON: 118 DAYS

TEMPERATURE DURING GROWING SEASON: 22.2

MEAN PRECIPITATION DURING GROWING SEASON: 1230 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: 93509 , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.0 DEPTH OF ROOTING ZONE: 80. CM

STATUS OF DATA:

GENERAL SITE DESCRIPTIONS

RESEARCHER(S): A.KLINGE, W.A.RODRIGUEZ SITE: MANAUS,BRAZIL

YEAR(S): 1970

FOREST TYPE: TROPICAL RAIN FOREST

SOIL TYPE: PALE YELLOW LATOSOL

GEOLOGY: PLIO-PLEISTOCENE

PRINCIPLE PLANT TYPES: LEGUMINOSEA,SAPOTACEAE,LAURACEAE,ROSECEA ,RUBIACEAE,BURSERACEAE,ANNONACEAE, LECYTHIDACEAE,MORACEAE,PALMAE,VIOLACEAE

SOIL DRAINAGE: GOOD

AGE OF STAND: NO DATA YEARS LEAF AREA INDEX: NO DATA SQ.M/SQ.M

BASAL AREA: 30.7 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 38.1 M STOCKING DENSITY: 93780 STEMS/HA

STANDING CROP, ABOVEGROUND: 73350.0 G/SQ.M STANDING CROP, BELOWGROUND: 25500.0 G/SQ.M

PRODUCTIVITY ABOVEGROUND: NO DATA G/SQ.M PRODUCTIVITY BELOWGROUND: NO DATA G/SQ.M

LATITUDE: 4 DEG MIN LONGITUDE: 60 DEG MIN

ALTITUDE: 90 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 27.2 DEG C

MEAN ANNUAL PRECIPITATION: 1771 L/SQ.M

LENGTH OF GROWING SEASON: 365 DAYS

TEMPERATURE DURING GROWING SEASON: 27.2

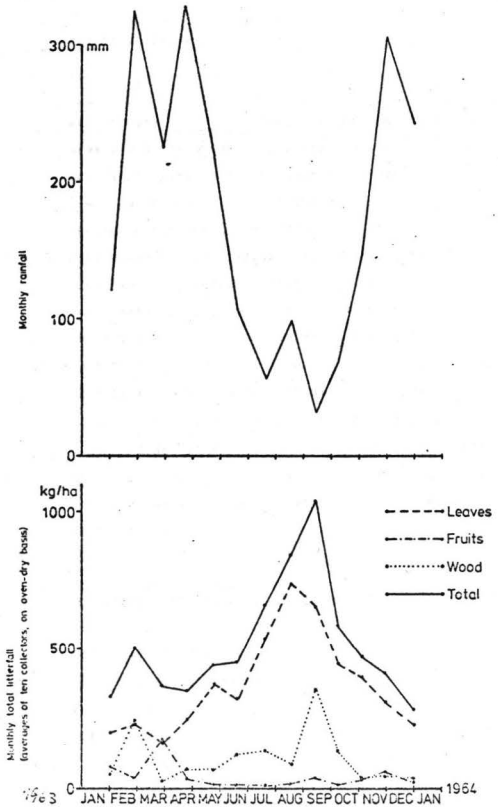
MEAN PRECIPITATION DURING GROWING SEASON: 1771 L/SQ.M

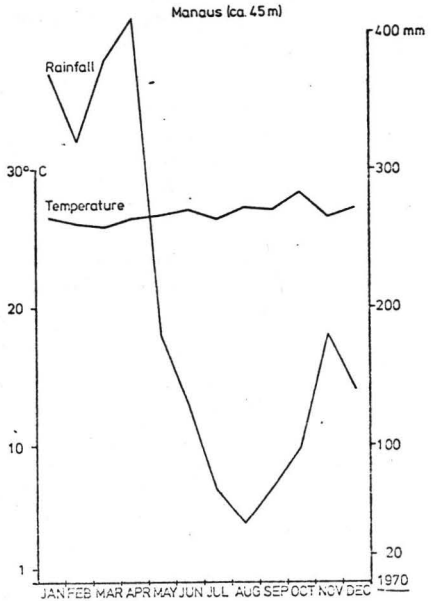
MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 3.1-4.4 DEPTH OF ROOTING ZONE: 110 CM

STATUS OF DATA:

KLINGE, RODRIGUEZ / MANAUS





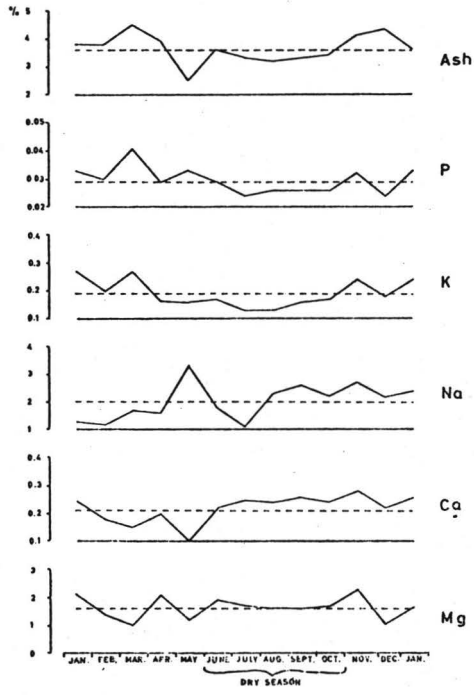


Fig. 2: Monthly ash and nutrient return of leaf litter in 1964 (as percentage of O. M.)

RESEARCHER(S): BANDHU SITE: CHAKIA, INDIA

FOREST TYPE: TROPICAL- DRY,DECIDUOUS YEAR(S): 1971

SOIL TYPE: RED, SANDY TO CLAY LOAM
GEOLOGY: RED SANDSTONE AND DHAURAU QUARTZITE
SOIL DRAINAGE: NO DATA

PRINCIPLE PLANT TYPES: SHOREA ROBUSTA, BUCHANANIA LANZAN, ANOGEINUS LATIFOLIA, TERMINALIA TOMENTOSA

AGE OF STAND: 60 YEARS LEAF AREA INDEX: 6. SQ.M/SQ.M

BASAL AREA: 30.02 SQ.M/HA BASAL AREA INCREM.: NO DATA SQ.M/HA

STAND HEIGHT: 5-18 M STOCKING DENSITY: 664 STEMS/HA

STANDING CROP, ABOVEGROUND: 20540.6 G/SQ.M STANDING CROP, BELOWGROUND: 3427.3 G/SQ.M

PRODUCTIVITY ABOVEGROUND: 793.8 G/SQ.M PRODUCTIVITY BELOWGROUND: 136.4 G/SQ.M

LATITUDE: N 25 DEG 20 MIN LONGITUDE: E 83 DEG MIN
ALTITUDE: 350. METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: NO DATA DEG C

MEAN ANNUAL PRECIPITATION: 844 L/SQ.M

LENGTH OF GROWING SEASON: 270 DAYS

TEMPERATURE DURING GROWING SEASON: NO DATA

MEAN PRECIPITATION DURING GROWING SEASON: NO DATA L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

PH: 5.65-6.8 DEPTH OF ROOTING ZONE: UP TO 150 CM

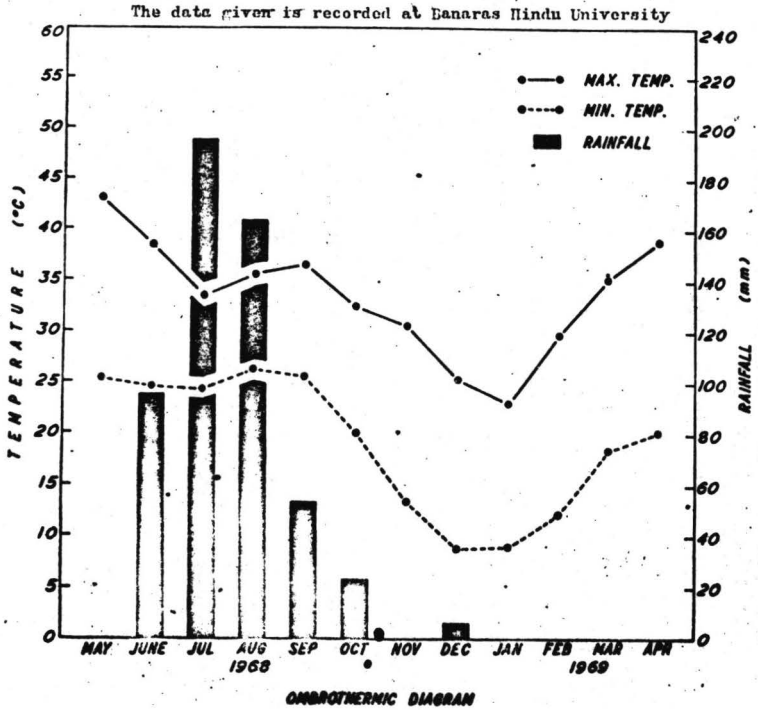
STATUS OF DATA: PUBLISHED(BIOMASS),PRELIMINARY(MINERAL)

BANDHU / CHAKIA

MONTH	TEMPERATURE Max. °C	Min.	HUMIDITY %	RAINFALL (mm)	SOLAR RADIATION (Kcal/m²/day)
June (1970)	38.6	28.1	91.2	156	4325
July	34.1	27.3	85.4	56	3930
August	33.4	26.4	91.7	135	4215
September	32.2	25.5	93.1	227	4220
October	33.6	22.1	86.9	46	3710
Nov.	33.9	13.3	79.2	-	3485
December	26.0	13.3	76.1	-	3165
January (1971)	23.0	8.6	73.6	50	3325
February	26.1	10.2	67.2	11	4255
March	32.7	15.2	65.8	10	5040
April	35.7	22.2	71.0	57	5500
May	37.7	24.5	71.2	95	5980

Note: Humidity (relative) is measured at 8 a.m.
Data of solar radiation is taken from Dwivedi, 1971

The data given is recorded at Banaras Hindu University



OMBROTHERMIC DIAGRAM

RESEARCHER(S): P.ATTIWILL SITE: MT DISAPPOINTMENT, AUSTRALIA

FOREST TYPE: BROAD LEAVED EVERGREEN, EUCALYPTUS YEAR(S): 1955-1972

SOIL TYPE: KRASNOZEM (RED FRIABLE POROUS EARTH)
GEOLOGY: METAMORPHOSED SILURIAN MUDSTONES, SANDSTONES AND SHALES
SOIL DRAINAGE: EXELLENT

PRINCIPLE PLANT TYPES: EUCALYPTUS OBLIQUA

AGE OF STAND: 51 YEARS LEAF AREA INDEX: 4.1 SQ.M/SQ.M

BASAL AREA: 54.1-63.3 SQ.M/HA BASAL AREA INCREM.: .55 SQ.M/HA

STAND HEIGHT: 21.7-29.1 M STOCKING DENSITY: 704-975 STEMS/HA

STANDING CROP, ABOVEGROUND: 31236. G/SQ.M STANDING CROP, BELOWGROUND: 7534. G/SQ.M

PRODUCTIVITY ABOVEGROUND: 612. G/SQ.M PRODUCTIVITY BELOWGROUND: 148. G/SQ.M

LATITUDE: S 37 DEG 25 MIN LONGITUDE: E 145DEG 10 MIN
ALTITUDE: 545 METERS ABOVE SEA LEVEL

MEAN ANNUAL RADIATION, GLOBAL R: , RAD. BALANCE: NO DATA CAL/SQ. CM

MEAN ANNUAL TEMPERATURE: 11.15 DEG C

MEAN ANNUAL PRECIPITATION: 982 L/SQ.M

LENGTH OF GROWING SEASON: 365 DAYS

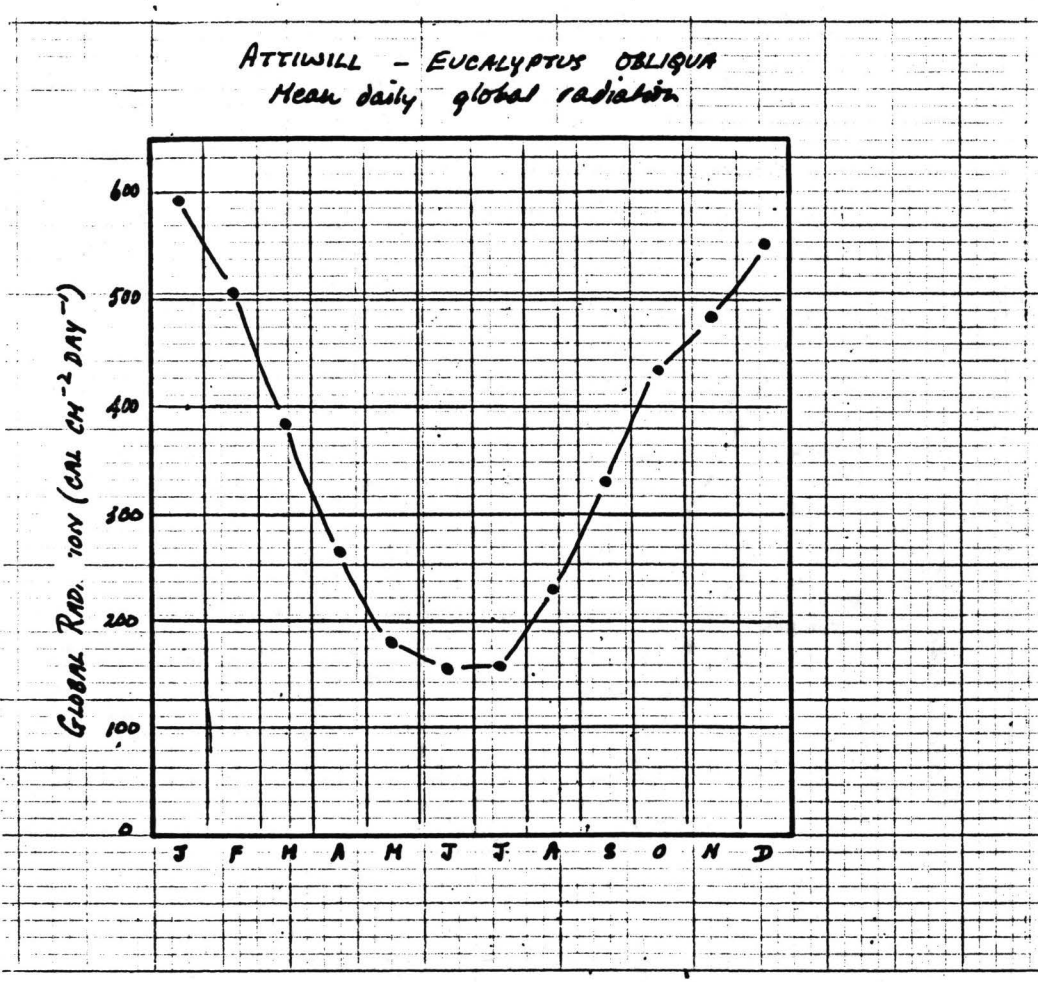
TEMPERATURE DURING GROWING SEASON: 11.15

MEAN PRECIPITATION DURING GROWING SEASON: 982 L/SQ.M

MEAN RADIATION OF GROWING SEASON, GLOBAL R: NO DATA , RAD. BALANCE: NO DATA CAL/SQ. CM

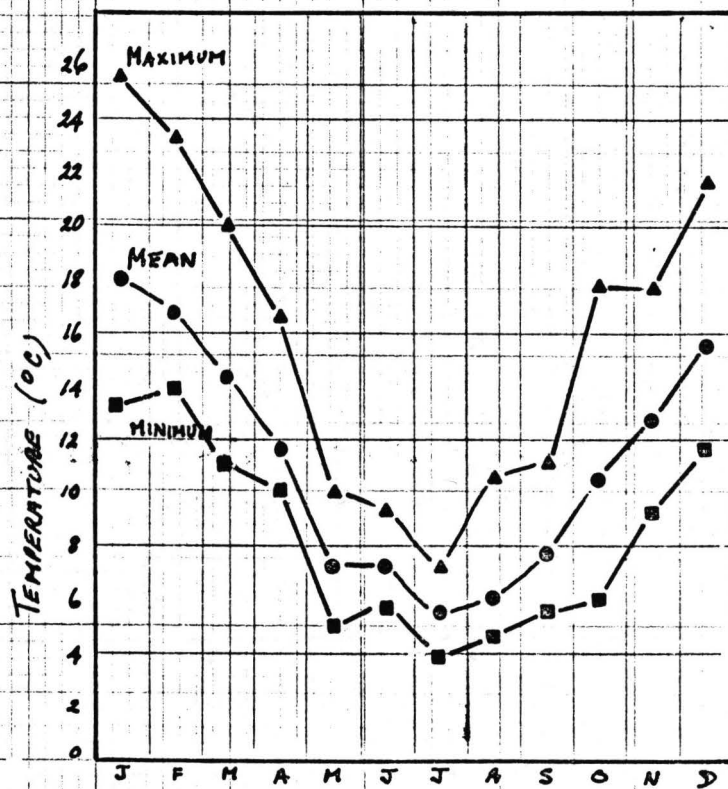
PH: 5.21-5.33 DEPTH OF ROOTING ZONE: 100. CM

STATUS OF DATA: PUBLISHED


ATTIWILL - EUCALYPTUS OBLIQUA
Mean daily global radiation
GLOBAL RAD. 10IN (CAL CM⁻² DAY⁻¹)
600
500
400
300
200
100
0
J F M A M J J A S O N D

ATTIWILL - EUCALYPTUS OBLIQUA.

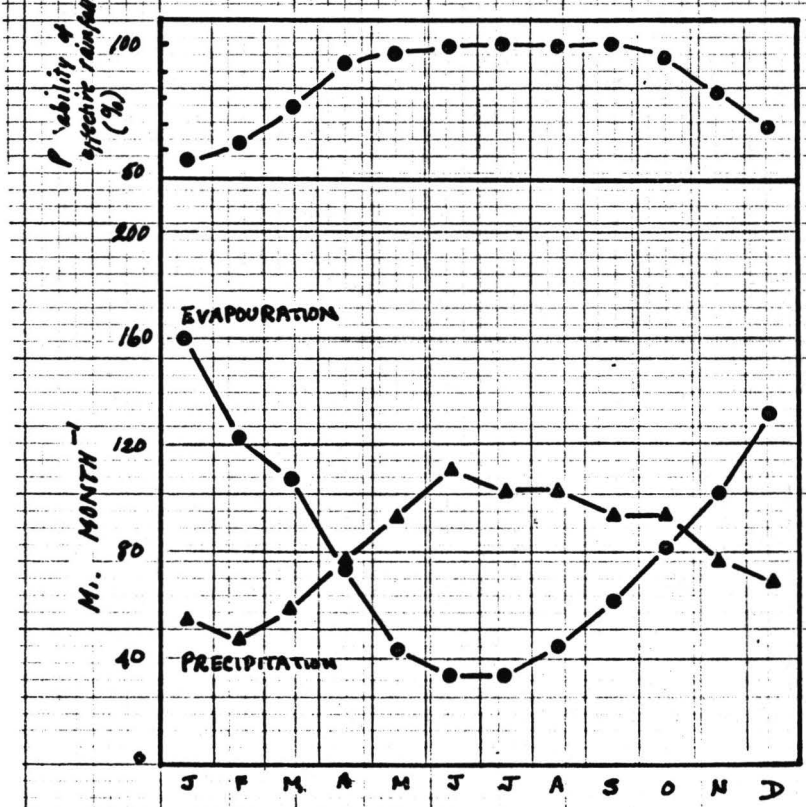
Mean, max, min temperatures.



ATTIWILL - EUCALYPTUS OBLIQUA

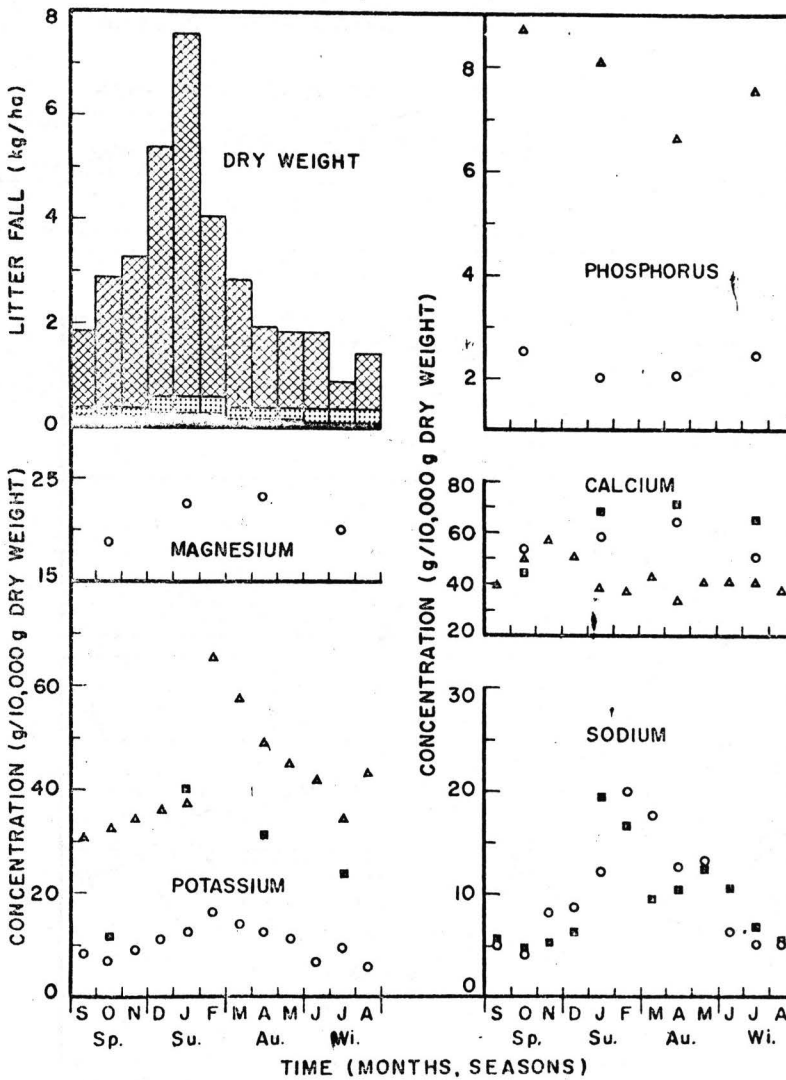
PRECIPITATION, EVAPOURATION, AND

EFFECTIVE ($P = 0.54 E^{0.7}$) RAINFALL



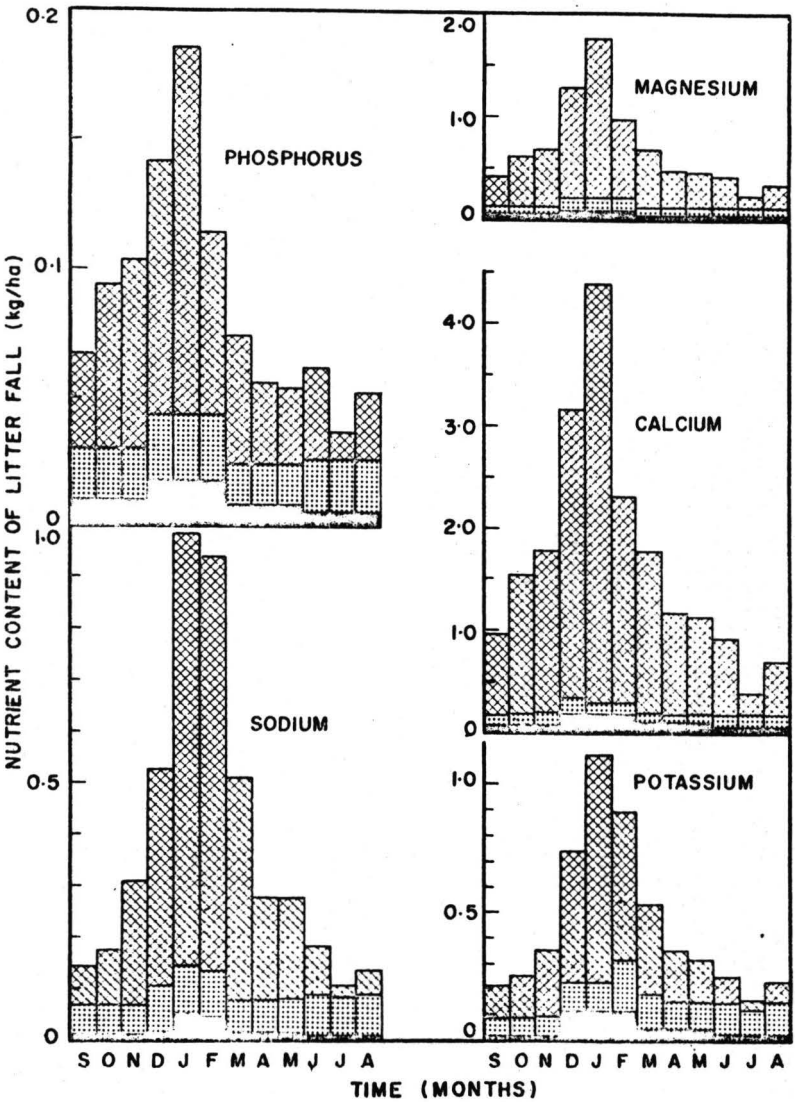
ATTIWILL - EUCALYPTUS OBLIQUA

LITTER FALL



ATTIWILL - EUCALYPTUS OBLIQUA

LITTER FALL NUTRIENT CONTENT.



COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	NOE WOOD LOUCKS LAWSON	MEATHOP SATCHELL	ROUWDET LOSSAINT RAPP	BABADAGI DONITA, ET AL	BABADAG2 DONITA, ET AL	SIKUFUT JAKUCS, PAPP	BAB BISKUP-SKY	BIALO-WIEZA FALINSKI
OVERSTORY LEAVES	.3750+03	.4100+03	.3505+03	.7000+03	.2376+03	.3244+03	.4670+03	.3424+03	
FRUITS,FLOWERS	.4350+02	.8000+01		.5960+02				.1291+03	
BRANCHES-SUM	.2925+04	**	.3364+04	.2700+04	.7739+03	.3345+03	.6738+04	.4284+04	
BRANCHES-BARK		**	.4396+03		.1139+03	.5070+02		.9295+03	
BRANCHES-WOOD		**	.2926+04		.6600+03	.2838+03		.3354+04	
BOLE-SUM	.1077+05	**	.7592+04	.2350+05	.4958+04	.4544+04	.1492+05	.1176+05	
BOLE-BARK		**	.1023+04		.1518+04	.1948+04		.1459+04	
BOLE-WOOD		.2644+05	.6570+04		.3440+04	.2600+04		.1031+05	
STANDING DEAD	.8330+03		.4907+03	0.			.6200+02		
SUM-OVERSTORY	.1425+05	.2686+05		.2690+05	.5969+05	.5210+04	.2219+05	.1605+05	
UNDERSTORY-LEAVES	.6000+02	.2300+02	.6390+02	.4900+01			.3500+02	.1189+02	
UND. FRUITS,FLOWERS									.1574+02
UND. BRANCHES-SUM	.2130+03		.4562+03						
UND. BRANCHES-BARK				**					
UND. BRANCHES-WOOD		.3100+02		.2910+02					
UND. BOLE-SUM	.5890+03		.9694+03	0.				.4113+02	
UND. BOLE-BARK				0.				.1113+02	
UND. BOLE-WOOD				0.				.3000+02	
UND. STANDING DEAD		.5000+01	.5490+02	0.					
SUM-UNDERSTORY	.8520+03	.5500+02		.3400+02					
HERBACEOUS (FIELD)	.2820+02	.1800+02	.6340+02		.5000+02	.9600+02		.1710+02	.2210+02
EPIPHYTES-TOTAL									
TOTAL PLANTS		.2693+05		.2693+05				.1611+05	
LIVING ROOTS-SUM	.4323+04	.6611+04	.3335+05	.4500+03					
LIVING ROOTS >5 MM			.2348+05	.4500+03					
LIVING ROOTS 2-5 MM			.2684+03						
LIVING ROOTS <5 MM			.7381+03						
DEAD ROOTS			.9365+03						
SOIL TOP ORGANIC	.5570+03	.6220+03	.6716+03	.1140+04					
ROOTING ZONE	.2112+05	.1726+05	.1380+05						
INTENSIVE ROOTED			.9722+04						
EXTENSIVE ROOTED			.4083+04						
SUBSOIL									
HETEROTROPHS-SUM	.3268+02								
ABOVEGROUND CONSUMERS	.2640+00		.4000+00						
DECOMPOSER FAUNA	.2080+02		.1690+02						
DECOMPOSER FLORA	.1160+02								

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

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	SOLLING B1	SOLLING B3	SOLLING B4	WESTERVN THANDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	ANDERSAY PERSSON, HYTTEBRN	OVED LINDGREN NIHLGARD
OVERSTORY LEAVES	.3078+03	.3294+03	.3158+03	.2100+03	**	**	**	.1852+03	**
FRUITS.FLOWERS	.3600+02	.3270+02	.2730+02		.3300+03	.3900+03	.5000+03	.2040+02	.4800+03
BRANCHES-SUM	.3248+04	.2587+04	.4130+04	.4320+04	.6600+04	.9900+04	.5300+04	.2079+04	.6400+04
BRANCHES-BARK	.6500+03	.5174+03	.8299+03					.5578+03	
BRANCHES-WOOD	.2598+04	.2069+04	.3320+04					.1521+04	
BOLE-SUM	.2384+05	.1296+05	.1100+05	.1704+05	.1660+05	.2210+05	.1430+05	.6529+04	.2450+05
BOLE-BARK	.1550+04	.842+03	.7150+03	.7400+03	.8000+03	.9000+03	.1700+04	.7314+03	.1100+04
BOLE-WOOD	.2229+05	.1212+05	.1029+05	.1430+05	.1580+05	.2120+05	.1260+05	.5798+04	.2340+05
STANDING DEAD	.6870+02							.1327+03	
SUM-OVERSTORY	.2750+05	.1600+05		.2167+05				.8996+04	
UNDERSTORY-LEAVES					0.	0.		.5380+02	0.
UND. FRUITS.FLOWERS					0.	0.		.8900+01	0.
UND. BRANCHES-SUM					0.	0.			0.
UND. BRANCHES-BARK					0.	0.			0.
UND. BRANCHES-WOOD					0.	0.			0.
UND. BOLE-SUM					0.	0.		.6506+03	0.
UND. BOLE-BARK					0.	0.		.1192+03	0.
UND. BOLE-WOOD					0.	0.		.5314+03	0.
UND. STANDING DEAD					0.	0.		.2930+02	0.
SUM-UNDERSTORY				.5400+03	0.	0.		.7426+03	0.
HERBACEOUS (FIELD)	.1300+01			.2000+02	.1000+01	.1000+02	.7000+01	.6860+02	.9000+02
EPIPHYTES-TOTAL									
TOTAL PLANTS				.2213+05	.2260+05	.3240+05		.9758+04	.3150+05
LIVING ROOTS-SUM				.4290+04	.3660+04	.5100+04	.3920+04	.1884+04	.4340+04
LIVING ROOTS >5 MM	.3004+04	.2206+04	.2396+04	.3000+04		.4500+04	.3320+04		
LIVING ROOTS 2-5 MM	.4600+03			**		**	**		
LIVING ROOTS <5 MM	.2470+03			.1290+04		.6000+03	.6000+03		
DEAD ROOTS									
SOIL TOP ORGANIC	.2970+04	.3900+04	.2900+04	.7500+03	.8200+03	.5200+03	.6100+03	.3890+04	.3400+03
ROOTING ZONE				.1410+05	.1650+05	.2980+05	.2660+05	.8615+04	
INTENSIVE ROOTED	.1900+05	.2120+05	.1860+05			.1270+05			
EXTENSIVE ROOTED						.1710+05			
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA								.8860+01	
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

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	SINAIA 1 BINDIU, MOCANU	SINAIA 2 BINDIU	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SHIGAYMA KITAZAWA	EBRSBRGH BAUMG'FR MAGER	SOLLING F1
OVERSTORY LEAVES	.1410+04	.2670+04	.8345+03	.9097+03	.7980+03	.6010+03	.9900+03	.1585+04	.1788+04
FRUITS,FLOWERS							.1000+00		
BRANCHES-SUM	.1433+04	.3784+04	.4435+04	.1389+04	.1459+04	.1179+04	.5170+04	.2828+04	.2821+04
BRANCHES-BARK	.1820+03	.4900+03							.4232+03
BRANCHES-WOOD	.1251+04	.3294+04							.2398+04
BOLE-SUM	.2663+05	.4055+05	.4195+05		.1248+05	.7483+04	.1309+05	.2680+05	.1984+05
BOLE-BARK	.2316+04	.4056+04		.1873+04	.1523+04				.1567+04
BOLE-WOOD	.2431+05	.3650+05		.1217+05	.1095+05				.1825+05
STANDING DEAD			.5520+04	.8145+03	.8600+03			.9980+03	.2670+02
SUM-OVERSTORY	.2947+05		.4722+05	.1715+05	.1559+05	.9263+04	.1926+05	.3221+05	.2450+05
UNDERSTORY-LEAVES			.1200+03						
UND. FRUITS,FLOWERS									
UND. BRANCHES-SUM									
UND. BRANCHES-BARK									
UND. BRANCHES-WOOD									
UND. BOLE-SUM			.1050+04						
UND. BOLE-BARK									
UND. BOLE-WOOD									
UND. STANDING DEAD									
SUM-UNDERSTORY			.1170+04						0.
HERBACEOUS (FIELD)	.2000+02			.1010+03					
EPIPHYTES-TOTAL			.1100+03						
TOTAL PLANTS			.4839+05			.9263+04			
LIVING ROOTS-SUM			.5704+04	.3299+04	.3630+04	.2184+04			
LIVING ROOTS >5 MM									.7172+04
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS			.3140+03						
SOIL TOP ORGANIC			.6140+04	.2277+04		.6000+03	.2664+05		.4900+04
ROOTING ZONE			.1910+05	.1116+05					
INTENSIVE ROOTED									.1900+05
EXTENSIVE ROOTED									
SUBSOIL			.7000+04						
HETEROTROPHS-SUM							.4114+03		
ABOVGROUND CONSUMERS							.2600+00		
DECOMPOSER FAUNA			.2700+00				.5130+01		
DECOMPOSER FLORA			.4040+02				.4060+03		

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	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD	N.TAIGA RODNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.1266+04	.1887+04	**	.7280+03	.1250+04	.5700+03	.8210+03	.1021+04	.9500+03
FRUITS,FLOWERS			.3300+03	.7200+02					
BRANCHES-SUM	.2463+04	.1873+04	.2500+04	.2126+04	.2350+04	.6090+03	.8680+03	.1123+04	.1246+04
BRANCHES-BARK	.3694+03	.2810+03							
BRANCHES-WOOD	.2094+04	.1592+04							
BOLE-SUM	.1957+05	.1051+05	.2620+05	.9780+04	.1685+05	.1649+04	.2903+04	.4822+04	.5842+04
BOLE-BARK	.1566+04	.8410+03	.2200+04		.1260+04	.1980+03	.3170+03	.4820+03	.5270+03
BOLE-WOOD	.1801+05	.9671+04	.2400+05		.1559+05	.1451+04	.2584+04	.4340+04	.5315+04
STANDING DEAD						.1950+03	.3700+03	.5300+03	.6200+03
SUM-OVERSTORY	.2350+05	.1430+05			.2045+05	.2983+04	.4962+04	.7496+04	.8558+04
UNDERSTORY-LEAVES			0.	.3200+02		0.	0.	0.	0.
UND. FRUITS,FLOWERS			0.			0.	0.	0.	0.
UND. BRANCHES-SUM			0.	.7000+02		0.	0.	0.	0.
UND. BRANCHES-BARK			0.			0.	0.	0.	0.
UND. BRANCHES-WOOD			0.			0.	0.	0.	0.
UND. BOLE-SUM			0.	.1420+03		0.	0.	0.	0.
UND. BOLE-BARK			0.			0.	0.	0.	0.
UND. BOLE-WOOD			0.			0.	0.	0.	0.
UND. STANDING DEAD			0.			0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	.1328+05		0.	0.	0.	0.
HERBACEOUS (FIELD)			.1000+01	.2360+03	.1460+03	.3010+03	.1830+03	.1470+03	.1040+03
EPIPHYTES-TOTAL				.7700+02					
TOTAL PLANTS			.3080+05			.3284+04	.5145+04	.7643+04	.8662+04
LIVING ROOTS-SUM			.5900+04	.4070+04	.6810+04	.6610+03	.1014+04	.1461+04	.1675+04
LIVING ROOTS >5 MM	.7493+04	.3456+04	.5700+04			.4250+03	.8500+03	.1259+04	.1459+04
LIVING ROOTS 2-5 MM			**			.7600+02	.1040+03	.1320+03	.1490+03
LIVING ROOTS <5 MM			.2000+03			.6000+02	.6000+02	.7000+02	.6700+02
DEAD ROOTS						.8000+02	.1290+03	.1610+03	.1760+03
SOIL TOP ORGANIC	.1110+05	.5200+04	.1850+04			.1870+04	.1930+04	.1980+04	.2060+04
ROOTING ZONE			.2870+05						
INTENSIVE ROOTED	.2510+05	.1900+05	.1130+05			.9800+03	.5140+04	.6640+04	.7240+04
EXTENSIVE ROOTED			.1740+05						
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

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	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.9910+03	.6530+03	.7530+03	.5500+03	.9100+03	.9800+03	.1090+04	.1150+04	.1140+04
FRUITS,FLOWERS								.9000+01	.2900+02
BRANCHES-SUM	.1223+04	.7000+03	.8190+03	.6500+03	.1060+04	.1210+04	.1420+04	.1510+04	.1680+04
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.6534+04	.2097+04	.2604+04	.1390+04	.4230+04	.5630+04	.7300+04	.1060+05	.1160+05
BOLE-BARK	.5230+03	.2300+03	.2600+03	.1530+03	.4230+03	.5070+03	.5630+03	.7420+03	.6960+03
BOLE-WOOD	.6011+04	.1867+04	.2394+04	.1237+04	.3807+04	.5123+04	.6717+04	.9858+04	.1090+05
STANDING DEAD	.6850+03	.2700+03	.3400+03	.1040+03	.3350+03	.4180+03	.5620+03	.6880+03	.8100+03
SUM-OVERSTORY	.9433+04	.3270+04	.4516+04	.2694+04	.6535+04	.8238+04	.1037+05	.1396+05	.1526+05
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.7800+02	.3500+03	.2400+03	.1300+03	.1500+03	.1600+03	.2100+03	.2200+03	.3200+03
EPIPHYTES-TOTAL									
TOTAL PLANTS	.9511+04	.4070+04	.4762+04	.2824+04	.6685+04	.8398+04	.1058+05	.1418+05	.1558+05
LIVING ROOTS-SUM	.1827+04	.7980+03	.9470+03	.6200+03	.1410+04	.1580+04	.2160+04	.2910+04	.3320+04
LIVING ROOTS >5 MM	.1598+04	.6400+03	.7870+03	.4780+03	.1180+04	.1213+04	.1834+04	.2510+04	.2842+04
LIVING ROOTS 2-5 MM	.1540+03	.8800+02	.1000+03	.8500+02	.1430+03	.1660+03	.2020+03	.2480+03	.3030+03
LIVING ROOTS <5 MM	.7500+02	.7000+02	.6000+02	.5700+02	.8700+02	.1010+03	.1290+03	.1520+03	.1750+03
DEAD ROOTS	.1920+03	.1030+03	.1290+03	.4800+02	.1120+03	.1190+03	.1620+03	.1890+03	.2250+03
SOIL TOP ORGANIC	.2000+04	.3380+04	.6100+04	.1790+04	.1850+04	.1920+04	.2200+04	.2470+04	.2600+04
ROOTING ZONE									
INTENSIVE ROOTED	.1174+05	.1200+05	.2490+05						
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

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	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	MIOMBO MALAISSE	MANAUS KLINGE,R ODRIGUEZ	CHAKIA BANDHU
OVERSTORY LEAVES	.1080+04	.9700+03	.8100+03	.7400+03	.6618+03	.4751+03	.2610+03	.1330+04	.5809+03
FRUITS+FLOWERS	.3300+02	.4100+02	.4700+02	.4400+02	.2000+02	.3880+01	.5370+02		.5380+01
BRANCHES-SUM	.1650+04	.1760+04	.1660+04	.1710+04	.1712+04	.5943+04	.7820+04	.1979+05	.5429+04
BRANCHES-BARK							.1603+04		
BRANCHES-WOOD							.6217+04		
BOLE-SUM	.1580+05	.1650+05	.1340+05	.1760+05	.6732+04	.2671+05	.6350+04	.4558+05	.1339+05
BOLE-BARK	.885C+03	.858C+03	.9020+03	.8100+03	.1074+04		.1073+04		
BOLE-WOOD	.1430+05	.1564+05	.1749+05	.1679+05	.5659+04		.5277+04		
STANDING DEAD	.798C+03	.711C+03	.7120+03	.7440+03	.4177+03	.1387+04	.2470+04	.6900+03	
SUM-OVERSTORY	.1937+05	.1998+05	.2163+05	.2084+05	.9543+04	.3652+05	.1695+05	.6739+05	.1941+05
UNDERSTORY-LEAVES	0.	0.	0.	0.	.3300+01	.1071+03		.4200+03	.9400+01
UND. FRUITS+FLOWERS	0.	0.	0.	0.					
UND. BRANCHES-SUM	0.	0.	0.	0.	.3300+01	.1962+03		.4300+03	.8369+02
UND. BRANCHES-BARK	0.	0.	0.	0.					
UND. BRANCHES-WOOD	0.	0.	0.	0.					
UND. BOLE-SUM	0.	0.	0.	0.	.6800+01	.1037+04		.1180+04	.1056+03
UND. BOLE-BARK	0.	0.	0.	0.					
UND. BOLE-WOOD	0.	0.	0.	0.					
UND. STANDING DEAD	0.	0.	0.	0.				.7030+02	
SUM-UNDERSTORY	0.	0.	0.	0.	.1340+02	.1340+04		.2100+04	.1987+03
HERBACEOUS (FIELD)	.3100+03	.3600+03	.4000+03	.4600+03	.5501+03	.2959+04	.3106+03	.1400+03	
EPIPHYTES-TOTAL					.8670+02			.4610+04	
TOTAL PLANTS	.1968+05	.2034+05	.2203+05	.2130+05	.1019+05	.3799+05	.1727+05	.7424+05	.1961+05
LIVING ROOTS-SUM	.4100+04	.4500+04	.4600+04	.4750+04	.3753+04	.2959+04	.2547+04	.2550+05	.3268+03
LIVING ROOTS >5 MM	.3573+04	.3968+04	.4050+04	.4137+04	.2365+04		.2115+04		
LIVING ROOTS 2-5 MM	.3270+03	.3400+03	.3480+03	.3620+03	.7130+02		.2300+03		
LIVING ROOTS <5 MM	.1940+03	.1920+03	.2020+03	.2010+03	.1316+04		.2030+03		
DEAD ROOTS	.2070+03	.1940+03	.1780+03	.2010+03		.1030+05			
SOIL TOP ORGANIC	.2960+04	.3280+04	.3550+04	.3900+04	.6760+04	.1257+04		.7500+03	
ROOTING ZONE						.8989+04			
INTENSIVE ROOTED									.7877+04
EXTENSIVE ROOTED									.5075+04
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS					.6000+00	.6930+01			
DECOMPOSER FAUNA					.3000+01				
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ORGANIC MATTER IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES	.6880+03
FRUITS+FLOWERS	
BRANCHES-SUM	.2200+04
BRANCHES-BARK	
BRANCHES-WOOD	
BOLE-SUM	.2725+05
BOLE-BARK	.9401+04
BOLE-WOOD	.2285+05
STANDING DEAD	.1100+04
SUM-OVERSTORY	.3124+05
UNDERSTORY-LEAVES	
UND. FRUITS+FLOWERS	
UND. BRANCHES-SUM	
UND. BRANCHES-BARK	
UND. BRANCHES-WOOD	
UND. BOLE-SUM	
UND. BOLE-BARK	
UND. BOLE-WOOD	
UND. STANDING DEAD	
SUM-UNDERSTORY	.3740+03
HERBACEOUS (FIELD)	
EPIPHYTES-TOTAL	
TOTAL PLANTS	
LIVING ROOTS-SUM	.7534+04
LIVING ROOTS >5 MM	
LIVING ROOTS 2-5 MM	
LIVING ROOTS <5 MM	
DEAD ROOTS	
SOIL TOP ORGANIC	.1824+04
ROOTING ZONE	
INTENSIVE ROOTED	
EXTENSIVE ROOTED	
SUBSOIL	
HETEROTROPHS-SUM	
ABOVEGROUND CONSUMERS	
DECOMPOSER FAUNA	
DECOMPOSER FLORA	

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

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	OAKRIDGE REICHLE SHUGART	NOE WOOD LOUCKS LARSON	MEATHOP SATCHELL	ROUQUET LUSSAINT RAPP	BABADAG1 DONITA, ET AL	BABADAG2 DONITA, ET AL	SOLLING B1	SOLLING B3	SOLLING B4
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.6750+02	.7300+02	.9980+02	.1100+03	.2050+02	.2840+02	.7840+02	.9470+02	.9890+02
BRANCHES-BARK			.1640+02		.3100+01	.4400+01	.1600+02	.8900+01	.1980+02
BRANCHES-WOOD			.8240+02		.1740+02	.2400+02	.6240+02	.8580+02	.7910+02
BOLE-SUM	.2254+03	.2820+03	.2167+03	.1500+03	.1298+03	.1760+03	.6490+03	.6907+03	.7666+03
BOLE-BARK			.3790+02		.3990+02	.7520+02	.9200+02	.3840+02	.4980+02
BOLE-WOOD			.1869+03		.8960+02	.1008+03	.6070+03	.5523+03	.7166+03
STANDING DEAD		.7800+02	.1360+02						
SUM-OVERSTORY	.2797+03								
UNDERSTORY-LEAVES									
UND. FRUITS,FLOWERS									
UND. BRANCHES-SUM	.2000+01								
UND. BRANCHES-BARK									
UND. BRANCHES-WOOD									
UND. BOLE-SUM	.6000+01	.5000+01							
UND. BOLE-BARK									
UND. BOLE-WOOD									
UND. STANDING DEAD		.5000+01							
SUM-UNDERSTORY	.8100+01								
HERBACEOUS (FIELD)			.3930+02				.1300+01		
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.4430+02	.6620+03	.1976+03						
LIVING ROOTS >5 MM	.2210+02		.1385+03				.6600+02	.6330+02	.1263+03
LIVING ROOTS 2-5 MM	.2210+02		.1580+02						
LIVING ROOTS <5 MM			.4350+02						
DEAD ROOTS									
SOIL TOP ORGANIC	.1600+01								
ROOTING ZONE	.1000+02								
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS			.3000+00						
DECOMPOSER FAUNA			.2040+02						
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

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	WESTMAN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJER ANDERS-SON	ANDERSBY PERSSON, MYTTEBORN	OVED LINDGREN NIHLGARD	SINAIA 1 BINDIU, MOCANU	SINAIA 2 BINDIU	ANDRES EXPFOR. GWIEK
OVERSTORY LEAVES									.5000+00
FRUITS,FLOWERS									
BRANCHES-SUM	.5350+03	**	**	**	.1732+03	**	.7500+02	.1900+03	.1600+02
BRANCHES-BARK		**	**	**	.7568+02	**	.6000+01		
BRANCHES-WOOD		**	**	**	.9748+02	**	.6900+02		
BOLE-SUM	.5170+03	**	**	**	.1005+03	**	.4550+03	.6055+03	.1720+03
BOLE-BARK	.2600+02	**	**	**	.1569+02	**	.3700+02	.6000+02	
BOLE-WOOD	.4910+03	.6300+03	.1010+04	.6200+03	.8459+02	.1000+04	.4160+03	.5455+03	
STANDING DEAD									
SUM-OVERSTORY									
UNDERSTORY-LEAVES		0.	0.			0.			.1000+02
UND. FRUITS,FLOWERS		0.	0.			0.			
UND. BRANCHES-SUM		0.	0.			0.			**
UND. BRANCHES-BARK		0.	0.			0.			**
UND. BRANCHES-WOOD		0.	0.			0.			**
UND. BOLE-SUM		0.	0.		.5948+02	0.			.5000+02
UND. BOLE-BARK		0.	0.		.1664+02	0.			
UND. BOLE-WOOD		0.	0.		.4284+02	0.			
UND. STANDING DEAD		0.	0.			0.			.2000+03
SUM-UNDERSTORY	.7900+02	0.	0.			0.			.6000+02
HERBACEOUS (FIELD)	.4900+02								0.
EPIPHYTES-TOTAL									0.
TOTAL PLANTS									
LIVING ROOTS-SUM	.2750+03								.1930+02
LIVING ROOTS >5 MM									
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC									0.
ROOTING ZONE									0.
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									0.
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									0.
DECOMPOSER FLORA									0.

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

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	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SHIGAYMA KITAZAWA	ERDSBRGR BAUMGARTER MAGER	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIMLGARD
OVERSTORY LEAVES	.3210+02		.3000+02						
FRUITS,FLOWERS									
BRANCHES-SUM	.4200+02	.1900+03	.7900+02	.1787+03	.3290+03	.6030+02	.3900+02	.6270+02	**
BRANCHES-BARK						.9000+01	.5900+01	.9400+01	**
BRANCHES-WOOD						.5130+02	.3340+02	.5330+02	**
BOLE-SUM		.5600+03	.9540+03	.1801+03	.5880+03	.5362+03	.7009+03	.7895+03	**
BOLE-BARK	.6910+02					.4290+02	.3200+02	.3920+02	**
BOLE-WOOD	.6099+03					.4933+03	.3669+03	.4503+03	.4900+03
STANDING DEAD									
SUM-OVERSTORY		.7600+03	.1063+04			.1469+04	.6520+03	.8500+03	
UNDERSTORY-LEAVES									0.
UND. FRUITS,FLOWERS									0.
UND. BRANCHES-SUM									0.
UND. BRANCHES-BARK									0.
UND. BRANCHES-WOOD									0.
UND. BOLE-SUM									0.
UND. BOLE-BARK									0.
UND. BOLE-WOOD									0.
UND. STANDING DEAD									0.
SUM-UNDERSTORY									0.
HERBACEOUS (FIELD)									.1000+01
EPIPHYTES-TOTAL									
TOTAL PLANTS			.1063+04						
LIVING ROOTS-SUM	.1185+03	.2000+03	.1650+03						
LIVING ROOTS >5 MM							.6530+02	.1593+03	
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC									
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

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	SITE 1 KAZIM'OV MOROZOVA	SITE 2 KAZIM'OV MOROZOVA	SITE 3 KAZIM'OV MOROZOVA	SITE 4 KAZIM'OV MOROZOVA	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.4000+01	.1300+02	.1700+02	.1500+02	.1600+02	.1000+02	.1100+02	.3000+02	.2100+02
FRUITS,FLOWERS									
BRANCHES-SUM	.1200+02	.1700+02	.2200+02	.2500+02	.2700+02	.1400+02	.1600+02	.2900+02	.2400+02
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.9900+02	.1510+03	.2050+03	.2390+03	.2500+03	.1200+03	.1370+03	.1180+03	.1850+03
BOLE-BARK	.1100+02	.1700+02	.2100+02	.2300+02	.2300+02	.1300+02	.1500+02	.1300+02	.1800+02
BOLE-WOOD	.8300+02	.1340+03	.1840+03	.2110+03	.2270+03	.1070+03	.1220+03	.1050+03	.1670+03
STANDING DEAD	.4000+01	.7400+01	.1060+02	.1290+02	.1370+02	.5400+01	.6800+01	.1400+02	.1650+02
SUM-OVERSTORY	.1180+03	.1884+03	.2546+03	.2864+03	.3067+03	.1494+03	.1708+03	.1930+03	.2465+03
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.3000+01	.6000+01	.4000+01	.2000+01	.1000+01	.7000+01	.3000+01	.1000+01	.1000+01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.1210+03	.1934+03	.2566+03	.2884+03	.3077+03	.1564+03	.1738+03	.1940+03	.2475+03
LIVING ROOTS-SUM	.2700+02	.3600+02	.4800+02	.6300+02	.6100+02	.2900+02	.3300+02	.4000+02	.4800+02
LIVING ROOTS >5 MM	.2150+02	.2900+02	.4100+02	.5420+02	.5340+02	.2330+02	.2640+02	.3080+02	.4000+02
LIVING ROOTS 2-5 MM	.3100+01	.4500+01	.4300+01	.4700+01	.5100+01	.3200+01	.3600+01	.5500+01	.5000+01
LIVING ROOTS <5 MM	.2900+01	.2500+01	.2700+01	.2100+01	.4600+01	.2500+01	.2100+01	.3700+01	.3000+01
DEAD ROOTS	.1400+01	.2600+01	.3200+01	.3600+01	.3800+01	.2000+01	.2500+01	.6500+01	.5500+01
SOIL TOP ORGANIC	.7000+01	.1100+02	.1300+02	.1200+02	.1000+02	.1400+02	.2000+02	.1100+02	.1200+02
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

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	SITE 10 KAZIM'OV MOKOZOVA	SITE 11 KAZIM'OV MOKOZOVA	SITE 12 KAZIM'OV MOKOZOVA	SITE 13 KAZIM'OV MOKOZOVA	SITE 14 KAZIM'OV MOKOZOVA	SITE 15 KAZIM'OV MOKOZOVA	SITE 16 KAZIM'OV MOKOZOVA	SITE 17 KAZIM'OV MOKOZOVA	FINLAND HAVAS
OVERSTORY LEAVES	.1900+02	.7000+01		-.2000+01	-.4000+01	-.5000+01	-.6000+01	-.6000+01	
FRUITS,FLOWERS			.1300+01	.9000+00	.5000+00	.3000+00	.1000+00		
BRANCHES-SUM	.1900+02	.1500+02	.9000+01	.6000+01	.4000+01	.2000+01	.1000+01	.1000+01	.1170+03
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.2060+03	.2150+03	.2040+03	.1740+03	.1300+03	.9700+02	.4100+02	.5000+01	.4100+01
BOLE-BARK	.1800+02	.1700+02	.1500+02	.1100+02	.7000+01	.5000+01	.2500+01	.3000+00	
BOLE-WOOD	.1860+03	.1980+03	.1890+03	.1630+03	.1270+03	.9200+02	.3850+02	.4700+01	
STANDING DEAD	.1400+02	.1060+02	.6000+01	.2900+01	.5000+00	-.1200+01	-.1900+01	-.4000+01	.1000+02
SUM-OVERSTORY	.2530+03	.2476+03	.2203+03	.1818+03	.1310+03	.9310+02	.3420+02	-.4000+01	
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	.3400+00
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	
HERBACEOUS (FIELD)	.2000+01	.3000+01	.3000+01	.3000+01	.3000+01	.4000+01	.4000+01	.4000+01	
EPIPHYTES-TOTAL									
TOTAL PLANTS	.2550+03	.2500+03	.2233+03	.1848+03	.1340+03	.9710+02	.3820+02		
LIVING ROOTS-SUM	.5200+02	.5300+02	.5000+02	.4200+02	.2500+02	.1500+02	.6000+01	.2000+01	
LIVING ROOTS >5 MM	.4320+02	.4500+02	.4300+02	.3800+02	.2150+02	.1300+02	.5200+01	.1700+01	
LIVING ROOTS 2-5 MM	.5500+01	.6000+01	.4400+01	.3800+01	.2300+01	.1300+01	.6000+00	.2000+00	
LIVING ROOTS <5 MM	.3300+01	.3000+01	.2600+01	.2200+01	.1200+01	.7000+00	.3000+00	.1000+00	
DEAD ROOTS	.4600+01	.3000+01	.1600+01	.9000+00	.1000+00	-.3000+00	-.4000+00	-.6000+00	
SOIL TOP ORGANIC	.1400+02	.1600+02	.1900+02	.2000+02	.2100+02	.2100+02	.2000+02	.2000+02	
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ORGANIC MATTER IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	MALAYSIA BULLOCK	CHAKIA BANDHU	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES	-.435D+01		.124D+02
FRUITS+FLOWERS			
BRANCHES-SUM	-.232D+02	.2332+03	.603D+02
BRANCHES-BARK			
BRANCHES-WOOD			
BOLE-SUM	-.158E+02	.5763+03	.3832+03
BOLE-BARK			.336D+02
BOLE-WOOD			.3496+03
STANDING DEAD			.403D+02
SUM-OVERSTORY			.4962+03
UNDERSTORY-LEAVES			
UND. FRUITS+FLOWERS			
UND. BRANCHES-SUM		.4800+01	
UND. BRANCHES-BARK			
UND. BRANCHES-WOOD			
UND. BOLE-SUM		.570D+01	
UND. BOLE-BARK			
UND. BOLE-WOOD			
UND. STANDING DEAD			
SUM-UNDERSTORY			
HERBACEOUS (FIELD)			
EPIPHYTES-TOTAL			
TOTAL PLANTS			
LIVING ROOTS-SUM	-.174E+02		
LIVING ROOTS >5 MM		**	
LIVING ROOTS 2-5 MM		**	
LIVING ROOTS <5 MM		.292D+02	
DEAD ROOTS			
SOIL TOP ORGANIC		**	
ROOTING ZONE		**	
INTENSIVE ROOTED		**	
EXTENSIVE ROOTED			
SUBSOIL			
HETEROTROPHS-SUM			
ABOVEGROUND CONSUMERS			
DECOMPOSER FAUNA			
DECOMPOSER FLORA			

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ORGANIC MATTER IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	NOE WOOD LOUCKS LAWSON	MEATHOP SATCHELL	SOLLING 01	SOLLING 03	SOLLING 04	HESTEMYN THAMUKUP ET AL	LANGANDO BEECH 2 LINDGREN	KONGLUND BEECH 1 NIMLGARD
CONSUMPTION-TOTAL							.1000+02		
CONS.-FOLIAGE-TOTAL				.1880+02	.1780+02	.1710+02	.1000+02		
CONS.-OVERSTORY									
CONS.-**OVE-OVERSTORY									
CONS.-**OVE-UNDERSTORY				.1300+01					
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-EMBAGEOUS									
CONS.-**OVE-TOTAL									
LITTERFALL-TOTAL	.4577+03						**	.3825+03	.5690+03
LITTERFALL-LEAF	.3250+03	.4100+03	.3246+03	.2977+03	.3270+03	.3164+03	.2979+03	.2400+03	.3670+03
LITTERFALL-FLOWER,FRUIT	.1400+02	.8000+01	.2110+02	.7760+02	.2760+02	.2540+02	.2280+02	.3500+02	.1030+03
LITTERFALL-BRANCH	.1700+02	**	.1003+03				.2030+02	.1075+03	.1090+03
LITTERFALL-BOLE	.9860+02	.1490+03	.7600+02				.9010+02		
LITTERFALL-GRASS	.6700+01		.3900+02						
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION			.6000+01						
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH			.4160+02						
STEM FLOW			.5600+01						
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ORGANIC MATTER IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	LINNEBJR ANDERS-SON	ANDERSBY PERSSON, MYTTEBRN	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SHIGATWA KITAZAWA	SOLLING FI
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL									
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.4768+03	.3697+03	.4216+03	.7010+03	.1830+03	.7749+03	.5998+03	.3921+03	.4196+03
LITTERFALL-LEAF	.2840+03	.2056+03	.2750+03	.2840+03			.5079+03	.2119+03	.3393+03
LITTERFALL-FLOWER,FRUIT	.8930+02	.2974+02	.7060+02	.1060+03				.6153+01	
LITTERFALL-BRANCH	.1035+03	.1278+03	.7600+02	.2090+03			.3740+02	.9256+02	.7530+02
LITTERFALL-BOLE				.2700+02				.1743+01	
LITTERFALL-GRASS		.1690+01		.9000+02				.1270+02	
LITTERFALL-EPIPHYTS		.4850+01		.3500+02				.1006+02	
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH					.3000+01				
STEM FLOW					.2000+01				
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ORGANIC MATTER IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA
CONSUMPTION-TOTAL				.3550+03	.5810+03	.7550+03	.8450+03	.9150+03	.9820+03
CONS.-FOLIAGE-TOTAL				.1500+03	.2390+03	.2810+03	.3110+03	.3300+03	.2200+03
CONS.-OVERSTORY				.1620+00	.2070+03	.2680+03	.2930+03	.3200+03	.1590+03
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY				.2900+02	.3200+02	.2300+02	.1800+02	.1000+02	.6100+02
CONS.-ROOTS-TOTAL				.1610+03	.2710+03	.3710+03	.4230+03	.4590+03	.2090+03
CONS.-UNDERSTORY				.1610+03	.2710+03	.3710+03	.4230+03	.4590+03	.2090+03
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL				.4900+02	.7100+02	.1030+03	.1110+03	.1260+03	.5300+02
LITTERFALL-TOTAL			.6710+03	.1950+03	.3230+03	.4050+03	.4930+03	.4940+03	.2280+03
LITTERFALL-LEAF	.3076+03	.2924+03	.4360+03	.1900+03	.2200+03	.2610+03	.2850+03	.3120+03	.1510+03
LITTERFALL-FLOWER,FRUIT			.1600+02						
LITTERFALL-BRANCH			.1190+03	.1600+02	.2900+02	.3800+02	.4000+02	.4500+02	.2100+02
LITTERFALL-BOLE				.3900+02	.7400+02	.1060+03	.1240+03	.1370+03	.5400+02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ORGANIC MATTER IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 7 KAZIMIOV MORDZOVA	SITE 8 KAZIMIOV MORDZOVA	SITE 9 KAZIMIOV MORDZOVA	SITE 10 KAZIMIOV MORDZOVA	SITE 11 KAZIMIOV MORDZOVA	SITE 12 KAZIMIOV MORDZOVA	SITE 13 KAZIMIOV MORDZOVA	SITE 14 KAZIMIOV MORDZOVA	SITE 15 KAZIMIOV MORDZOVA
CONSUMPTION-TOTAL	.5730+03	.4450+03	.6650+03	.7250+03	.7740+03	.7770+03	.7430+03	.6380+03	.5540+03
CONS.-FOLIAGE-TOTAL	.2250+03	.1740+03	.2520+03	.2660+03	.2820+03	.2880+03	.2800+03	.2610+03	.2480+03
CONS.-OVERSTORY	.1850+03	.1530+03	.2270+03	.2410+03	.2520+03	.2570+03	.2400+03	.2180+03	.1950+03
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY.	.7000+02	.2100+02	.2500+02	.2500+02	.3000+02	.3100+02	.4800+02	.4500+02	.5100+02
CONS.-ROOTS-TOTAL	.2470+03	.1970+03	.3120+03	.3440+03	.3690+03	.3600+03	.3300+03	.2650+03	.2190+03
CONS.-UNDERSTORY	.2470+03	.1970+03	.3120+03	.3440+03	.3690+03	.3600+03	.3300+03	.2650+03	.2190+03
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.7100+02	.7400+02	.1010+03	.1150+03	.1230+03	.1290+03	.1250+03	.1120+03	.9400+02
LITTERFALL-TOTAL	.2750+03	.1930+03	.3340+03	.3700+03	.4120+03	.4330+03	.4380+03	.3940+03	.3630+03
LITTERFALL-LEAF	.1810+03	.1430+03	.2310+03	.2610+03	.2730+03	.2860+03	.2880+03	.2630+03	.2480+03
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.2600+02	.2400+02	.3600+02	.4000+02	.4200+02	.4100+02	.3600+02	.2600+02	.2500+02
LITTERFALL-BOLE	.6800+02	.2600+02	.6700+02	.7900+02	.9700+02	.1060+03	.1140+03	.1060+03	.9000+02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ORGANIC MATTER IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL C. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 16 KAZIM'OV MOROZOVA	SITE 17 KAZIM'OV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	MIOMBO MALAISSE	MANAUS KLINGE+R ODRIGUEZ	CHAKIA BANDHU	EUCALYP-TUS ATTIWILL
CONSUMPTION-TOTAL	.4480+03	.3940+03		.3750+02				
CONS.-FOLIAGE-TOTAL	.2200+03	.2120+03						
CONS.-OVERSTORY	.1640+03	.1460+03						
CONS.-WOOD-OVERSTORY								
CONS.-WOOD-UNDERSTORY	.5800+02	.6600+02						
CONS.-ROOTS-TOTAL	.1450+03	.1090+03						
CONS.-UNDERSTORY	.1450+03	.1090+03						
CONS.-HERBACEOUS								
CONS.-WOOD-TOTAL	.8100+02	.7300+02						
LITTERFALL-TOTAL	.3280+03	.3200+03	.2500+03	.1723+04	.6001+03		.6781+03	
LITTERFALL-LEAF	.2250+03	.2170+03	.1247+03	.7483+03	.4255+03	.5600+00	.5560+03	.1390+03
LITTERFALL-FLOWER+FRUIT			.2000+02	.4650+02	.5370+02	.3500-01	**	
LITTERFALL-BRANCH	.1400+02	.1000+02	**	.3095+03	.6520+02	.1350+00	**	.1010+03
LITTERFALL-BOLE	.8900+02	.9300+02	.1000+02	.5966+03	.5290+02		.1171+03	.4700+02
LITTERFALL-GRASS				.2703+02	.2700+01			
LITTERFALL-EPIPHYTS			.3300+01		.1000+00			.1900+02
ATMOSPHERIC INPUT								
PRECIPITATION				**				
DRY PARTICULATES(DUST)				.4922+01				
GASEOUS FIXATION								
LEACHING								
LEAF WASH				**				
STEM FLOW				.1304+02				
LEACHING- SOIL LAYERS								
OUTPUT								
OUTPUT-WIND EROSION								
OUTPUT-WATER EROSION								
OUTPUT-PERCOLATION								

COMPARISONS AMONG ECOSYSTEMS WITH RESPECT TO PHOTOSYNTHESIS AND TRANSLOCATION IN UNITS OF GRAM/SQ.M/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	NOE WOOD LOUCKS LAWSON	SINAIA 2 BINDIU	MALAYSIA BULLOCK
OVERSTORY LEAVES	.1354+04	.3587+04	.6430+04	.1084+05
FRUITS,FLOWERS				.7650+02
BRANCHES-SUM	.1260+03			.5972+04
BRANCHES-BARK				
BRANCHES-WOOD				
BOLE-SUM	.2420+03	.1206+04		.3608+04
BOLE-BARK				
BOLE-WOOD				
SUM-OVERSTORY				
UNDERSTORY-LEAVES	.2170+03	.1000+03		
UND. FRUITS,FLOWERS				
UND. BRANCHES-SUM				
UND. BRANCHES-BARK				
UND. BRANCHES-WOOD				
UND. BOLE-SUM	.6400+02	.3600+02		
UND. BOLE-BARK				
UND. BOLE-WOOD				
SUM-UNDERSTORY				
HERBACEOUS (FIELD)	.5500+02	.4100+02		
EPIPHYTES-TOTAL				
TOTAL PLANTS				
LIVING ROOTS-SUM	.7860+03	.1441+04		.1631+04
LIVING ROOTS >5 MM				
LIVING ROOTS 2-5 MM				
LIVING ROOTS <5 MM				
SOIL TOP ORGANIC	.1730+03			

COMPARISONS AMONG ECOSYSTEMS WITH RESPECT TO RESPIRATION IN UNITS OF GRAM/SQ.M/YEAR

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	OAKRIDGE WEICHLE SHUGART	NOE WOOD LOUCKS LAWSON	WESTERVN THAMDRUP ET AL	SINAIA 2 BINDIU	ANDREWS EXP.FOR. GRIER	TRIANGLE MURPHY	MALAYSIA BULLOCK
OVERSTORY LEAVES	.2080+03	.5330+03	.3600+03	.4980+04		.4790+02	.3262+04
FRUITS,FLOWERS							.3000+02
BRANCHES-SUM	.8100+02		.8600+02			.7050+03	.1798+04
BRANCHES-BARK							
BRANCHES-WOOD	.8900+02						
BOLE-SUM		.8600+03	.3410+03			.2090+03	.1168+04
BOLE-BARK							
BOLE-WOOD							
STANDING DEAD							
SUM-OVERSTORY		.1383+04	.7870+03			.9619+03	.6278+04
UNDERSTORY-LEAVES	.2800+02	.3000+02					.8259+03
UND. FRUITS,FLOWERS							
UND. BRANCHES-SUM			**				.2060+03
UND. BRANCHES-BARK			**				
UND. BRANCHES-WOOD			**				
UND. BOLE-SUM	.2900+02	.6300+02	**				.3303+03
UND. BOLE-BARK			**				
UND. BOLE-WOOD			**				
UND. STANDING DEAD			**				
SUM-UNDERSTORY		.6300+02	.1100+02				.1369+04
HERBACEOUS (FIELD)	.1000+02	.2300+02	.3440+02				
EPIPHYTES-TOTAL							
TOTAL PLANTS	.9410+03		.8324+03			.9619+03	.7942+04
LIVING ROOTS-SUM	.4980+03	.6620+03	**			.1072+03	.5636+03
LIVING ROOTS >5 MM			**				
LIVING ROOTS 2-5 MM			**				
LIVING ROOTS <5 MM			**				
DEAD ROOTS			**				
SOIL TOP ORGANIC		.3050+03	**		.3660+03		.7371+03
ROOTING ZONE	.6200+02	.9150+03	**		.6160+03		
INTENSIVE ROOTED			**				.2022+04
EXTENSIVE ROOTED			.7800+03				
SUBSOIL							
HETEROTROPHS-SUM	.4600+03						
ABOVEGROUND CONSUMERS							.1039+02
DECOMPOSER FAUNA					.1220+02		
DECOMPOSER FLORA							

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CARBON(C) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	BAB BISKUP-SKY	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	TRIANGLE MURPHY
OVERSTORY LEAVES	.1960+03	.1654+03		.9000+02	**	**	**	**	.2480+03
FRUITS+FLOWERS	.2160+02		.1233+03		.1700+03	.2000+03	.2800+03	.2500+03	
BRANCHES-SUM	.1451+04			.1900+04	.2960+04	.5050+04	.2710+04	.3200+04	.4970+03
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.5343+04			.7900+04	.9500+04	.1065+05	.9410+04	.1710+05	.3090+04
BOLE-BARK				.3000+03	.4000+03	.4500+03	.8300+03	.5600+03	
BOLE-WOOD				.7500+04	.8100+04	.1020+05	.7590+04	.1150+05	
STANDING DEAD	.4132+03								
SUM-OVERSTORY	.7415+04			.9790+04					.3925+04
UNDERSTORY-LEAVES	.2480+02				0.	0.		0.	
UND. FRUITS+FLOWERS					0.	0.		0.	
UND. BRANCHES-SUM	.1050+03				0.	0.		0.	
UND. BRANCHES-BARK					0.	0.		0.	
UND. BRANCHES-WOOD					0.	0.		0.	
UND. BOLE-SUM	.2900+03				0.	0.		0.	
UND. BOLE-BARK					0.	0.		0.	
UND. BOLE-WOOD					0.	0.		0.	
UND. STANDING DEAD					0.	0.		0.	
SUM-UNDERSTORY	.4198+03			.2400+03	0.	0.		0.	
HERBACEOUS (FIELD)	.1400+02			.1000+02		.5000+01	.3000-02	.4000+02	
EPIPHYTES-TOTAL									
TOTAL PLANTS				.1004+05	.1150+05	.1590+05		.1560+05	.3925+04
LIVING ROOTS-SUM	.1673+04			.1900+04		.2600+04	.1860+04		.3020+03
LIVING ROOTS >5 MM				.1340+04		.2300+04	.1590+04		
LIVING ROOTS 2-5 MM				**		**	**		
LIVING ROOTS <5 MM				.5600+03		.3000+03	.2800+03		
DEAD ROOTS									
SOIL TOP ORGANIC	.2370+03			.2700+03	.3690+03	.2670+03	.2875+03	.1530+03	
ROOTING ZONE	.1225+05			.7070+04		.1034+05	.1090+05		
INTENSIVE ROOTED						.5130+04			
EXTENSIVE ROOTED						.5210+04			
SUBSOIL									
HETEROTROPHS-SUM	.1478+02								
ABOVGROUND CONSUMERS	.1290+00								
DECOMPOSER FAUNA	.9300+01								
DECOMPOSER FLORA	.5200+01								

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CARBON(C) IN UNITS OF GRAMS/SQ.METER

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	SHIGAYMA KITAZAWA	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA
OVERSTORY LEAVES					**	.2680+03	.3870+03	.4740+03	.4420+03
FRUITS,FLOWERS					.1700+03				
BRANCHES-SUM					.1300+04	.3160+03	.4570+03	.5840+03	.5960+03
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM					.1290+05	.8370+03	.1477+04	.2454+04	.2969+04
BOLE-BARK					.1100+04	.9700+02	.1570+03	.2360+03	.2590+03
BOLE-WOOD					.1180+05	.7400+03	.1370+04	.2219+04	.2710+04
STANDING DEAD						.1000+03	.1890+03	.2700+03	.3160+03
SUM-OVERSTORY						.1521+04	.2499+04	.3782+04	.4322+04
UNDERSTORY-LEAVES					0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS					0.	0.	0.	0.	0.
UND. BRANCHES-SUM					0.	0.	0.	0.	0.
UND. BRANCHES-BARK					0.	0.	0.	0.	0.
UND. BRANCHES-WOOD					0.	0.	0.	0.	0.
UND. BOLE-SUM					0.	0.	0.	0.	0.
UND. BOLE-BARK					0.	0.	0.	0.	0.
UND. BOLE-WOOD					0.	0.	0.	0.	0.
UND. STANDING DEAD					0.	0.	0.	0.	0.
SUM-UNDERSTORY		0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)						.1440+03	.8800+02	.7100+02	.5000+02
EPIPHYTES-TOTAL									
TOTAL PLANTS					.1530+05	.1665+04	.2597+04	.3853+04	.4372+04
LIVING ROOTS-SUM					.2930+05	.3370+03	.5170+03	.7450+03	.8540+03
LIVING ROOTS >5 MM					.2830+04	.2670+03	.4370+03	.6420+03	.7440+03
LIVING ROOTS 2-5 MM					**	.3900+02	.5300+02	.6700+02	.7600+02
LIVING ROOTS <5 MM					.1000+03	.3100+02	.3100+02	.3600+02	.3400+02
DEAD ROOTS						.4000+02	.6500+02	.8200+02	.9100+02
SOIL TOP ORGANIC	.1558+05	.2840+04	.6459+04	.3011+04	.9100+03	.9500+03	.9600+03	.9900+03	.1030+04
ROOTING ZONE					.1034+05				
INTENSIVE ROOTED		.1100+05	.1450+05	.4100+05	.4240+04	.4900+03	.2570+04	.2820+04	.3620+04
EXTENSIVE ROOTED					.6100+05				
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA	.2030+03								

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CARBON(C) IN UNITS OF GRAMS/SQ.METER

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	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA	SITE 10 KAZIM'OV MOROZOVA	SITE 11 KAZIM'OV MOROZOVA	SITE 12 KAZIM'OV MOROZOVA	SITE 13 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.4610+03	.3040+03	.3500+03	.2560+03	.4230+03	.4560+03	.5070+03	.5350+03	.5300+03
FRUITS,FLOWERS								.4000+01	.1400+02
BRANCHES-SUM	.6360+03	.3640+03	.4260+03	.3380+03	.5510+03	.6290+03	.7390+03	.7850+03	.8730+03
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.3297+04	.1065+04	.1323+04	.7190+03	.2147+04	.2959+04	.3716+04	.5393+04	.5901+04
BOLE-BARK	.2570+03	.1130+03	.1270+03	.8500+02	.2070+03	.2490+03	.2870+03	.3630+03	.3410+03
BOLE-WOOD	.3030+04	.9520+03	.1196+04	.6430+03	.1940+04	.2610+04	.3430+04	.5033+04	.5560+04
STANDING DEAD	.3490+03	.1380+03	.1730+03	.5300+02	.1710+03	.2130+03	.2970+03	.3510+03	.4130+03
SUM-OVERSTORY	.4733+04	.1971+04	.2272+04	.1365+04	.3292+04	.4157+04	.5249+04	.7069+04	.7731+04
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.3700+02	.1680+03	.1180+03	.6200+02	.7200+02	.7700+02	.1070+03	.1060+03	.1540+03
EPIPHYTES-TOTAL									
TOTAL PLANTS	.4770+04	.2039+04	.2390+04	.1427+04	.3364+04	.4234+04	.5355+04	.7174+04	.7885+04
LIVING ROOTS-SUM	.9310+03	.4070+03	.4930+03	.3160+03	.7130+03	.9060+03	.1098+04	.1495+04	.1694+04
LIVING ROOTS >5 MM	.8150+03	.3260+03	.4010+03	.2440+03	.6030+03	.6690+03	.9230+03	.1281+04	.1451+04
LIVING ROOTS 2-5 MM	.7900+02	.4500+02	.5100+02	.4300+02	.7200+02	.9500+02	.1070+03	.1270+03	.1540+03
LIVING ROOTS <5 MM	.3800+02	.3600+02	.3100+02	.2900+02	.4400+02	.5200+02	.6300+02	.7700+02	.8900+02
DEAD ROOTS	.9900+02	.5200+02	.6300+02	.2300+02	.5700+02	.6100+02	.9300+02	.9600+02	.1150+03
SOIL TOP ORGANIC	.1000+04	.1690+04	.3050+04	.8700+03	.9250+03	.9600+03	.1100+04	.1235+04	.1300+04
ROOTING ZONE									
INTENSIVE ROOTED	.5970+04	.6000+04	.1245+05						
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CARBON(C) IN UNITS OF GRAMS/SQ.METER

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	SITE 14 KAZIM'OV MOROZOVA	SITE 15 KAZIM'OV MOROZOVA	SITE 16 KAZIM'OV MOROZOVA	SITE 17 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.5030+03	.4520+03	.3760+03	.3440+03
FRUITS+FLOWERS	.1900+02	.2000+02	.2300+02	.2200+02
BRANCHES-SUM	.9590+03	.9150+03	.9630+03	.9990+03
BRANCHES-BARK				
BRANCHES-WOOD				
BOLE-SUM	.8044+04	.8401+04	.9362+04	.8967+04
BOLE-BARK	.4340+03	.4210+03	.4420+03	.3970+03
BOLE-WOOD	.7610+04	.7980+04	.8920+04	.8570+04
STANDING DEAD	.4070+03	.3620+03	.3630+03	.3790+03
SUM-OVERSTORY	.9932+04	.1015+05	.1099+05	.1060+05
UNDERSTORY-LEAVES	0.	0.	0.	0.
UND. FRUITS+FLOWERS	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.
HERBACEOUS (FIELD)	.1490+03	.1730+03	.1320+03	.2210+03
EPIPHYTES-TOTAL				
TOTAL PLANTS	.9981+04	.1032+05	.1119+05	.1092+05
LIVING ROOTS-SUM	.2090+04	.2300+04	.2346+04	.2420+04
LIVING ROOTS >5 MM	.1927+04	.2029+04	.2067+04	.2132+04
LIVING ROOTS 2-5 MM	.1650+03	.1740+03	.1760+03	.1960+03
LIVING ROOTS <5 MM	.9900+02	.9900+02	.1030+03	.1020+03
DEAD ROOTS	.1050+03	.9900+02	.9100+02	.1030+03
SOIL TOP ORGANIC	.1480+04	.1640+04	.1775+04	.1950+04
ROOTING ZONE				
INTENSIVE ROOTED				
EXTENSIVE ROOTED				
SUBSOIL				
HETEROTROPHS-SUM				
ABOVGROUND CONSUMERS				
DECOMPOSER FAUNA				
DECOMPOSER FLORA				

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF CARBON(C) IN UNITS OF GRAM/SQ.M

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	OAKRIDGE REICHLE SHUGART	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	TRIANGLE MURPHY	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA
OVERSTORY LEAVES							.1200+02		.3700+01
FRUITS+FLOWERS									
BRANCHES-SUM	.2700+02		**	**	**	**	.3300+02	**	.6200+01
BRANCHES-BARK			**	**	**	**		**	
BRANCHES-WOOD			**	**	**	**		**	
BOLE-SUM	.1120+03		**	**	**	**	.3940+03	**	.4770+02
BOLE-BARK			**	**	**	**		**	.5400+01
BOLE-WOOD			.3220+03	.9010+03	.3060+03	.4900+03		.4960+03	.4230+02
STANDING DEAD									.2000+01
SUM-OVERSTORY	.1390+03						.4390+03		.5960+02
UNDERSTORY-LEAVES			0.	0.		0.		0.	0.
UND. FRUITS+FLOWERS			0.	0.		0.		0.	0.
UND. BRANCHES-SUM	.1000+01		0.	0.		0.		0.	0.
UND. BRANCHES-BARK			0.	0.		0.		0.	0.
UND. BRANCHES-WOOD			0.	0.		0.		0.	0.
UND. BOLE-SUM	.3000+01		0.	0.		0.		0.	0.
UND. BOLE-BARK			0.	0.		0.		0.	0.
UND. BOLE-WOOD			0.	0.		0.		0.	0.
UND. STANDING DEAD			0.	0.		0.		0.	0.
SUM-UNDERSTORY	.4000+01		0.	0.		0.		0.	0.
HERBACEOUS (FIELD)									.1400+01
EPIPHYTES-TOTAL									
TOTAL PLANTS							.4390+03		.6100+02
LIVING ROOTS-SUM	.2200+02	.1100+03					.6800+02		.1350+02
LIVING ROOTS >5 MM	.1100+02								.1080+02
LIVING ROOTS 2-5 MM	.1100+02								.1500+01
LIVING ROOTS <5 MM									.1200+01
DEAD ROOTS									.9000+00
SOIL TOP ORGANIC	.9000+00								.3500+01
ROOTING ZONE	.5900+01								
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF CARBON(C) IN UNITS OF GRAM/SQ.M

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	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.6200+01	.8100+01	.7000+01	.8400+01	.4700+01	.5100+01	.1400+02	.1000+02	.6700+01
FRUITS.FLOWERS									
BRANCHES-SUM	.8800+01	.1140+02	.1300+02	.1400+02	.7300+01	.8300+01	.1510+02	.1250+02	.9800+01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.7660+02	.1033+03	.1139+03	.1273+03	.6100+02	.6970+02	.6100+02	.9730+02	.1083+03
BOLE-BARK	.8300+01	.1030+02	.1180+02	.1330+02	.6400+01	.7300+01	.6400+01	.8800+01	.8800+01
BOLE-WOOD	.6930+02	.9300+02	.1050+03	.1160+03	.5460+02	.6240+02	.5460+02	.9950+02	.9950+02
STANDING DEAD	.3700+01	.5300+01	.6300+01	.8000+01	.2800+01	.3400+01	.8200+01	.8400+01	.7200+01
SUM-OVERSTORY	.9530+02	.1291+03	.1461+03	.1557+03	.7590+02	.8650+02	.9830+02	.1282+03	.1321+03
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS.FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.2400+01	.1900+01	.1000+01	.5000+00	.3400+01	.1400+01	.5000+00	.5000+00	.1000+01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.9770+02	.1300+03	.1471+03	.1562+03	.7920+02	.8790+02	.9980+02	.1287+03	.1331+03
LIVING ROOTS-SUM	.1900+02	.2400+02	.2650+02	.3050+02	.1490+02	.1640+02	.2040+02	.2430+02	.2660+02
LIVING ROOTS >5 MM	.1450+02	.2050+02	.2310+02	.2670+02	.1190+02	.1350+02	.1570+02	.2020+02	.2200+02
LIVING ROOTS 2-5 MM	.2200+01	.2200+01	.2400+01	.2500+01	.1600+01	.1800+01	.2800+01	.2600+01	.2900+01
LIVING ROOTS <5 MM	.1300+01	.1300+01	.1000+01	.1300+01	.1300+01	.1100+01	.1900+01	.1500+01	.1700+01
DEAD ROOTS	.1300+01	.1600+01	.1900+01	.1900+01	.1000+01	.1300+01	.3200+01	.2900+01	.2300+01
SOIL TOP ORGANIC	.5500+01	.6500+01	.6000+01	.5000+01	.7000+01	.1000+02	.5500+01	.6000+01	.7000+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF CARBON(C) IN UNITS OF GRAM/SQ.M

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	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.3300+01		**	-.1300+01	-.2300+01	-.2800+01	-.3800+01
FRUITS,FLOWERS		.6000+00	.4000+00	.2000+00	.2000+00		
BRANCHES-SUM	.7900+01	.4700+01	.3100+01	.2100+01	.1000+01	.5000+00	.5000+00
BRANCHES-BARK							
BRANCHES-WOOD							
BOLE-SUM	.1139+03	.1073+03	.3150+02	.6740+02	.5030+02	.2120+02	.2500+01
BOLE-BARK	.8300+01	.7300+01	.5300+01	.3400+01	.2500+01	.1200+01	.1000+00
BOLE-WOOD	.1055+03	.1000+03	.9620+02	.6400+02	.4790+02	.2000+02	.2400+01
STANDING DEAD	.5600+01	.3100+01	.1500+01	.3000+00	-.6000+00	**	**
SUM-OVERSTORY	.1305+03	.1157+03	.3550+02	.6910+02	.4960+02	.1790+02	-.1800+01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.1500+01	.1500+01	.1500+01	.1500+01	.1900+01	.1900+01	.1900+01
EPIPHYTES-TOTAL							
TOTAL PLANTS	.1320+03	.1172+03	.9700+02	.6960+02	.5050+02	.1980+02	.1000+00
LIVING ROOTS-SUM	.2700+02	.2530+02	.2130+02	.1270+02	.7600+01	.3000+01	.1000+01
LIVING ROOTS >5 MM	.2230+02	.2170+02	.1920+02	.1090+02	.6600+01	.2600+01	.9000+00
LIVING ROOTS 2-5 MM	.2600+01	.2300+01	.2000+01	.1200+01	.7000+00	.2000+00	.1000+00
LIVING ROOTS <5 MM	.1500+01	.1300+01	.1100+01	.6000+00	.3000+00	.2000+00	0.
DEAD ROOTS	.1500+01	.8000+00	.5000+00	0.	-.2000+00	-.2000+00	-.3000+00
SOIL TOP ORGANIC	.8000+01	.9500+01	.1000+02	.1050+02	.1050+02	.1000+02	.1000+02
ROOTING ZONE							
INTENSIVE ROOTED							
EXTENSIVE ROOTED							
SUBSOIL							
HETEROTROPHS-SUM							
ABOVEGROUND CONSUMERS							
DECOMPOSER FAUNA							
DECOMPOSER FLORA							

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CARBON(C) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LENNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA
CONSUMPTION-TOTAL	.9000+01						.1750+03	.2951+03	.3715+03
CONS.-FOLIAGE-TOTAL	.4700+01						.7000+02	.1116+03	.1310+03
CONS.-OVERSTORY	.4000+01						.5950+02	.9620+02	.1200+03
CONS.-WOOD-OVERSTORY	.5000+00								
CONS.-WOOD-UNDERSTORY	.2000+00						.1150+02	.1540+02	.1100+02
CONS.-ROOTS-TOTAL							.8200+02	.1380+03	.1890+03
CONS.-UNDERSTORY							.8200+02	.1380+03	.1890+03
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL							.2200+02	.3550+02	.5150+02
LITTERFALL-TOTAL	.2270+03	.2120+03	.3000+03	.2320+03	.2140+03	.2700+03	.9470+02	.1577+03	.1943+03
LITTERFALL-LEAF	.1570+03	.1385+03		.1375+03	.1390+03		.6600+02	.1050+03	.1215+03
LITTERFALL-FLOWER,FRUIT	.8000+01	.1720+02		.4780+02	.3600+02				
LITTERFALL-BRANCH	.8000+01	.5600+02		.9080+02	.3900+02		.9200+01	.1510+02	.1940+02
LITTERFALL-BOLC	.4900+02						.2000+02	.3760+02	.5400+02
LITTERFALL-GRASS	.5000+01								
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION	.1354+04								
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CARBON(C) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL	.4161+03	.4538+03	.2363+03	.2911+03	.2193+03	.3270+03	.3570+03	.3759+03	.3929+03
CONS.-FOLIAGE-TOTAL	.1446+03	.1569+03	.1033+03	.1196+03	.8130+02	.1175+03	.1240+03	.1314+03	.1348+03
CONS.-OVERSTORY	.1360+03	.1520+03	.7400+02	.9600+02	.7120+02	.1055+03	.1170+03	.1170+03	.1200+03
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.8600+01	.4900+01	.2330+02	.3360+02	.1010+02	.1200+02	.1200+02	.1440+02	.1480+02
CONS.-ROOTS-TOTAL	.2160+03	.2340+03	.1065+03	.1260+03	.1010+03	.1590+03	.1755+03	.1830+03	.1835+03
CONS.-UNDERSTORY	.2160+03	.2340+03	.1065+03	.1260+03	.1010+03	.1590+03	.1755+03	.1830+03	.1835+03
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.5550+02	.6300+02	.2650+02	.3550+02	.3700+02	.5050+02	.5750+02	.6150+02	.6450+02
LITTERFALL-TOTAL	.2176+03	.2400+03	.1093+03	.1330+03	.9260+02	.1611+03	.1790+03	.1994+03	.2094+03
LITTERFALL-LEAF	.1340+03	.1470+03	.7000+02	.8500+02	.6720+02	.1085+03	.1190+03	.1295+03	.1345+03
LITTERFALL-FLOWER+FRUIT									
LITTERFALL-BRANCH	.2040+02	.2300+02	.1070+02	.1330+02	.1220+02	.1840+02	.2040+02	.2140+02	.2090+02
LITTERFALL-BOLE	.6320+02	.7000+02	.2760+02	.3470+02	.1320+02	.3420+02	.4020+02	.4950+02	.5400+02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CARBON(C) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 13 KAZIMOV MOROZOVA	SITE 14 KAZIMOV MOROZOVA	SITE 15 KAZIMOV MOROZOVA	SITE 16 KAZIMOV MOROZOVA	SITE 17 KAZIMOV MOROZOVA	MANAUS KLINGE,R ODRIGUEZ
CONSUMPTION-TOTAL	.3655+03	.3126+03	.2715+03	.2189+03	.1917+03	
CONS.-FOLIAGE-TOTAL	.1345+03	.1213+03	.1155+03	.1043+03	.9970+02	
CONS.-OVERSTORY	.1115+03	.1010+03	.9100+02	.7630+02	.6800+02	
CONS.-WOOD-OVERSTORY						
CONS.-WOOD-UNDERSTORY	.2300+02	.2060+02	.2450+02	.2900+02	.3170+02	
CONS.-ROOTS-TOTAL	.1685+03	.1350+03	.1090+03	.7400+02	.5550+02	
CONS.-UNDERSTORY	.1685+03	.1350+03	.1090+03	.7400+02	.5550+02	
CONS.-HERBACEOUS						
CONS.-WOOD-TOTAL	.6250+02	.5600+02	.4700+02	.4050+02	.3650+02	
LITTERFALL-TOTAL	.2115+03	.1898+03	.1763+03	.1586+03	.1540+03	
LITTERFALL-LEAF	.1350+03	.1240+03	.1165+03	.1060+03	.1020+03	.2970+00
LITTERFALL-FLOWER+FRUIT						.1800-01
LITTERFALL-BRANCH	.1940+02	.1330+02	.1290+02	.7100+01	.5100+01	.6400-01
LITTERFALL-BOLE	.5810+02	.5250+02	.4600+02	.4550+02	.4740+02	
LITTERFALL-GRASS						
LITTERFALL-EPIPHYTS						
ATMOSPHERIC INPUT						
PRECIPITATION						
DRY PARTICULATES(DUST)						
GASEOUS FIXATION						
LEACHING						
LEAF WASH						
STEM FLOW						
LEACHING- SOIL LAYERS						
OUTPUT						
OUTPUT-WIND EROSION						
OUTPUT-WATER EROSION						
OUTPUT-PERCOLATION						

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ENERGY IN UNITS OF KCAL/HECTARE

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	BIALO-WIEZA FALINSKI	HESTEHVN THAMDRUP ET AL	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	SHIGAYMA KITAZAWA	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.1762+09		.1100+09	**			.3020+08	.4350+08	.5420+08
FRUITS+FLOWERS	.2263+08			.1900+08					
BRANCHES-SUM	.1362+10		.1960+09	.4920+09	.2620+09		.3040+08	.4320+08	.5600+08
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.5072+10		.7750+09	.1025+10	.6130+09		.7930+09	.1403+09	.2330+09
BOLE-BARK			.3400+08	.4100+09	.8300+08		.9300+07	.1500+08	.2260+08
BOLE-WOOD			.7410+09	.9940+09	.5360+09		.7030+08	.1253+09	.2104+09
STANDING DEAD	.3608+09						.9400+07	.1790+08	.2580+08
SUM-OVERSTORY	.6993+10		.9820+09				.1493+09	.2493+09	.3690+09
UNDERSTORY-LEAVES	.1074+08			0.			0.	0.	0.
UND. FRUITS+FLOWERS		.6280+07		0.			0.	0.	0.
UND. BRANCHES-SUM	.9864+08			0.			0.	0.	0.
UND. BRANCHES-BARK				0.			0.	0.	0.
UND. BRANCHES-WOOD				0.			0.	0.	0.
UND. BOLE-SUM	.2711+09			0.			0.	0.	0.
UND. BOLE-BARK				0.			0.	0.	0.
UND. BOLE-WOOD				0.			0.	0.	0.
UND. STANDING DEAD				0.			0.	0.	0.
SUM-UNDERSTORY	.3905+09			0.			0.	0.	0.
HERBACEOUS (FIELD)	.1254+08	.9318+07	.8000+06	.5000+06	.3000+06		.1350+08	.8400+07	.6700+07
EPIPHYTES-TOTAL									
TOTAL PLANTS				.1536+10			.1631+09	.2533+09	.3757+09
LIVING ROOTS-SUM	.1979+10		.2020+09		.1754+09		.3220+08	.4940+08	.7100+08
LIVING ROOTS >5 MM			.1420+09		.1500+09		.2590+08	.4140+08	.6120+08
LIVING ROOTS 2-5 MM			**		**		.3700+07	.5100+07	.6400+07
LIVING ROOTS <5 MM			.6000+08		.2540+08		.2900+07	.2900+07	.3400+07
DEAD ROOTS							.3900+07	.6300+07	.7900+07
SOIL TOP ORGANIC	.1615+09		.3400+08		.2930+08	.1200+10	.9350+08	.9650+08	.9300+08
ROOTING ZONE	.5120+10		.4500+09						
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM	.1634+08								
ABOVGROUND CONSUMERS	.1400+06								
DECOMPOSER FAUNA	.1040+08								
DECOMPOSER FLORA	.5800+07					.1600+08			

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ENERGY IN UNITS OF KCAL/HECTARE

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	SITE 4 KAZIM'OV MOROZOVA	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA	SITE 10 KAZIM'OV MOROZOVA	SITE 11 KAZIM'OV MOROZOVA	SITE 12 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.5040+08	.5250+08	.3460+08	.3390+08	.2910+08	.4820+08	.5200+08	.5800+08	.6100+08
FRUITS,FLOWERS									
BRANCHES-SUM	.5710+08	.6100+08	.3490+08	.4080+08	.3240+08	.5280+08	.6000+08		.7500+08
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.2918+09	.3156+09	.9930+08	.1259+09	.6720+08	.2040+09	.2720+09	.3520+09	.5120+09
BOLE-BARK	.2480+08	.2460+08	.1080+08	.1220+08	.7200+07	.1980+08	.2400+08	.2700+08	.3500+08
BOLE-WOOD	.2570+09	.2910+09	.8850+09	.1136+09	.6000+08	.1842+09	.2490+09	.3250+09	.4770+09
STANDING DEAD	.3000+08	.3320+08	.1310+08	.1650+08	.5000+07	.1630+08	.2000+08	.2700+08	.3300+08
SUM-OVERSTORY	.4193+09	.4623+09	.1919+09	.2230+09	.1337+09	.3213+09	.4040+09	.5080+09	.6810+09
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.4800+07	.3600+07	.1600+08	.2130+08	.6000+07	.6900+07	.7000+07	.1000+08	.1000+08
EPIPHYTES-TOTAL									
TOTAL PLANTS	.4241+09	.4659+09	.1979+09	.2343+09	.1397+09	.3282+09	.4110+09	.5180+09	.6910+09
LIVING ROOTS-SUM	.9170+09	.9990+08	.3980+09	.4600+08	.3020+08	.6970+09	.7200+09	.1050+09	.1410+09
LIVING ROOTS >5 MM	.7110+08	.7780+08	.3110+08	.3820+08	.2330+08	.5750+08	.5900+08	.8900+08	.1220+09
LIVING ROOTS 2-5 MM	.7300+07	.7500+07	.4300+07	.4900+07	.4100+07	.7000+07	.9000+07	.1000+08	.1290+08
LIVING ROOTS <5 MM	.3300+07	.3600+07	.3400+07	.2300+07	.2800+07	.4200+07	.5000+07	.6000+07	.7000+07
DEAD ROOTS	.9700+07	.9400+07	.5000+07	.6000+07	.2200+07	.5500+07	.6000+07	.9000+07	.9000+07
SOIL TOP ORGANIC	.1030+09	.1000+09	.1690+09	.3050+09	.8700+08	.9250+08	.9600+08	.1100+09	.1240+09
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF ENERGY IN UNITS OF KCAL/HECTARE

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	CHAKIA BANDHU
OVERSTORY LEAVES	.4000+08	.5700+08	.5100+08	.4300+08	.3900+08	.4470+08	.2409+08
FRUITS,FLOWERS	.1000+07	.2000+07	.2000+07	.2000+07	.2000+07	.1100+07	.2200+06
BRANCHES-SUM	.8400+08	.8200+08	.8800+08	.8300+08	.8500+08	.9800+08	.2068+09
BRANCHES-BARK							
BRANCHES-WOOD							
BOLE-SUM	.6610+09	.7650+09	.7970+09	.8690+09	.8490+09	.3900+09	.5737+09
BOLE-BARK	.3300+08	.4200+08	.4000+08	.4200+08	.3800+08		
BOLE-WOOD	.6280+09	.7230+09	.7570+09	.8220+09	.8100+09		
STANDING DEAD	.3900+08	.3920+08	.3400+08	.3300+08	.3600+08	.2460+08	
SUM-OVERSTORY	.7450+09	.9450+09	.9720+09	.1025+10	.1010+10	.5586+09	.8049+09
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	.2000+06	.4000+06
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.		
UND. BRANCHES-SUM	0.	0.	0.	0.	0.		.3580+07
UND. BRANCHES-BARK	0.	0.	0.	0.	0.		
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.		
UND. BOLE-SUM	0.	0.	0.	0.	0.		.4780+07
UND. BOLE-BARK	0.	0.	0.	0.	0.		
UND. BOLE-WOOD	0.	0.	0.	0.	0.		
UND. STANDING DEAD	0.	0.	0.	0.	0.		
SUM-UNDERSTORY	0.	0.	0.	0.	0.		.8710+07
HERBACEOUS (FIELD)	.1500+08	.1400+08	.1700+08	.1800+08	.2100+08	.3170+08	
EPIPHYTES-TOTAL						.4400+07	
TOTAL PLANTS	.7600+09	.9590+09	.9890+09	.1043+10	.1021+10		.8136+09
LIVING ROOTS-SUM	.1630+09	.1980+09	.2190+09	.2290+09	.2300+09	.1957+09	.1479+09
LIVING ROOTS >5 MM	.1390+09	.1730+09	.1930+09	.1970+09	.2020+09		
LIVING ROOTS 2-5 MM	.1500+08	.1600+08	.1700+08	.1700+08	.1800+08		
LIVING ROOTS <5 MM	.9000+07	.9000+07	.9000+07	.1000+08	.1000+08		
DEAD ROOTS	.1100+08	.1000+08	.9000+07	.9000+07	.1000+08		
SOIL TOP ORGANIC	.1300+09	.1480+09	.1690+09	.1780+09	.1950+09	.2700+09	
ROOTING ZONE							
INTENSIVE ROOTED							
EXTENSIVE ROOTED							
SUBSOIL							
HETEROTROPHS-SUM							
ABOVEGROUND CONSUMERS							
DECOMPOSER FAUNA							
DECOMPOSER FLORA							

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ENERGY IN UNITS OF KCAL/HECTARE

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA
OVERSTORY LEAVES		.4200+06	.6900+06	.9000+06	.9000+06	.9500+06	.5300+06	.5830+06	.1590+07
FRUITS+FLOWERS									
BRANCHES-SUM	.2677+09	.6000+06	.9500+06	.1090+07	.1250+07	.1340+07	.7000+06	.9000+06	.1450+07
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1172+10	.4540+07	.7300+07	.9900+07	.1130+08	.1208+08	.5680+07	.6510+07	.5700+07
BOLE-BARK		.5200+06	.9000+06	.4900+06	.1090+07	.1080+07	.6100+06	.7000+06	.6000+06
BOLE-WOOD		.4020+07	.6500+07	.8910+07	.1022+08	.1100+08	.5070+07	.5810+07	.5100+07
STANDING DEAD		.1900+06	.3600+06	.9100+06	.6000+06	.6600+06	.2600+06	.3300+06	.7700+06
SUM-OVERSTORY	.1440+10	.5750+07	.9200+07	.1240+08	.1395+08	.1493+08	.7170+07	.8220+07	.9510+07
UNDERSTORY-LEAVES		0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS+FLOWERS		0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	.9300+07	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK		0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD		0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	.2760+08	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK		0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD		0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD		0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	.3690+09	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)		.1400+06	.2300+06	.1900+06	.9000+05	.5000+05	.3200+06	.1400+06	.5000+05
EPIPHYTES-TOTAL									
TOTAL PLANTS		.5890+07	.9430+07	.1259+08	.1404+08	.1499+08	.7490+07	.9360+07	.9560+07
LIVING ROOTS-SUM	.2028+09	.1310+07	.1750+07	.2340+07	.2580+07	.2970+07	.1410+07	.1550+07	.1950+07
LIVING ROOTS >5 MM	.1014+09	.1040+07	.1410+07	.2000+07	.2250+07	.2600+07	.1130+07	.1290+07	.1500+07
LIVING ROOTS 2-5 MM	.1014+09	.1500+06	.2200+06	.2100+06	.2300+06	.2500+06	.1600+06	.1700+06	.2700+06
LIVING ROOTS <5 MM		.1200+06	.1200+06	.1300+06	.1000+06	.1200+06	.1200+06	.1000+06	.1900+06
DEAD ROOTS		.7000+05	.1300+06	.1600+06	.1800+06	.1800+06	.1000+06	.1200+06	.3100+06
SOIL TOP ORGANIC	.7300+07	.3500+06	.5500+06	.8500+06	.6000+06	.5000+06	.7000+06	.1000+07	.5500+06
ROOTING ZONE	.2400+08								
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ENERGY IN UNITS OF KCAL/HECTARE

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	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.1110+07	.7500+06	.3700+06		-.9000+05	-.2200+06	-.2600+06	-.3200+00	-.4300+06
FRUITS+FLOWERS				.6000+05	.4000+05	.2000+05	.1000+01		
BRANCHES-SUM	.1190+07	.9400+06	.2400+06	.4400+06	.2900+06	.2000+06	.1000+06	.5000+05	.5000+05
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.9140+07	.1017+08	.1061+08	.1010+08	.8810+07	.6290+07	.4700+07	.1950+07	.2400+06
BOLE-BARK	.9400+06	.9400+06	.7300+06	.7000+06	.5100+06	.3200+06	.2300+06	.1100+06	.1000+05
BOLE-WOOD	.8300+07	.9330+07	.9820+07	.9400+07	.8100+07	.5970+07	.4470+07	.1870+07	.2300+06
STANDING DEAD	.9000+06	.6900+06	.5200+06	.3000+06	.1400+06	.2000+05	-.6000+05	-.9000+05	-.1000+06
SUM-OVERSTORY	.1224+08	.1254+08	.1224+08	.1090+08	.8930+07	.6310+07	.4490+07	.1620+07	-.2400+06
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS+FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.5000+05	.9000+05	.1400+07	.1400+06	.1400+06	.1400+06	.1900+06	.1900+06	.1900+06
EPIPHYTES-TOTAL									
TOTAL PLANTS	.1229+08	.1263+08	.1239+08	.1104+08	.9130+07	.6450+07	.4670+07	.1900+07	-.6000+05
LIVING ROOTS-SUM	.2330+07	.2520+07	.2590+07	.2430+07	.2040+07	.1230+07	.7500+06	.2800+06	.9000+05
LIVING ROOTS >5 MM	.1950+07	.2110+07	.2200+07	.2100+07	.1760+07	.1050+07	.6500+06	.2400+06	.9000+05
LIVING ROOTS 2-5 MM	.2400+06	.2600+06	.2400+06	.2100+06	.1900+06	.1200+06	.7000+05	.2000+05	.1000+05
LIVING ROOTS <5 MM	.1400+06	.1500+06	.1400+06	.1200+06	.1000+06	.6000+05	.3000+05	.2000+05	
DEAD ROOTS	.2700+06	.2200+06	.1500+06	.8000+05	.5000+05		-.2000+05	-.2000+05	-.3000+05
SOIL TOP ORGANIC	.6000+06	.7000+06	.8000+06	.9500+06	.1000+07	.1050+07	.1050+07	.1000+07	.1000+07
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF ENERGY IN UNITS OF KCAL/HECTARE

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	FINLANC HAVAS
OVERSTORY LEAVES	
FRUITS,FLOWERS	
BRANCHES-SUM	.8700+07
BRANCHES-BARK	
BRANCHES-WOOD	
BOLE-SUM	.5000+06
BOLE-BARK	
BOLE-WOOD	
STANDING DEAD	.6000+06
SUM-OVERSTORY	
UNDERSTORY-LEAVES	
UND. FRUITS,FLOWERS	
UND. BRANCHES-SUM	
UND. BRANCHES-BARK	
UND. BRANCHES-WOOD	
UND. BOLE-SUM	
UND. BOLE-BARK	
UND. BOLE-WOOD	
UND. STANDING DEAD	
SUM-UNDERSTORY	
HERBACEOUS (FIELD)	
EPIPHYTES-TOTAL	
TOTAL PLANTS	
LIVING ROOTS-SUM	
LIVING ROOTS >5 MM	
LIVING ROOTS 2-5 MM	
LIVING ROOTS <5 MM	
DEAD ROOTS	
SOIL TOP ORGANIC	
ROOTING ZONE	
INTENSIVE ROOTED	
EXTENSIVE ROOTED	
SUBSOIL	
HETEROTROPHS-SUM	
ABOVEGROUND CONSUMERS	
DECOMPOSER FAUNA	
DECOMPOSER FLORA	

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ENERGY IN UNITS OF KCAL/HECTARE

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	SOLLING B1	HESTEHVN THAMDRUP ET AL	LINNEBJR ANDERS-SON	SITE 1 KAZIM*OV MOROZOVA	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL	.1100+07			.1770+08	.2900+08	.3780+08	.4210+08	.4580+08	.2400+08
CONS.-FOLIAGE-TOTAL	.9000+06			.7900+07	.1250+08	.1490+08	.1630+08	.1740+08	.1130+08
CONS.-OVERSTORY				.5700+07	.1100+08	.1370+08	.1550+08	.1700+08	.8400+07
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY				.1100+07	.1500+07	.1100+07	.9000+06	.4000+06	.2900+07
CONS.-ROOTS-TOTAL				.7900+07	.1310+08	.1900+08	.2050+08	.2230+08	.2600+07
CONS.-UNDERSTORY				.7900+07	.1310+08	.1900+08	.2050+08	.2230+08	.1010+08
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.3000+06			.2100+07	.3400+07	.5000+07	.5300+07	.6100+07	.2600+07
LITTERFALL-TOTAL		**	.2160+09	.1000+09	.1670+09	.2050+09	.2290+09	.2510+09	.1140+09
LITTERFALL-LEAF		**	.1300+08	.7300+07	.1170+08	.1360+08	.1490+08	.1620+08	.7800+07
LITTERFALL-FLOWER,FRUIT		**	.3940+07						
LITTERFALL-BRANCH		.1620+03	.4630+07	.8000+06	.1400+07	.1900+07	.2000+07	.2300+07	.1000+07
LITTERFALL-BOLE				.1900+07	.3600+07	.5100+07	.6000+07	.6600+07	.2600+07
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ENERGY IN UNITS OF KCAL/HECTARE

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	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA	SITE 10 KAZIM'OV MOROZOVA	SITE 11 KAZIM'OV MOROZOVA	SITE 12 KAZIM'OV MOROZOVA	SITE 13 KAZIM'OV MOROZOVA	SITE 14 KAZIM'OV MOROZOVA	SITE 15 KAZIM'OV MOROZOVA
CONSUMPTION-TOTAL	.2840+08	.2210+08	.3310+08	.3620+08	.3850+08	.3970+08	.3700+08	.3190+08	.2770+08
CONS.-FOLIAGE-TOTAL	.1300+08	.9100+07	.1310+08	.1390+08	.1470+08	.1500+08	.1490+08	.1360+08	.1270+08
CONS.-OVERSTORY	.9800+07	.8100+07	.1200+08	.1280+08	.1330+08	.1360+08	.1270+08	.1150+08	.1040+08
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.3200+07	.1000+07	.1100+07	.1100+07	.1400+07	.1400+07	.2200+07	.2100+07	.2300+07
CONS.-ROOTS-TOTAL	.1190+08	.7400+07	.1510+08	.1670+08	.1790+08	.1740+08	.1600+08	.1290+08	.1040+08
CONS.-UNDERSTORY	.1190+08	.9400+07	.1510+08	.1670+08	.1780+08	.1740+08	.1600+08	.1290+08	.1040+08
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.3500+07	.3600+07	.4300+07	.5600+07	.6000+07	.6300+07	.6100+07	.5400+07	.4600+07
LITTERFALL-TOTAL	.1400+08	.9300+07	.1700+08	.1990+08	.2100+08	.2200+08	.2230+08	.2010+08	.1940+08
LITTERFALL-LEAF	.9400+07	.7400+07	.1200+08	.1310+08	.1420+08	.1490+08	.1500+08	.1370+08	.1290+08
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.1300+07	.1200+07	.1800+07	.2000+07	.2100+07	.2000+07	.1900+07	.1300+07	.1200+07
LITTERFALL-BOLE	.3300+07	.1300+07	.3200+07	.3900+07	.4700+07	.5100+07	.5500+07	.5130+07	.4300+07
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF ENERGY IN UNITS OF KCAL/HECTARE

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	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	CHAKIA BANDHU
CONSUMPTION-TOTAL	.2250+08	.1950+08	.1000+06	
CONS.-FOLIAGE-TOTAL	.1140+08	.1070+08		.1200-01
CONS.-OVERSTORY	.8700+07	.7700+07		.1200-01
CONS.-WOOD-OVERSTORY				
CONS.-WOOD-UNDERSTORY	.2700+07	.3000+07		
CONS.-ROOTS-TOTAL	.7200+07	.5300+07		
CONS.-UNDERSTORY	.7200+07	.5300+07		
CONS.-HERBACEOUS				
CONS.-WOOD-TOTAL	.3900+07	.3500+07		
LITTERFALL-TOTAL	.1670+08	.1630+08	.1410+08	.3660+08
LITTERFALL-LEAF	.1170+08	.1130+08	.6700+07	.2270+08
LITTERFALL-FLOWER,FRUIT			.1100+07	**
LITTERFALL-BRANCH	.7000+06	.5000+06	**	**
LITTERFALL-BOLE	.4300+07	.4500+07	.6000+06	.3900+06
LITTERFALL-GRASS				
LITTERFALL-EPIPHYTS			.2000+06	
ATMOSPHERIC INPUT				
PRECIPITATION				
DRY PARTICULATES(DUST)				
GASEOUS FIXATION				
LEACHING				
LEAF WASH				
STEM FLOW				
LEACHING- SOIL LAYERS				
OUTPUT				
OUTPUT-WIND EROSION				
OUTPUT-WATER EROSION				
OUTPUT-PERCOLATION				

@XQT IBP.MPA

@ADD,P IBP.DATENA

@ADD,P IBP.DATENM

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF NITROGEN(N) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING 81	SOLLING 83	SOLLING 84	WESTERVN THAMDRUP ET AL	LANGARDD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNERJR ANDERS-SON
OVERSTORY LEAVES	.8570+01	.9300+01	.8937+01	.9546+01	.9718+01	.3500+01	**	**	**
FRUITS,FLOWERS							.7000+01	.1000+02	.8100+01
BRANCHES-SUM	.5880+01	.1350+02	.1287+02	.9710+01	.1050+02	.2070+02	.3600+02	.4400+02	.4000+02
BRANCHES-BARK	.2240+01		.5487+01	.4201+01	.5354+01				
BRANCHES-WOOD	.3640+01		.7384+01	.5505+01	.5112+01				
BOLE-SUM	.1336+02	.5170+02	.3679+02	.2115+02	.2050+04	.2110+02	.2200+02	.2900+02	.3230+02
BOLE-BARK	.5240+01		.1213+02	.7548+01	.4615+01	.5300+01	.6000+01	.8000+01	.1040+02
BOLE-WOOD	.8120+01		.2466+02	.1367+02	.1584+02	.1580+02	.1600+02	.2100+02	.2190+02
STANDING DEAD	.1450+01	0.							
SUM-OVERSTORY		.7450+02	.5900+02	.4050+02	.4070+02	.4630+02			
UNDERSTORY-LEAVES	.1630+01	.1000+00					0.	0.	
UND. FRUITS,FLOWERS							0.	0.	
UND. BRANCHES-SUM	.2920+01						0.	0.	
UND. BRANCHES-BARK		**					0.	0.	
UND. BRANCHES-WOOD		.1300+00					0.	0.	
UND. BOLE-SUM	.2130+01	0.					0.	0.	
UND. BOLE-BARK		0.					0.	0.	
UND. BOLE-WOOD		0.					0.	0.	
UND. STANDING DEAD	.2000+00	0.					0.	0.	
SUM-UNDERSTORY		.2300+00				.1000+01	0.	0.	
HERBACEOUS (FIELD)	.1270+01					.3000+01		.1000+01	.2000+00
EPIPHYTES-TOTAL									
TOTAL PLANTS		.7473+02				.4930+02	.6400+02	.1040+03	
LIVING ROOTS-SUM	.9230+02	.1530+01	.1070+02			.2780+02		.1500+02	.3170+02
LIVING ROOTS >5 MM	.1365+02	.1530+01	.9020+01	.5751+01	.6236+01	.1730+02		.1100+02	.2300+02
LIVING ROOTS 2-5 MM	.1960+01					**		**	**
LIVING ROOTS <5 MM	.6790+01		.1491+01			.1050+02		.4000+01	.8700+01
DEAD ROOTS	.5460+01								
SOIL TOP ORGANIC	.7440+01	.1247+02	.8100+02	.1050+03	.8160+02	.6900+01	.1030+02	.8600+01	.1070+02
ROOTING ZONE						.7620+03		.7800+03	.1200+04
INTENSIVE ROOTED			.7340+03	.9452+03	.6332+03			.3600+03	
EXTENSIVE ROOTED								.4200+03	
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS	.1000-01								
DECOMPOSER FAUNA	.1310+01								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF NITROGEN(N) IN UNITS OF GRAMS/SQ.METER

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	OVED LINDGREN NIHLGARD	ANDREWS EAP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD
OVERSTORY LEAVES	**	.9850+01	.1040+02	.8200+01	.6160+01	.2280+02	.1614+02	.2478+02	**
FRUITS.FLOWERS	.1300+02								.6000+01
BRANCHES-SUM	.3300+02	.1330+02	.6200+01	.3400+01	.2740+01	.2427+02	.2120+02	.9940+01	.2300+02
BRANCHES-BARK						.3849+01	.3377+01	.2050+01	
BRANCHES-WOOD						.2041+02	.1782+02	.7890+01	
BOLE-SUM	.3400+02	.3776+02	.1310+02	.1150+02	.5390+01	.2584+02	.2550+02	.1022+02	.2700+02
BOLE-BARK	.7000+01			.3600+01		.1051+02	.1037+02	.5616+01	.1000+02
BOLE-WOOD	.2700+02			.7900+01		.1533+02	.1513+02	.4604+01	.1700+02
STANDING DEAD				.2600+01					
SUM-OVERSTORY				.2570+02	.1429+02	.7300+02	.6300+02	.4500+02	
UNDERSTORY-LEAVES	0.								0.
UND. FRUITS.FLOWERS	0.								0.
UND. BRANCHES-SUM	0.								0.
UND. BRANCHES-BARK	0.								0.
UND. BRANCHES-WOOD	0.								0.
UND. BOLE-SUM	0.								0.
UND. BOLE-BARK	0.								0.
UND. BOLE-WOOD	0.								0.
UND. STANDING DEAD	0.								0.
SUM-UNDERSTORY	0.					0.	0.	0.	0.
HERBACEOUS (FIELD)	.3000+01		.7000+00						
EPIPHYTES-TOTAL									
TOTAL PLANTS	.8300+02	.5540+01			.1429+02				.7700+02
LIVING ROOTS-SUM			.3200+01	.6400+01	.4060+01				.9000+01
LIVING ROOTS >5 MM									.7000+01
LIVING ROOTS 2-5 MM									**
LIVING ROOTS <5 MM									.2000+01
DEAD ROOTS		.3000+00							
SOIL TOP ORGANIC	.6300+01	.6020+02	.1750+02	.3070+02		.9600+02	.2260+03	.1430+03	.2450+02
ROOTING ZONE		.4340+03	.2809+03	.1168+03					.6900+03
INTENSIVE ROOTED						.7100+03	.7060+03	.6650+03	.2700+03
EXTENSIVE ROOTED									.4200+03
SUBSOIL		.1600+03		.5840+02					
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA		.2700+01							
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF NITROGEN(N) IN UNITS OF GRAMS/SQ.METER

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	N.TAIGA RUDNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA
OVERSTORY LEAVES FRUITS,FLOWERS	.7560+01	.1400+02	.5130+01	.7862+01	.1060+02	.1137+02	.1514+02	.6120+01	.8850+01
BRANCHES-SUM	.7967+01	.9870+01	.2696+01	.3945+01	.5325+01	.6358+01	.7460+01	.3276+01	.4847+01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.6846+01	.1514+02	.3300+01	.6090+01	.1160+02	.1356+02	.1706+02	.4620+01	.5980+01
BOLE-BARK			.1464+01	.2410+01	.4224+01	.4562+01	.4843+01	.1820+01	.2230+01
BOLE-WOOD			.1834+01	.3660+01	.7360+01	.9000+01	.1242+02	.2800+01	.3750+01
STANDING DEAD			.3900+00	.7770+00	.1167+01	.1427+01	.1786+01	.5950+00	.7820+00
SUM-OVERSTORY			.1152+02	.1667+02	.2870+02	.3271+02	.4199+02	.1461+02	.2046+02
UNDERSTORY-LEAVES			0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS			0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM			0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK			0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD			0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM			0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK			0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD			0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD			0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY			0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.2833+01		.2629+01	.2129+01	.1996+01	.1766+01	.1437+01	.4663+01	.4900+01
EPIPHYTES-TOTAL	.7360+00								
TOTAL PLANTS			.1418+02	.2080+02	.3069+02	.3448+02	.4288+02	.1927+02	.2536+02
LIVING ROOTS-SUM	.1684+02		.1978+01	.3111+01	.4911+01	.6904+01	.9750+01	.2982+01	.3469+01
LIVING ROOTS >5 MM			.1424+01	.2426+01	.3974+01	.5747+01	.8246+01	.2185+01	.2659+01
LIVING ROOTS 2-5 MM			.2660+00	.3740+00	.5300+00	.7150+00	.9400+00	.3700+00	.4500+00
LIVING ROOTS <5 MM			.2880+00	.3120+00	.4070+00	.4420+00	.6640+00	.4270+00	.3600+00
DEAD ROOTS			.2500+00	.3970+00	.5420+00	.7340+00	.1023+01	.3840+00	.4550+00
SOIL TOP ORGANIC			.3102+02	.2308+02	.2636+02	.3321+02	.3620+02	.6330+02	.1236+03
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO RANGES OF NITROGEN(N) IN UNITS OF GRAMS/SQ.METER

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	SITE 8 KAZIMIROV MOROZOVA	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.5720+01	.9960+01	.1019+02	.1133+04	.1196+02	.1186+02	.1122+02	.1008+02	.8420+01
FRUITS,FLOWERS					.7000-01	.2300+00	.3000+00	.3300+00	.3800+00
BRANCHES-SUM	.2990+01	.4670+01	.5570+01	.6530+01	.6990+01	.7730+01	.7590+01	.8090+01	.7630+01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.3060+01	.9310+01	.1239+02	.1600+02	.2332+02	.2552+02	.3476+02	.3630+02	.4048+02
BOLE-BARK	.1050+01	.3310+01	.4190+01	.5320+01	.7520+01	.8070+01	.1086+02	.1140+02	.1248+02
BOLE-WOOD	.2010+01	.6100+01	.8200+01	.1074+02	.1580+02	.1745+02	.2390+02	.2490+02	.2600+02
STANDING DEAD	.2300+00	.7400+00	.9200+00	.1240+01	.1520+01	.1760+01	.1760+01	.1570+01	.1570+01
SUM-OVERSTORY	.1200+02	.2938+02	.2907+02	.3516+02	.4381-01	.4710+02	.5562+02	.5637+02	.5648+02
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.1810+01	.2030+01	.2210+01	.2760+01	.2990+01	.4310+01	.4090+01	.4710+01	.5300+01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.1361+02	.2641+02	.3128+02	.3791+02	.4675+02	.5141+02	.5966+02	.6108+02	.6378+02
LIVING ROOTS-SUM	.2980+01	.5640+01	.6320+01	.8690+01	.1164+02	.1328+02	.1690+02	.1600+02	.1840+02
LIVING ROOTS >5 MM	.1810+01	.4510+01	.4830+01	.6820+01	.9910+01	.1063+02	.1350+02	.1506+02	.1535+02
LIVING ROOTS 2-5 MM	.3900+00	.6300+00	.9000+00	.1100+01	.1350+01	.1630+01	.1770+01	.1890+01	.1880+01
LIVING ROOTS <5 MM	.3300+00	.5000+00	.6900+00	.7200+00	.8800+00	.1020+01	.1130+01	.1100+01	.1170+01
DEAD ROOTS	.1800+00	.4500+00	.4800+00	.6500+00	.7600+00	.9300+00	.8300+00	.7800+00	.7100+00
SOIL TOP ORGANIC	.2312+02	.2460+02	.2550+02	.2920+02	.3280+02	.3430+02	.3930+02	.4360+02	.4710+02
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF NITROGEN(N) IN UNITS OF GRAMS/SQ.METER

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	SITE 17 KAZIMIROV MOROZOVA	FINLAND MAVAS	MALAYSIA BULLOCK	HIOMBO MALAISSE	CHAKIA BANDHU
OVERSTORY LEAVES	.7700+01	.5950+01	.1231+02	.9072+01	.1178+02
FRUITS,FLOWERS	.3500+00			.1020+01	.1300+00
BRANCHES-SUM	.7890+01	.2500+01	.2434+02	.3612+02	.3973+01
BRANCHES-BARK				.1523+02	
BRANCHES-WOOD				.1989+02	
BOLE-SUM	.3872+02	.8870+01	.5622+02	.2708+02	.9007+02
BOLE-BARK	.1182+02			.1019+02	
BOLE-WOOD	.2690+02			.1689+02	
STANDING DEAD	.1690+01	.9200+00			
SUM-OVERSTORY	.5627+02	.1770+02			.1918+03
UNDERSTORY-LEAVES	0.	.7000+01			.4990+02
UND. FRUITS,FLOWERS	0.				
UND. BRANCHES-SUM	0.				.2180+01
UND. BRANCHES-BARK	0.				
UND. BRANCHES-WOOD	0.				
UND. BOLE-SUM	0.				.2960+01
UND. BOLE-BARK	0.				
UND. BOLE-WOOD	0.				
UND. STANDING DEAD	0.				
SUM-UNDERSTORY	0.				.5080+01
HERBACEOUS (FIELD)	.6190+01	.5100+01			
EPIPHYTES-TOTAL					
TOTAL PLANTS	.6291+02				.1968+03
LIVING ROOTS-SUM	.1900+02	.1720+02	.1034+02	.2600+02	.2128+02
LIVING ROOTS >5 MM	.1670+02			.2116+02	
LIVING ROOTS 2-5 MM	.9110+01			.2607+01	
LIVING ROOTS <5 MM	.1190+01			.2293+01	
DEAD ROOTS	.9300+00				
SOIL TOP ORGANIC	.5170+02	.4030+02			
ROOTING ZONE			.2311+03		
INTENSIVE ROOTED				.9996+03	.5862+03
EXTENSIVE ROOTED					.3516+03
SUBSOIL					
HETEROTROPHS-SUM					
ABOVEGROUND CONSUMERS					
DECOMPOSER FAUNA					
DECOMPOSER FLORA					

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF NITROGEN(N) IN UNITS OF GRAM/SQ.M

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	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING B1	SOLLING B3	SOLLING B4	HESTERVN THAMDRUP ET AL	LANGARDD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.2070+00	.9900+00	.3120+00	.1675+00	.2500+00	**	**	**	**
BRANCHES-BARK	.7100-01		.1351+00	.7227-01	.1278+00	**	**	**	**
BRANCHES-WOOD	.1040+00		.1773+00	.9523-01	.1218+00	**	**	**	**
BOLE-SUM	.4100+00	.3300+00	.1000+01	.9630+00	.1425+01	**	**	**	**
BOLE-BARK	.1580+00		.3287+00	.3991+00	.3214+00	**	**	**	**
BOLE-WOOD	.2320+00		.6713+00	.6186+00	.1104+01	**	.1800+01	.6300+01	.2900+01
STANDING DEAD	.3700-01					.7800+01			
SUM-OVERSTORY									
UNDERSTORY-LEAVES							0.	0.	
UND. FRUITS,FLOWERS							0.	0.	
UND. BRANCHES-SUM							0.	0.	
UND. BRANCHES-BARK							0.	0.	
UND. BRANCHES-WOOD							0.	0.	
UND. BOLE-SUM							0.	0.	
UND. BOLE-BARK							0.	0.	
UND. BOLE-WOOD							0.	0.	
UND. STANDING DEAD							0.	0.	
SUM-UNDERSTORY							0.	0.	
HERBACEOUS (FIELD)	.3300+00								
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.1317+01					.1600+01			
LIVING ROOTS >5 MM	.8170+00		.2312+00	.1646+00	.3269+00				
LIVING ROOTS 2-5 MM	.1170+00								
LIVING ROOTS <5 MM	.3840+00								
DEAD ROOTS									
SOIL TOP ORGANIC									
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS	.7000-02								
DECOMPOSER FAUNA	.1670+01								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF NITROGEN(N) IN UNITS OF GRAM/SQ.M

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	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD
OVERSTORY LEAVES		.7500-02	.4400+00		.3100+00	.3704+01	.2704+01	.3900+01	
FRUITS,FLOWERS									
BRANCHES-SUM	**	.1400+00	.1500+00	.4400+00	.1800+00	.5190+00	.3401+00	.3330+00	**
BRANCHES-BARK	**					.8230-01	.5394-01	.6856-01	**
BRANCHES-WOOD	**					.4367+00	.2826+00	.2641+00	**
BOLE-SUM	**	.2300+00		.4000+00	.6900+00	.6990+00	.5214+00	.4761+00	**
BOLE-BARK	**		.1700+00			.2841+00	.2119+00	.2618+00	**
BOLE-WOOD	.2800+01		.3500+00			.4194+00	.3095+00	.2143+00	.1400+01
STANDING DEAD									
SUM-OVERSTORY				.8400+00	.1180+01	.5000+01	.3570+01	.4700+01	
UNDERSTORY-LEAVES	0.								0.
UND. FRUITS,FLOWERS	0.								0.
UND. BRANCHES-SUM	0.								0.
UND. BRANCHES-BARK	0.								0.
UND. BRANCHES-WOOD	0.								0.
UND. BOLE-SUM	0.								0.
UND. BOLE-BARK	0.								0.
UND. BOLE-WOOD	0.								0.
UND. STANDING DEAD	0.	.4400+00							0.
SUM-UNDERSTORY	0.								0.
HERBACEOUS (FIELD)		0.							
EPIPHYTES-TOTAL		0.							
TOTAL PLANTS					.1180+01				
LIVING ROOTS-SUM			.1200+00	.3700+00	.3100+00				
LIVING ROOTS >5 MM									
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC		0.	.1160+01						
ROOTING ZONE		0.	-.3460+01						
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL		0.							
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA		0.							
DECOMPOSER FLORA		0.							

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF NITROGEN(N) IN UNITS OF GRAM/SQ.M

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	SITE 1 KAZIM'OV MOROZOVA	SITE 2 KAZIM'OV MOROZOVA	SITE 3 KAZIM'OV MOROZOVA	SITE 4 KAZIM'OV MOROZOVA	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.7200-01	.1250+00	.1770+00	.1700+00	.1940+00	.9400-01	.1300+00	.3120+00	.2180+00
FRUITS,FLOWERS									
BRANCHES-SUM	.4800-01	.7500-01	.1030+00	.1280+00	.1650+00	.6800-01	.8800-01	.1330+00	.1100+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1890+00	.3160+00	.4510+00	.5920+00	.6360+00	.2880+00	.3150+00	.2600+00	.4070+00
BOLE-BARK	.6200-01	.1160+00	.1560+00	.1820+00	.1820+00	.1270+00	.1200+00	.9200-01	.1500+00
BOLE-WOOD	.1250+00	.2000+00	.2950+00	.3800+00	.4540+00	.1610+00	.1950+00	.1680+00	.2570+00
STANDING DEAD	.8000-02	.1500-01	.2300-01	.2900-01	.3500-01	.1300-01	.1600-01	.3500-01	.3600-01
SUM-OVERSTORY	.3150+00	.5310+00	.7540+00	.8690+00	.1030+01	.4530+00	.5490+00	.7400+00	.7710+00
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.3500-01	.6000-01	.9500-01	.2900-01	.1900-01	.9200-01	.9000-01	.1700-01	.1700-01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.3500+00	.5910+00	.7990+00	.8980+00	.1049+01	.5450+00	.5890+00	.7570+00	.7880+00
LIVING ROOTS-SUM	.7800-01	.1120+00	.1620+00	.2150+00	.2600+00	.9600-01	.1180+00	.1600+00	.1920+00
LIVING ROOTS >5 MM	.5600-01	.8300-01	.1230+00	.1800+00	.2160+00	.6600-01	.8900-01	.1090+00	.1470+00
LIVING ROOTS 2-5 MM	.1100-01	.1600-01	.2300-01	.1900-01	.2700-01	.1900-01	.1600-01	.3000-01	.2700-01
LIVING ROOTS <5 MM	.1100-01	.1300-01	.1600-01	.1600-01	.1700-01	.1600-01	.1300-01	.2100-01	.1800-01
DEAD ROOTS	.5000-02	.8000-02	.1100-01	.1500-01	.1600-01	.7000-02	.9000-02	.2600-01	.2200-01
SOIL TOP ORGANIC	.1090+00	.1260+00	.1670+00	.1920+00	.1840+00	.2620+00	.4060+00	.1460+00	.1600+00
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									

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	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS
OVERSTORY LEAVES	.1460+00	.7300-01		-.2100-01	-.4200-01	-.5200-01	-.6200-01	-.8300-01	
FRUITS,FLOWERS			.1000-01	.7000-02	.4000-02	.2000-02	.1000-02		
BRANCHES-SUM	.8700-01	.6900-01	.4100-01	.2800-01	.1800-01	.9000-02	.6000-02	.6000-02	.4400+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.4530+00	.4730+00	.4490+00	.3830+00	.2860+00	.2130+00	.9000-01	.1100-01	.9000-02
BOLE-BARK	.1520+00	.1560+00	.1460+00	.1180+00	.9000-01	.6600-01	.2800-01	.4000-02	
BOLE-WOOD	.3010+00	.3170+00	.3030+00	.2610+00	.1960+00	.1470+00	.6200-01	.7000-02	
STANDING DEAD	.3100-01	.2300-01	.1300-01	.6000-02	.1000-02	-.3000-02	-.4000-02	-.4000-02	.9000-02
SUM-OVERSTORY	.7170+00	.6380+00	.5130+00	.4030+00	.2670+00	.1690+00	.3000-01	-.7100-01	
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	
HERBACEOUS (FIELD)	.2200-01	.2500-01	.3000-01	.3900-01	.3900-01	.4700-01	.5100-01	.6000-01	
EPIPHYTES-TOTAL									
TOTAL PLANTS	.7390+00	.6630+00	.6430+00	.4420+00	.3060+00	.2160+00	.8100-01	-.1100-01	
LIVING ROOTS-SUM	.2080+00	.2120+00	.2000+00	.1680+00	.1000+00	.6000-01	.2400-01	.6000-02	
LIVING ROOTS >5 MM	.1590+00	.1670+00	.1610+00	.1340+00	.8000-01	.4900-01	.1900-01	.6000-02	
LIVING ROOTS 2-5 MM	.3000-01	.2730-01	.2400-01	.2100-01	.1300-01	.7000-02	.3000-02	.1000-02	
LIVING ROOTS <5 MM	.1900-01	.1600-01	.1500-01	.1300-01	.7000-02	.4000-02	.2000-02	.1000-02	
DEAD ROOTS	.1800-01	.1200-01	.6000-02	.4000-02		0.	-.2000-02	-.2000-02	
SOIL TOP ORGANIC	.1870+00	.2140+00	.2530+00	.2660+00	.2730+00	.2790+00	.2660+00	.2660+00	
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF NITROGEN(N) IN UNITS OF GRAM/SQ.M

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	CHAKIA	RANDHU
OVERSTORY LEAVES		
FRUITS,FLOWERS		
BRANCHES-SUM	.2820+01	
BRANCHES-BARK		
BRANCHES-WOOD		
BOLE-SUM	.5400+00	
BOLE-BARK		
BOLE-WOOD		
STANDING DEAD		
SUM-OVERSTORY		
UNDERSTORY-LEAVES		
UND. FRUITS,FLOWERS		
UND. BRANCHES-SUM		
UND. BRANCHES-BARK		
UND. BRANCHES-WOOD		
UND. BOLE-SUM		
UND. BOLE-BARK		
UND. BOLE-WOOD		
UND. STANDING DEAD		
SUM-UNDERSTORY		
HERBACEOUS (FIELD)		
EPIPHYTES-TOTAL		
TOTAL PLANTS		
LIVING ROOTS-SUM		
LIVING ROOTS >5 MM		
LIVING ROOTS 2-5 MM		
LIVING ROOTS <5 MM		
DEAD ROOTS		
SOIL TOP ORGANIC	**	
ROOTING ZONE	**	
INTENSIVE ROOTED	**	
EXTENSIVE ROOTED		
SUBSOIL		
HETEROTROPHS-SUM		
ABOVEGROUND CONSUMERS		
DECOMPOSER FAUNA		
DECOMPOSER FLORA		

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF NITROGEN(N) IN UNITS OF GRAM/SQ.METER/YEAR

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	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING B1	SOLLING B3	SOLLING B4	HESTEMVN THAMDRUP ET AL	LANWAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL			.6153+00	.5158+00	.6262+00				
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL		.3280+01				.4084+01	.3140+01	.6900+01	.6930+01
LITTERFALL-LEAF	.5020+01	.2070+01	.4993+01	.5430+01	.6262+01	.2941+01	.2140+01		.3870+01
LITTERFALL-FLOWER,FRUIT	.2000+00	.6300+00				.1960+00	.2900+00		.1850+01
LITTERFALL-BRANCH	.8800+00	.5800+00				.2120+00	.7340+00		.1220+01
LITTERFALL-BOLE	.2500+00					.7350+00			
LITTERFALL-GRASS	.5100+00								
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.5800+00	.1560+01	.2184+01				.6200+01	.8200+00	.9444+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.8800+00		.1960+01				**	**	**
STEM FLOW	.4000+01	.1490+01	.2540+00				0.	.1000+00	.1290+01
LEACHING- SOIL LAYERS		.1200+00							
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION	.1260+01		.4410+00						

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF NITROGEN(N) IN UNITS OF GRAM/SQ.METER/YEAR

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	OVED LINDGREN NIMLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	SHIGAYMA KITAZAWA	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIMLGARD
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL									
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.4040+01	.2730+01	.1360+01	.5324+01	.2363+01	.4710+01			.5800+01
LITTERFALL-LEAF	.2700+01	.1312+01			.1742+01	.4073+01	.3693+01	.3612+01	
LITTERFALL-FLOWER,FRUIT	.6100+00	.5030+00			.3090-01				
LITTERFALL-BRANCH	.7300+00	.4680+00			.4374+00	.6410+00			
LITTERFALL-BOLE		.2310+00							
LITTERFALL-GRASS					.6300-01				
LITTERFALL-EPIPHYTS		.1920+00			.3660-01				
ATMOSPHERIC INPUT									
PRECIPITATION	.3500+01	.9000-01	.1100+00			.2180+01			.8200+00
DRY PARTICULATES(DUST)				.5460+00					
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	.2000+00	.1500+00			.2660+01			**
STEM FLOW	D.		.2000-01						.1600+01
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION				.9300+00					
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION		.3800-01	.6000-01						

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF NITROGEN(N) IN UNITS OF GRAM/SQ.METER/YEAR

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	SITE 1 KAZIM'OV MOROZOVA	SITE 2 KAZIM'OV MOROZOVA	SITE 3 KAZIM'OV MOROZOVA	SITE 4 KAZIM'OV MOROZOVA	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA
CONSUMPTION-TOTAL	.1807+01	.3080+01	.4096+01	.5551+01	.6340+01	.2969+01	.4526+01	.2692+01	.3767+01
CONS.-FOLIAGE-TOTAL	.1284+01	.2154+01	.2694+01	.3778+01	.4183+01	.2179+01	.3389+01	.1733+01	.2421+01
CONS.-OVERSTORY	.1039+01	.1776+01	.2321+01	.3493+01	.3982+01	.1346+01	.1748+01	.1407+01	.2051+01
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.2450+00	.3800+00	.3270+00	.3250+00	.2010+00	.8330+00	.1641+01	.3260+00	.3700+01
CONS.-ROOTS-TOTAL	.3830+00	.6760+00	.9680+00	.1181+01	.1427+01	.5720+00	.7110+00	.5600+00	.8290+00
CONS.-UNDERSTORY	.3830+00	.6760+00	.9680+00	.1181+01	.1427+01	.5720+00	.7110+00	.5600+00	.8290+00
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.1400+00	.2490+00	.4790+00	.5920+00	.7300+00	.2180+00	.4260+00	.3990+00	.5170+00
LITTERFALL-TOTAL	.1331+01	.2272+01	.2851+01	.4098+01	.4588+01	.2274+01	.3536+01	.1562+01	.2502+01
LITTERFALL-LEAF	.1183+01	.1987+01	.2437+01	.3587+01	.3962+01	.2048+01	.3226+01	.1415+01	.2190+01
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.6900-01	.1290+00	.1810+00	.2240+00	.2750+00	.9600-01	.1520+00	.1100+00	.1650+00
LITTERFALL-BOLE	.7900-01	.1560+00	.2330+00	.2870+00	.3510+00	.1300+00	.1560+00	.6700-01	.1470+00
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**	**	**	**	**	**
STEM FLOW	.9000-01	.1900+00	.2900+00	.3600+00	.4100+00	.2200+00	.3800+00	.2700+00	.2800+00
LEACHING- SOIL LAYERS		.6000-01	.8000-01	.1000+00	.1200+00			.8000-01	.8700-01
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF NITROGEN(N) IN UNITS OF GRAM/SQ.METER/YEAR

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	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS
CONSUMPTION-TOTAL	.4025+01	.4200+01	.4258+01	.4394+01	.3784+01	.3511+01	.3178+01		
CONS.-FOLIAGE-TOTAL	.2548+01	.2650+01	.2703+01	.2811+01	.2498+01	.2400+01	.2254+01	.2198+01	
CONS.-OVERSTORY	.2166+01	.2253+01	.2287+01	.2133+01	.1916+01	.1728+01	.1451+01	.1288+01	
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.3820+00	.3970+00	.4160+00	.6760+00	.5820+00	.6720+00	.8030+00	.9100+00	
CONS.-ROOTS-TOTAL	.9890+00	.9480+00	.9130+00	.6270+00	.6550+00	.5350+00	.3550+00	.2660+00	
CONS.-UNDERSTORY	.8980+00	.9480+00	.9130+00	.6270+00	.6550+00	.5350+00	.3550+00	.2660+00	
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.5790+00	.6100+00	.6420+00	.7060+00	.6310+00	.6760+00	.6690+00	.6690+00	
LITTERFALL-TOTAL	.2744+01	.2966+01	.3104+01	.3220+01	.2774+01	.2743+01	.2543+01	.2461+01	.1040+01
LITTERFALL-LEAF	.2386+01	.2560+01	.2681+01	.2804+01	.2423+01	.2430+01	.2283+01	.2211+01	.1200+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.1840+00	.1930+00	.1890+00	.1650+00	.1200+00	.1150+00	.6400-01	.4600-01	**
LITTERFALL-BOLE	.1740+00	.2130+00	.2340+00	.2510+00	.2310+00	.1980+00	.1960+00	.2040+00	.1000-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	.1100+00	
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**		**	**	**	**	
STEM FLOW	.2700+00	.2900+00	.2900+00		.2500+00	.2400+00	.2100+00	.1600+00	
LEACHING- SOIL LAYERS	.8700-01	.9300-01	.6700-01	.8400-01	.7600-01	.7100-01	.1040+00	.5400-01	
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF NITROGEN(N) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED. AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	MALAYSIA BULLOCK	MIOMBO MALAISSE	MANAUS KLINGE,R ODRIGUEZ	CHAKIA BANDHU
CONSUMPTION-TOTAL				
CONS.-FOLIAGE-TOTAL				.6120+00
CONS.-OVERSTORY				.5900+00
CONS.-WOOD-OVERSTORY				.2200-01
CONS.-WOOD-UNDERSTORY				
CONS.-ROOTS-TOTAL				
CONS.-UNDERSTORY				
CONS.-HERBACEOUS				
CONS.-WOOD-TOTAL				
LITTERFALL-TOTAL		.8504+01		.1267+02
LITTERFALL-LEAF	.1095+02	.6634+01	.6630+01	.1107+02
LITTERFALL-FLOWER,FRUIT		.1124+01	.4100+00	**
LITTERFALL-BRANCH	.1229+01	.4960+00	.1520+01	**
LITTERFALL-BOLE	.1128+01	.2430+00		.1600+01
LITTERFALL-GRASS		.4300-01		
LITTERFALL-EPIPHYTS				
ATMOSPHERIC INPUT				
PRECIPITATION	**			
DRY PARTICULATES(DUST)	.1595+01			
GASEOUS FIXATION				
LEACHING				
LEAF WASH	**			
STEM FLOW	.1314+01			
LEACHING- SOIL LAYERS				
OUTPUT				
OUTPUT-WIND EROSION				
OUTPUT-WATER EROSION				
OUTPUT-PERCOLATION				

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@XQT  IBP.HPA


@ADD.P  IBP.DATENA


@ADD.P  IBP.DATEN48
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COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF PHOSPHORUS(P) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	BAB BISKUPSKY	SOLLING B1	SOLLING B3	SOLLING B4	HESTEMVN THAMDRUP ET AL	LANGAMOO BEECH 2 LINDGREN	KONGLUND BEECH 1 NIMLGARD
OVERSTORY LEAVES	.4640+00	.1000+01		.4580+00	.5718+00	.6461+00	.4600+00	**	**
FRUITS,FLOWERS			.4190+00					.6100+00	.6200+00
BRANCHES-SUM	.3750+00	.3800+01		.9820+00	.1165+01	.1370+01	.2650+01	.3540+01	.5520+01
BRANCHES-BARK	.1750+00			.5239+00	.2663+00	.4374+00			
BRANCHES-WOOD	.2500+00			.2094+01	.8982+00	.9365+00			
BOLE-SUM	.4400+00	.1740+02		.5470+01	.1873+01	.3280+01	.1400+01	.2000+01	.2240+01
BOLE-BARK	.2700+00			.1326+01	.4831+00	.3768+00	.1500+00	.3400+00	.4700+00
BOLE-WOOD	.4700+00			.4147+01	.1370+01	.2902+01	.1250+01	.1660+01	.1770+01
STANDING DEAD	.5300-01	0.							
SUM-OVERSTORY		.2220+02		.7000+01	.3610+01	.5300+01	.4710+01		
UNDERSTORY-LEAVES	.9000-01	.4000+02						0.	0.
UND. FRUITS,FLOWERS								0.	0.
UND. BRANCHES-SUM	.1900+00							0.	0.
UND. BRANCHES-BARK		**						0.	0.
UND. BRANCHES-WOOD		.1000-01						0.	0.
UND. BOLE-SUM	.1600+00	0.						0.	0.
UND. BOLE-BARK		0.						0.	0.
UND. BOLE-WOOD		0.						0.	0.
UND. STANDING DEAD	.1000-01	0.						0.	0.
SUM-UNDERSTORY		.1400-01					.1200+00	0.	0.
HERBACEOUS (FIELD)	.1100+00						.4000-01		.7000-01
EPIPHYTES-TOTAL									
TOTAL PLANTS		.2221+02					.4870+01	.6490+01	.8450+01
LIVING ROOTS-SUM	.1190+01	.8100+00		.1900+01			.3320+01		.1540+01
LIVING ROOTS >5 MM	.7300+00	.8100+00		.1718+01	.1095+01	.1188+01	.2150+01		.1090+01
LIVING ROOTS 2-5 MM	.9400-01						**		**
LIVING ROOTS <5 MM	.3630+00			.1838+00			.1170+01		.4700+00
DEAD ROOTS	.2240+00								
SOIL TOP ORGANIC	.3300+00	.4000+00		.5200+01	.7200+01	.6200+01	.6700+00	.8200+00	.5800+00
ROOTING ZONE							.2560+02		
INTENSIVE ROOTED	.1070+01			.2870+03	.2310+03	.3150+03			
EXTENSIVE ROOTED	.4500+00								
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS	.7000-02								
DECOMPOSER FAUNA	.1600+00								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF PHOSPHORUS(P) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE. EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED. AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3
OVERSTORY LEAVES	**	**	.2270+01	.3000+01	.1000+01	.7500+00	.1884+01	.1334+01	.2960+01
FRUITS,FLOWERS	.5200+00	.1900+00							
BRANCHES-SUM	.3010+01	.2660+01	.3100+01	.1200+01	.4500+00	.3600+00	.1728+01	.1510+01	.2282+01
BRANCHES-BARK							.3149+00	.2748+00	.2090+00
BRANCHES-WOOD							.1413+01	.1233+01	.2073+01
BOLE-SUM	.1370+01	.2100+01	.5450+01	.2100+01	.1490+01	.7300+00	.7920+00	.3690+01	.6300+00
BOLE-BARK	.4200+00				.4200+00		.2263+01	.2233+01	.1800+00
BOLE-WOOD	.9500+00	.1660+01			.1070+01		.1471+01	.1452+01	.4500+00
STANDING DEAD					.1500+00				
SUM-OVERSTORY					.3090+01	.1840+01	.4400+01	.6530+01	.5900+01
UNDERSTORY-LEAVES		0.							
UND. FRUITS,FLOWERS		0.							
UND. BRANCHES-SUM		0.							
UND. BRANCHES-BARK		0.							
UND. BRANCHES-WOOD		0.							
UND. BOLE-SUM		0.							
UND. BOLE-BARK		0.							
UND. BOLE-WOOD		0.							
UND. STANDING DEAD		0.							
SUM-UNDERSTORY		0.					0.	0.	0.
HERBACEOUS (FIELD)	.1500-01	.1900+01		.1000+00					
EPIPHYTES-TOTAL									
TOTAL PLANTS		.5420+01	.1030+01			.1840+01			
LIVING ROOTS-SUM	.1770+01			.6000+00	.1690+01	.1070+01			
LIVING ROOTS >5 MM	.1260+01								
LIVING ROOTS 2-5 MM	**								
LIVING ROOTS <5 MM	.5200+00								
DEAD ROOTS									
SOIL TOP ORGANIC	.4470+00	.2110+00	.8600+01	.2600+01	.3000+01		.5300+01	.9800+01	.1990+02
ROOTING ZONE			.2600+01	.3878+03	.3550+02				
INTENSIVE ROOTED							.2630+03	.1530+03	.2660+03
EXTENSIVE ROOTED									
SUBSOIL			.1300+01		.1600+01				
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF PHOSPHORUS(P) IN UNITS OF GRAMS/SQ.METER

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	KONGLUND SPRUCE NIMLGARD	N.TAIGA RUDNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	**	.1284+01	.2500+01	.5700+00	.9010+00	.1224+01	.1290+01	.1499+01	.7150+00
FRUITS,FLOWERS	.6500+00								
BRANCHES-SUM	.3020+01	.6890+00	.1645+01	.2590+00	.3710+00	.5250+00	.5780+00	.6120+00	.3760+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.2850+01	.3910+00	.6055+01	.3300+00	.5600+00	.9640+00	.1168+01	.1372+01	.4200+00
BOLE-BARK	.1360+01			.1390+00	.2300+00	.3560+00	.3710+00	.4720+00	.1570+00
BOLE-WOOD	.1490+01			.1910+00	.3300+00	.6080+00	.7970+00	.9000+00	.2630+00
STANDING DEAD				.3900-01	.7400-01	.1060+00	.1240+00	.1430+00	.5400-01
SUM-OVERSTORY				.1138+01	.1926+01	.2819+01	.3160+01	.3426+01	.1565+01
UNDERSTORY-LEAVES	0.			0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.			0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.			0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.			0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)				.2050+00	.2880+00	.3750+00	.2240+00	.1710+00	.5090+00
EPIPHYTES-TOTAL		.1770+00							
TOTAL PLANTS	.8700+01			.1403+01	.2214+01	.3194+01	.3384+01	.3797+01	.2074+01
LIVING ROOTS-SUM	.5700+00	.1788+01		.1940+00	.3100+00	.4260+00	.5750+00	.6250+00	.2610+00
LIVING ROOTS >5 MM	.4100+00			.1270+00	.2260+00	.3110+00	.4450+00	.4650+00	.1680+00
LIVING ROOTS 2-5 MM	**			.3100-01	.4200-01	.6600-01	.7500-01	.9400-01	.4400-01
LIVING ROOTS <5 MM	.1600+00			.3600-01	.4200-01	.4900-01	.5500-01	.6200-01	.4900-01
DEAD ROOTS				.2600-01	.4000-01	.4700-01	.6100-01	.6600-01	.3400-01
SOIL TOP ORGANIC	.1540+01			.3061+01	.1835+01	.2487+01	.2075+01	.2469+01	.3824+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF PHOSPHORUS(P) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA	SITE 10 KAZIM'OV MOROZOVA	SITE 11 KAZIM'OV MOROZOVA	SITE 12 KAZIM'OV MOROZOVA	SITE 13 KAZIM'OV MOROZOVA	SITE 14 KAZIM'OV MOROZOVA	SITE 15 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.1050+01	.6600+00	.1090+01	.1180+01	.1310+01	.1380+01	.1370+01	.1300+01	.1060+01
FRUITS,FLOWERS						.1000-01	.3000-01	.4000-01	.4000-01
BRANCHES-SUM	.4850+00	.2600+00	.4200+00	.4800+00	.6700+00	.6000+00	.6700+00	.6600+00	.7000+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.5200+00	.2800+00	.6400+00	.1120+01	.1460+01	.2140+01	.2320+01	.3160+01	.3300+01
BOLE-BARK	.1920+00	.1100+00	.3100+00	.4000+00	.6200+00	.7400+00	.7900+00	.1070+01	.1120+01
BOLE-WOOD	.3280+00	.1730+00	.6300+00	.7200+00	.9400+00	.1340+01	.1530+01	.2090+01	.2180+01
STANDING DEAD	.4800-01	.2000-01	.7000+01	.6000-01	.1100+00	.1400+00	.1600+00	.1600+00	.1400+00
SUM-OVERSTORY	.2123+01	.1220+01	.2420+01	.2860+01	.3450+01	.4250+01	.4550+01	.5320+01	.5240+01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.4630+00	.2600+00	.3100+00	.3100+00	.3700+00	.3800+00	.5600+00	.5400+00	.6000+00
EPIPHYTES-TOTAL									
TOTAL PLANTS	.2588+01	.1480+01	.2730+01	.3170+01	.3820+01	.4630+01	.5100+01	.5840+01	.5840+01
LIVING ROOTS-SUM	.3010+00	.3100+00	.7000+00	.7900+00	.1040+01	.1460+01	.1660+01	.2050+01	.2250+01
LIVING ROOTS >5 MM	.2030+00	.2300+00	.5600+00	.6100+00	.8600+00	.1190+01	.1340+01	.1710+01	.1900+01
LIVING ROOTS 2-5 MM	.5000-01	.4000-01	.8000-01	.1100+00	.1300+00	.1700+00	.2000+00	.2100+00	.2200+00
LIVING ROOTS <5 MM	.4800-01	.4000-01	.6000-01	.7000-01	.9000-01	.1000+00	.1200+00	.1300+00	.1300+00
DEAD ROOTS	.3900-01	.2000-01	.6000-01	.6000-01	.8000-01	.9000-01	.1100+00	.1000+00	.9000-01
SOIL TOP ORGANIC	.1560+02	.2190+01	.2320+01	.2410+01	.2760+01	.3100+01	.3260+01	.3710+01	.4100+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF PHOSPHORUS(P) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWERT COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	CHAKIA BANUMU	EUCALYPTUS ATTILILL
OVERSTORY LEAVES	.9700+00	.8900+00	.1360+01	.7680+00	.9730+00	.4930+00
FRUITS,FLOWERS	.5000-01	.4000-01			.1100-01	
BRANCHES-SUM	.6600+00	.6800+00	.3300+00	.2001+01	.6774+01	.4140+00
BRANCHES-BARK						
BRANCHES-WOOD						
BOLE-SUM	.3680+01	.3520+01	.1110+01	.3986+01	.2968+02	.1758+01
BOLE-BARK	.1230+01	.1170+01				.6070+00
BOLE-WOOD	.2450+01	.2350+01				.1151+01
STANDING DEAD	.1400+00	.1500+00	.4000-01			
SUM-OVERSTORY	.5500+01	.5280+01	.2840+01		.3764+02	.2665+01
UNDERSTORY-LEAVES	0.	0.	.1000-01		.2800-01	
UND. FRUITS,FLOWERS	0.	0.				
UND. BRANCHES-SUM	0.	0.			.1150+00	
UND. BRANCHES-BARK	0.	0.				
UND. BRANCHES-WOOD	0.	0.				
UND. BOLE-SUM	0.	0.			.4950+00	
UND. BOLE-BARK	0.	0.				
UND. BOLE-WOOD	0.	0.				
UND. STANDING DEAD	0.	0.				
SUM-UNDERSTORY	0.	0.			.6380+00	.3780+00
HERBACEOUS (FIELD)	.4800+00	.7600+00	.9400+00			
EPIPHYTES-TOTAL						
TOTAL PLANTS	.6180+01	.6040+01			.3828+02	
LIVING ROOTS-SUM	.2300+01	.2380+01	.3200+01	.8550+00	.5559+01	.6580+00
LIVING ROOTS >5 MM	.1930+01	.2000+01				
LIVING ROOTS 2-5 MM	.2300+00	.2400+00				
LIVING ROOTS <5 MM	.1400+00	.1400+00				
DEAD ROOTS	.9000-01	.1100+00				
SOIL TOP ORGANIC	.4450+01	.4880+01	.3500+01			.5260+00
ROOTING ZONE						
INTENSIVE ROOTED					.3984+02	
EXTENSIVE ROOTED					.1523+02	
SUBSOIL						
HETEROTROPHS-SUM						
ABOVEGROUND CONSUMERS						
DECOMPOSER FAUNA						
DECOMPOSER FLORA						

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING 81	SOLLING 83	SOLLING 84	HESTEHVN THAMDRUP ET AL	LANGARDD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.1200-01	.1600+00	.6320-01	.2011-01	.3270-01	**	**	**	**
BRANCHES-BARK	.3000-02		.1230-01	.4590-02	.1043-01	**	**	**	**
BRANCHES-WOOD	.7000-02		.5029-01	.1554-01	.2231-01	**	**	**	**
BOLE-SUM	.2400-01	.1000+00	.1490+00	.8540-01	.2290+00	**	**	**	**
BOLE-BARK	.7000-02		.3594-01	.2202-01	.2624-01	**	**	**	**
BOLE-WOOD	.1500-01		.1129+00	.6335-01	.2022+00	**	.2300+00	.3500+00	.1900+00
STANDING DEAD	.7000-02					.5100+00			
SUM-OVERSTORY									
UNDERSTORY-LEAVES							0.	0.	
UND. FRUITS,FLOWERS							0.	0.	
UND. BRANCHES-SUM							0.	0.	
UND. BRANCHES-BARK							0.	0.	
UND. BRANCHES-WOOD							0.	0.	
UND. BOLE-SUM							0.	0.	
UND. BOLE-BARK							0.	0.	
UND. BOLE-WOOD							0.	0.	
UND. STANDING DEAD							0.	0.	
SUM-UNDERSTORY							0.	0.	
HERBACEOUS (FIELD)	.2000-01								
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.6400-01					.2000+00			
LIVING ROOTS >5 MM	.3700-01		.4404-01	.3140-01	.6264-01				
LIVING ROOTS 2-5 MM	.5000-02								
LIVING ROOTS <5 MM	.2100-01								
DEAD ROOTS									
SOIL TOP ORGANIC									
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS	.3000-02								
DECOMPOSER FAUNA	.2200+00								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLINS F1	SOLLING F2	SOLLINS F3	KONGLUND SPRUCE NIHLGARD
OVERSTORY LEAVES		.1200-02	.1200+00		.3700-01				
FRUITS,FLOWERS									
BRANCHES-SUM	**	.3400-01	.5000-01	.5950+00	.2400-01	.3690-01	.2390-01	.7640-01	**
BRANCHES-BARK	**					.6700-02	.4390-02	.6994-02	**
BRANCHES-WOOD	**					.3020-01	.1955-01	.6940-01	**
BOLE-SUM	**	.4500-01		.9500-01	.9300-01	.1010+00	.7530-01	.2933-01	**
BOLE-BARK	**		.5000-01			.6120-01	.4553-01	.8395-02	**
BOLE-WOOD	.2400+00		.2000-01			.3976-01	.2959-01	.2094-01	.1600+00
STANDING DEAD									
SUM-OVERSTORY				.6400+00	.1540+00	.4440+00	.3230+00	.5700+00	
UNDERSTORY-LEAVES	0.								0.
UND. FRUITS,FLOWERS	0.								0.
UND. BRANCHES-SUM	0.								0.
UND. BRANCHES-BARK	0.								0.
UND. BRANCHES-WOOD	0.								0.
UND. BOLE-SUM	0.								0.
UND. BOLE-BARK	0.								0.
UND. BOLE-WOOD	0.								0.
UND. STANDING DEAD	0.								0.
SUM-UNDERSTORY	0.								0.
HERBACEOUS (FIELD)		0.							
EPIPHYTES-TOTAL		0.							
TOTAL PLANTS					.1540+00				
LIVING ROOTS-SUM				.3900-01	.8100-01				
LIVING ROOTS >5 MM									
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC		0.	-.4000-01						
ROOTING ZONE	.4400+01	0.	-.6300+00						
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL		0.							
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA		0.							
DECOMPOSER FLORA		0.							

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF PHOSPHORUS(P) IN UNITS OF GRAM/S2.M

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	SITE 1 KAZIM*OV MOROZOVA	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA	SITE 9 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.8000-02	.1400-01	.2000-01	.2000-01	.2200-01	.1100-01	.1500-01	.3600-01	.2500-01
FRUITS,FLOWERS									
BRANCHES-SUM	.4000-02	.7000-02	.1000-01	.1200-01	.1400-01	.4000-02	.7000-02	.1200-01	.1000-01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1900-01	.3000-01	.4100-01	.4600-01	.5100-01	.2400-01	.2700-01	.2400-01	.3700-01
BOLE-BARK	.6000-02	.1100-01	.1500-01	.1400-01	.1700-01	.9000-02	.1000-01	.9000-02	.1400-01
BOLE-WOOD	.1200-01	.1900-01	.2600-01	.3200-01	.3400-01	.1500-01	.1700-01	.1500-01	.2300-01
STANDING DEAD	.1000-02	.2000-02	.2000-02	.2000-02	.3000-02	.1000-02	.1000-02	.3000-02	.3000-02
SUM-OVERSTORY	.3100-01	.5300-01	.7300-01	.8000-01	.9000-01	.4000-01	.5000-01	.7500-01	.7500-01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.4000-02	.9000-02	.7000-02	.3000-02	.2000-02	.1100-01	.4000-02	.2000-02	.2000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS	.3500-01	.6200-01	.8000-01	.8300-01	.9200-01	.5100-01	.5400-01	.7700-01	.7700-01
LIVING ROOTS-SUM	.9000-02	.1100-01	.1400-01	.1600-01	.2900-01	.8000-02	.1100-01	.2000-01	.2400-01
LIVING ROOTS >5 MM	.6000-02	.7000-02	.9000-02	.1200-01	.2400-01	.4000-02	.7000-02	.1300-01	.1900-01
LIVING ROOTS 2-5 MM	.1000-02	.2000-02	.3000-02	.2000-02	.3000-02	.2000-02	.2000-02	.4000-02	.3000-02
LIVING ROOTS <5 MM	.1000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02	.3000-02	.2000-02
DEAD ROOTS	.1000-02	.1000-02	.1000-02	.1000-02	.2000-02	.1000-02	.1000-02	.3000-02	.3000-02
SOIL TOP ORGANIC	.9000-02	.1100-01	.1600-01	.1300-01	.1000-01	.1600-02	.5600-01	.1400-01	.1500-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.M

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	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA	FINLAND HAVAS
OVERSTORY LEAVES	.1700-01	.8000-02		-.2000-02	-.5000-02	-.6000-02	-.7000-02	-.1000-01	
FRUITS,FLOWERS			.1000-02	.1000-02					
BRANCHES-SUM	.8000-02	.6000-02	.4000-02	.2000-02	.2000-02	.1000-02			.7000-01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.4100-01	.4300-01	.4100-01	.3500-01	.2600-01	.1900-01	.9000-02	.1000-02	.9000-03
BOLE-BARK	.1500-01	.1500-01	.1500-01	.1200-01	.9000-02	.6000-02	.3000-02		
BOLE-WOOD	.2600-01	.2900-01	.2600-01	.2300-01	.1700-01	.1300-01	.5000-02	.1000-02	
STANDING DEAD	.3000-02	.2000-02	.1000-02	.1000-02					.9000-03
SUM-OVERSTORY	.6900-01	.5900-01	.4700-01	.3700-01	.2300-01	.1400-01	.1000-02	-.9000-02	
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	
HERBACEOUS (FIELD)	.3000-02	.3000-02	.4000-02	.6000-02	.5000-02	.6000-02	.7000-02	.7000-02	
EPIPHYTES-TOTAL									
TOTAL PLANTS	.7200-01	.6200-01	.5100-01	.4200-01	.2800-01	.2000-01	.9000-02	-.2000-02	
LIVING ROOTS-SUM	.2600-01	.2600-01	.2500-01	.2100-01	.1200-01	.8000-02	.3000-02	.1000-02	
LIVING ROOTS >5 MM	.2000-01	.2100-01	.2000-01	.1600-01	.9000-02	.7000-02	.3000-02	.1000-02	
LIVING ROOTS 2-5 MM	.4000-02	.3000-02	.3000-02	.3000-02	.2000-02	.1000-02			
LIVING ROOTS <5 MM	.2000-02	.2000-02	.2000-02	.2000-02	.1000-02				
DEAD ROOTS	.2000-02	.1000-02	.1000-02						
SOIL TOP ORGANIC	.1900-01	.2100-01	.2400-01	.2500-01	.2700-01	.2700-01	.2500-01	.2500-01	
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.M

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	CHAKIA BANDHU	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES		.6600-02
FRUITS,FLOWERS		
BRANCHES-SUM	.3000+00	.1210-01
BRANCHES-BARK		
BRANCHES-WOOD		
BOLE-SUM	.1420+01	.1890-01
BOLE-BARK		.4900-02
BOLE-WOOD		.1400-01
STANDING DEAD		
SUM-OVERSTORY		.4750-02
UNDERSTORY-LEAVES		
UND. FRUITS,FLOWERS		
UND. BRANCHES-SUM		
UND. BRANCHES-BARK		
UND. BRANCHES-WOOD		
UND. BOLE-SUM		
UND. BOLE-BARK		
UND. BOLE-WOOD		
UND. STANDING DEAD		
SUM-UNDERSTORY		
HERBACEOUS (FIELD)		
EPIPHYTES-TOTAL		
TOTAL PLANTS		
LIVING ROOTS-SUM		
LIVING ROOTS >5 MM		
LIVING ROOTS 2-5 MM		
LIVING ROOTS <5 MM		
DEAD ROOTS		
SOIL TOP ORGANIC	**	
ROOTING ZONE	**	
INTENSIVE ROOTED	**	
EXTENSIVE ROOTED		
SUBSOIL		
HETEROTROPHS-SUM		
ABOVEGROUND CONSUMERS		
DECOMPOSER FAUNA		
DECOMPOSER FLORA		

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.METER/YEAR

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	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING B1	SOLLING B3	SOLLING B4	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONSLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL			.2797-01	.3090-01	.3499-01				
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL		.2900+00				.1990+00	.2650+00	.5000+00	.3390+00
LITTERFALL-LEAF	.2000+00	.1800+00	.3369+00	.4353+00	.4219+00	.1500+00	.1370+00		.1700+00
LITTERFALL-FLOWER+FRUIT	.1300-01	.5000-01				.1200-01	.1600-01		.1140+00
LITTERFALL-BRANCH	.4000-01	.5000-01				.9000-02	.5200-01		.5400-01
LITTERFALL-BOLE	.8000-02					.2800-01			
LITTERFALL-GRASS	.2000-01								
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.2000-01	.1000+00	.5100-01			.1420+00	.3000-01	.6600-02	.3900-02
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.7000-01		.4010-01			.1400+00	**	**	**
STEM FLOW	.3000-02	.1600+00	.2300-02			.2100-01	.1000-01	.5600-02	.1504+00
LEACHING- SOIL LAYERS		.2000-01							
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION	.2000-01		.1000-02						

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.METER/YEAR

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	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MORPHY	TRIANGLE MURPHY	SHIGAYMA KITAZAWA	SOLLING F1	SOLLING F2	SOLLING F3
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL									
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.2100+00	.4700+00	.2000-01	.7540+00		.2097+00	.4020+00		
LITTERFALL-LEAF	.1410+00	.3260+00				.1421+00	.3576+00	.3242+00	.3082+00
LITTERFALL-FLOWER,FRUIT	.3600-01	.5700-01				.2500-02			
LITTERFALL-BRANCH	.2800-01	.5000-01				.4000-01	.4435-01		
LITTERFALL-BOLE		.2000-01							
LITTERFALL-FRASS						.1440-01			
LITTERFALL-EPIPHYTS		.1800-01				.3200-02			
ATMOSPHERIC INPUT									
PRECIPITATION	.2000-01	.2700-01					.5100-01		
DRY PARTICULATES(DUST)				.2100-01					
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	.2500+00	.3000-01				.7100-01		
STEM FLOW	.1000-01		.1000-01						
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION				.4600-01					
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION		.5200-01	.2000-02						

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.METER/YEAR

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	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIM*OV MOROZOVA	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL		.1730+00	.3340+00	.4530+00	.5950+00	.6370+00	.3070+00	.4550+00	.3070+00
CONS.-FOLIAGE-TOTAL		.1293+00	.2430+00	.3110+00	.4340+00	.4420+00	.2360+00	.3520+00	.2050+00
CONS.-OVERSTORY		.1020+00	.1830+00	.2610+00	.3310+00	.4160+00	.1450+00	.2050+00	.1590+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY		.2600-01	.5400-01	.5000-01	.4300-01	.2600-01	.9100-01	.1460+00	.4600-01
CONS.-ROOTS-TOTAL		.3600-01	.6500-01	.3000-01	.1030+00	.1170+00	.5000-01	.6300-01	.5000-01
CONS.-UNDERSTORY		.3600-01	.6500-01	.9000-01	.1030+00	.1170+00	.5000-01	.6300-01	.5000-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL		.1500-01	.2600-01	.5200-01	.5900-01	.7800-01	.2100-01	.4000-01	.5200-01
LITTERFALL-TOTAL	.4900+00	.1300+00	.2500+00	.3240+00	.4560+00	.4690+00	.2390+00	.3610+00	.1920+00
LITTERFALL-LEAF		.1160+00	.2220+00	.2950+00	.4120+00	.4170+00	.2170+00	.3320+00	.1680+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH		.6000-02	.1300-01	.1800-01	.1900-01	.2300-01	.1100-01	.1500-01	.9000-02
LITTERFALL-BOLE		.9000-02	.1500-01	.2100-01	.2500-01	.2900-01	.1100-01	.1400-01	.5000-02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.6600-02								
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**	**	**	**	**	**
STEM FLOW	.4350-01	.2000-01	.3000-01	.3000-01	.4000-01	.4000-01	.3000-01	.4000-01	.2000-01
LEACHING- SOIL LAYERS			.4000-02	.9000-02	.6000-02	.7000-02			.5000-02
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL	.4300+00	.4510+00	.4720+00	.4750+00	.4950+00	.4360+00	.4100+00	.3740+00	.3560+00
CONS.-FOLIAGE-TOTAL	.2970+00	.2960+00	.3030+00	.3120+00	.3300+00	.2960+00	.2840+00	.1630+00	.2590+00
CONS.-OVERSTORY	.2310+00	.2440+00	.2530+00	.2570+00	.2400+00	.2150+00	.1940+00		.1440+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.5600-01	.5200-01	.5600-01	.5500-01	.9000-01	.8100-01	.9000-01	.1060+00	.1150+00
CONS.-ROOTS-TOTAL	.7400-01	.8100-01	.8500-01	.9200-01	.7400-01	.5900-01	.4800-01	.3200-01	.2400-01
CONS.-UNDERSTORY	.7400-01	.8100-01	.8500-01	.9200-01	.7400-01	.5900-01	.4800-01	.3200-01	.2400-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.6900-01	.7400-01	.7900-01	.8100-01	.9100-01	.8100-01	.7200-01	.7300-01	.7300-01
LITTERFALL-TOTAL	.2990+00	.3090+00	.3350+00	.3460+00	.3640+00	.3290+00	.3120+00	.2940+00	.2970+00
LITTERFALL-LEAF	.2610+00	.2770+00	.2930+00	.3090+00	.3270+00	.2980+00	.2840+00	.2700+00	.2640+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.1400-01	.1600-01	.1700-01	.1600-01	.1400-01	.1000-01	.1000-01	.6000-02	.4000-02
LITTERFALL-BOLE	.1300-01	.1600-01	.1900-01	.2100-01	.2300-01	.2100-01	.1800-01	.1900-01	.1300-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION									
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**		**	**	**	**
STEM FLOW	.3000-01	.3000-01	.3000-01	.3000-01		.1000-01	.1000-01	.1000-01	.1000-01
LEACHING- SOIL LAYERS	.6000-02	.5000-02	.6000-02	.8000-02	.5000-02	.4000-02	.5000-01	.7000-02	.6000-02
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF PHOSPHORUS(P) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	FINLAND HAVAS	MALAYSIA BULLOCK	MANAUS KLINGE,R OURIGUEZ	CHAKIA BANJHU	EUCALYP-TUS ATTIWILL
CONSUMPTION-TOTAL					
CONS.-FOLIAGE-TOTAL				.5100-01	
CONS.-OVERSTORY				.5000-01	
CONS.-WOOD-OVERSTORY				.1000-02	
CONS.-WOOD-UNDERSTORY					
CONS.-ROOTS-TOTAL					
CONS.-UNDERSTORY					
CONS.-HERBACEOUS					
CONS.-WOOD-TOTAL					
LITTERFALL-TOTAL	.4200+00			.1000+01	.5900-01
LITTERFALL-LEAF	.2500+00	.9130+00	.1650+00	.8500+00	
LITTERFALL-FLOWER,FRUIT			.1500-01	**	
LITTERFALL-BRANCH	**	.1010+00	.3000-01	**	.2300-01
LITTERFALL-WOOD	.1000+00	.8000-01		.1500+00	.1000-01
LITTERFALL-GRASS					
LITTERFALL-EPIPHYTS					.1100-01
ATMOSPHERIC INPUT					
PRECIPITATION		**			
DRY PARTICULATES(DUST)		.1116+00			
GASEOUS FIXATION					
LEACHING					
LEAF WASH		**			
STEM FLOW		.2898+01			
LEACHING- SOIL LAYERS					
OUTPUT					
OUTPUT-WIND EROSION					
OUTPUT-WATER EROSION					
OUTPUT-PERCOLATION					

END

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF SULFUR(S) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	BAB BISKUP-SKY	HESTEHVN THAMCRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	KONGLUND SPRUCE NIHLGARD	TAIGA KARFOV, ROCIN	SITE 1 KAZIM*OV MOROZOVA
OVERSTORY LEAVES		.2400+00	**	**	**	**	**	.1625+01	.4550+00
FRUITS,FLOWERS	.1170+00		.3500+00	.4400+00	.5200+00	.5000+00	.2600+00		
BRANCHES-SUM		.1520+01	.2160+01	.3490+01	.2160+01	.1860+01	.2000+01	.1645+01	.7100-01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM		.2140+01	.1700+01	.2970+01	.2580+01	.3450+00	.6990+01	.6740+01	.3300-01
BOLE-BARK		.4100+00	.3300+00	.4900+00	.9800+00	.2900+00	.1130+01		.2200-01
BOLE-WOOD		.1730+01	.1370+01	.2380+01	.1600+01	.3160+01	.5760+01		.1100-01
STANDING DEAD									.4000-02
SUM-OVERSTORY		.3900+01							.5630+00
UNDERSTORY-LEAVES		**	0.	0.		0.	0.		0.
UND. FRUITS,FLOWERS		**	0.	0.		0.	0.		0.
UND. BRANCHES-SUM		**	0.	0.		0.	0.		0.
UND. BRANCHES-BARK		**	0.	0.		0.	0.		0.
UND. BRANCHES-WOOD		**	0.	0.		0.	0.		0.
UND. BOLE-SUM		**	0.	0.		0.	0.		0.
UND. BOLE-BARK		**	0.	0.		0.	0.		0.
UND. BOLE-WOOD		**	0.	0.		0.	0.		0.
UND. STANDING DEAD		**	0.	0.		0.	0.		0.
SUM-UNDERSTORY		.1200+00	0.	0.		0.	0.		0.
HERBACEOUS (FIELD)		.2000-01		.2000-01	.1700-01	.1200+00			.1110+00
EPIPHYTES-TOTAL									
TOTAL PLANTS		.4040+01	.4210+01	.6920+01		.5920+01	.1122+02		.6740+00
LIVING ROOTS-SUM		.9200+00		.1450+01	.3010+01		.1450+01		.2500-01
LIVING ROOTS >5 MM		.5200+00		.1100+01	.2020+01		.1260+01		.1400-01
LIVING ROOTS 2-5 MM		.3400+01		**	**		**		.5000-02
LIVING ROOTS <5 MM				.3500+00	.9900+00		.1900+00		.6000-02
DEAD ROOTS									.2000-02
SOIL TOP ORGANIC		.2600+00	.1210+01		.1386+01	.3270+00			.1972+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF SULFUR(S) IN UNITS OF GRAMS/SQ.METER

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	SITE 2 KAZIMIROVA MOROZOVA	SITE 3 KAZIMIROVA MOROZOVA	SITE 4 KAZIMIROVA MOROZOVA	SITE 5 KAZIMIROVA MOROZOVA	SITE 6 KAZIMIROVA MOROZOVA	SITE 7 KAZIMIROVA MOROZOVA	SITE 8 KAZIMIROVA MOROZOVA	SITE 9 KAZIMIROVA MOROZOVA	SITE 10 KAZIMIROVA MOROZOVA
OVERSTORY LEAVES	.5730+00	.6120+00	.3860+00	.3060+00	.3900+00	.2250+00	.3300+00	.5500+00	.5900+00
FRUITS,FLOWERS									
BRANCHES-SUM	.9100-01	.1620+00	.1170+00	.1390+00	.7900-01	.1030+00	.6000-01	.1000+00	.1100+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.5900-01	.9600-01	.1990+00	.2360+00	.4200-01	.7800-01	.3000-01	.9000-01	.1100+00
BOLE-BARK	.3200-01	.5300-01	.8200-01	.1160+00	.2300-01	.3100-01	.2000-01	.4000-01	.6000-01
BOLE-WOOD	.2600-01	.4300-01	.1060+00	.1200+00	.1900-01	.4700-01	.1000-01	.4000-01	.5000-01
STANDING DEAD	.7000-02	.1100-01	.1300-01	.2500-01	.5000-02	.1000-01		.1000-01	.1000-01
SUM-OVERSTORY	.7290+00	.9810+00	.7100+00	.7350+00	.5160+00	.4160+00	.4200+00	.7400+00	.9200+00
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.1630+00	.1400+00	.9800-01	.7100-01	.2650+00	.2680+00	.1300+00	.1400+00	.1600+00
EPIPHYTES-TOTAL									
TOTAL PLANTS	.8920+00	.1021+01	.8080+00	.7760+00	.7810+00	.6840+00	.5500+00	.8800+00	.9900+00
LIVING ROOTS-SUM	.3600-01	.4900-01	.9100-01	.1150+00	.3000-01	.4000-01	.4000-01	.9000-01	.9000-01
LIVING ROOTS >5 MM	.2400-01	.3300-01	.7500-01	.9100-01	.1800-01	.2800-01	.2000-01	.6000-01	.6000-01
LIVING ROOTS 2-5 MM	.6000-02	.9000-02	.9000-02	.1400-01	.5000-02	.6000-02	.1000-01	.1000-01	.2000-01
LIVING ROOTS <5 MM	.6000-02	.7000-02	.7000-02	.1000-01	.7000-02	.6000-02	.1000-01	.1000-01	.1000-01
DEAD ROOTS	.5000-02	.5000-02	.1000-01	.1200-01	.4000-02	.5000-02		.1000-01	.1000-01
SOIL TOP ORGANIC	.1189+01	.1411+01	.1841+01	.2266+01	.3320+01	.1560+02	.1240+01	.1320+01	.1370+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF SULFUR(S) IN UNITS OF GRAMS/SQ.METER

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	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA	MALAYSIA BULLOCK
OVERSTORY LEAVES	.6500+00	.6900+00	.6800+00	.6500+00	.5900+00	.4900+00	.4400+00	.1022+01
FRUITS+FLOWERS			.1000-01	.1000-01	.1000-01		.1000-01	
BRANCHES-SUM	.1300+00	.1400+00	.1500+00	.1500+00	.1600+00	.1500+00	.1500+00	.2677+01
BRANCHES-BARK								
BRANCHES-WOOD								
BOLE-SUM	.1500+00	.2100+00	.2300+00	.3200+00	.3300+00	.3700+00	.3500+00	.9190+01
BOLE-BARK	.9000-01	.1200+00	.1200+00	.1700+00	.1700+00	.2000+00	.1800+00	
BOLE-WOOD	.7000-01	.9000-01	.1100+00	.1500+00	.1600+00	.1700+00	.1700+00	
STANDING DEAD	.1000-01	.1000-01	.2000-01	.2000-01	.1000-01	.1000-01	.1000-01	
SUM-OVERSTORY	.9400+00	.1050+01	.1090+01	.1150+01	.1090+01	.1030+01	.9600+00	
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	
UND. FRUITS+FLOWERS	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	
HERBACEOUS (FIELD)	.1900+00	.2000+00	.2800+00	.2600+00	.3200+00	.3700+00	.4100+00	
EPIPHYTES-TOTAL								
TOTAL PLANTS	.1130+01	.1250+01	.1370+01	.1410+01	.1410+01	.1400+01	.1370+01	
LIVING ROOTS-SUM	.1300+00	.1700+00	.2000+00	.2500+00	.2700+00	.2900+00	.2900+00	.2480+01
LIVING ROOTS >5 MM	.1000+00	.1300+00	.1500+00	.2000+00	.2200+00	.2300+00	.2300+00	
LIVING ROOTS 2-5 MM	.2000-01	.2000-01	.3000-01	.3000-01	.3000-01	.3000-01	.3000-01	
LIVING ROOTS <5 MM	.1000-01	.2000-01	.2000-01	.2000-01	.2000-01	.2000-01	.2000-01	
DEAD ROOTS	.1000-01	.1000-01	.1000-01	.1000-01	.1000-01	.1000-01	.1000-01	
SOIL TOP ORGANIC	.1570+01	.1760+01	.1850+01	.2110+01	.2340+01	.2530+01	.2790+01	
ROOTING ZONE								
INTENSIVE ROOTED								
EXTENSIVE ROOTED								
SUBSOIL								
HETEROTROPHS-SUM								
ABOVEGROUND CONSUMERS								
DECOMPOSER FAUNA								
DECOMPOSER FLORA								

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF SULFUR(S) IN UNITS OF GRAM/SQ.M

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	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	OVED LENDGREN NIHLGARD	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA
OVERSTORY LEAVES						.6000-02	.3000-02	.1000-01	.6000-02
FRUITS,FLOWERS									
BRANCHES-SUM		**	**	**	**	.1000-02	.1000-02	.2000-02	.2000-02
BRANCHES-BARK		**	**	**	**				
BRANCHES-WOOD		**	**	**	**				
BOLE-SUM		**	**	**	**	.1000-02	.4000-02	.4000-02	.8000-02
BOLE-BARK		**	**	**	**		.3000-02	.2000-02	.4000-02
BOLE-WOOD		.1500+00	.2500+00	.2000+00	.2900+00	.1000-02	.1000-02	.2000-02	.4000-02
STANDING DEAD									
SUM-OVERSTORY						.8000-02	.1400-01	.1600-01	.1600-01
UNDERSTORY-LEAVES		0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS		0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM		0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK		0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD		0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM		0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK		0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD		0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD		0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY		0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)						.1000-02	.5000-02	.3000-02	.1000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS						.9000-02	.1900-01	.1900-01	.1700-01
LIVING ROOTS-SUM	.6000-01					.1000-02	.1000-02	.2000+02	.2000-02
LIVING ROOTS >5 MM						.1000-02	.1000-02	.1000-02	.1000-02
LIVING ROOTS 2-5 MM								.1000-02	.1000-02
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC						.8000-02	.8000-02	.9000-02	.9000-02
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF SULFUR(S) IN UNITS OF GRAM/SQ.M

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	SITE 5 KAZIM'OV MOROZOVA	SITE 6 KAZIM'OV MOROZOVA	SITE 7 KAZIM'OV MOROZOVA	SITE 8 KAZIM'OV MOROZOVA	SITE 9 KAZIM'OV MOROZOVA	SITE 10 KAZIM'OV MOROZOVA	SITE 11 KAZIM'OV MOROZOVA	SITE 12 KAZIM'OV MOROZOVA	SITE 13 KAZIM'OV MOROZOVA
OVERSTORY LEAVES	.4000-02	.7000-02	.3000-02	.1900-01	.1300-01	.8000-02	.4000-02		0.
FRUITS,FLOWERS									
BRANCHES-SUM	.3000-02	.2000-02	.2000-02	.3000-02	.2000-02	.2000-02	.1000-02	.1000-02	.1000-02
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.8000-02	.2000-02	.4000-02	.2000-02	.4000-02	.4000-02	.4000-02	.4000-02	.4000-02
BOLE-BARK	.3000-02	.1000-02	.2000-02	.1000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02
BOLE-WOOD	.5000-02	.1000-02	.2000-02	.1000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02
STANDING DEAD									
SUM-OVERSTORY	.1500-01	.1100-01	.9000-02	.2300-01	.1900-01	.1400-01	.9000-02	.5000-02	.4000-02
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)		.4000-02	.1000-02	.1000-02	.1000-02	.1000-02	.2000-02	.2000-02	.3000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS	.1500-01	.1500-01	.1000-01	.2400-01	.2000-01	.1500-01	.1100-01	.7000-02	.7000-02
LIVING ROOTS-SUM	.4000-02	.1000-02	.1000-02	.2000-02	.3000-02	.3000-02	.3000-02	.3000-02	.2000-02
LIVING ROOTS >5 MM	.3000-02	.1000-02	.1000-02	.1000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02
LIVING ROOTS 2-5 MM	.1000-02			.1000-02	.1000-02	.1000-02	.1000-02	.1000-02	
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC	.1000-01	.1400-01	.5600-01	.8000-02	.9000-02	.1000-01	.1100-01	.1500-01	.1600-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF SULFUR(S) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	-.2000-02	-.3000-02	-.4000-02	-.5000-02
FRUITS,FLOWERS				
BRANCHES-SUM	.1000-02			
BRANCHES-BARK				
BRANCHES-WOOD				
BOLE-SUM	.3000-02	.2000-02	.1000-02	
BOLE-BARK	.2000-02	.1000-02		
BOLE-WOOD	.1000-02	.1000-02	.1000-02	
STANDING DEAD				
SUM-OVERSTORY	.2000-02	0.	-.3000-02	-.5000-02
UNDERSTORY-LEAVES	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.
HERBACEOUS (FIELD)	.3000-02	.3000-02	.4000-02	.4000-02
EPIPHYTES-TOTAL				
TOTAL PLANTS	.5000-02	.2000-02	.1000-02	0.
LIVING ROOTS-SUM	.2000-02	.1000-02		
LIVING ROOTS >5 MM	.2000-02	.1000-02		
LIVING ROOTS 2-5 MM				
LIVING ROOTS <5 MM				
DEAD ROOTS				
SOIL TOP ORGANIC	.1600+02	.1600-01	.1600-01	.1600-01
ROOTING ZONE				
INTENSIVE ROOTED				
EXTENSIVE ROOTED				
SUBSOIL				
HETEROTROPHS-SUM				
ABOVGROUND CONSUMERS				
DECOMPOSER FAUNA				
DECOMPOSER FLORA				

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF SULFUR(S) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SOLLING B1	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA
CONSUMPTION-TOTAL					.1340+00	.2070+00	.2040+00	.1940+00	.1780+00
CONS.-FOLIAGE-TOTAL					.1260+00	.1940+00	.1760+00	.1630+00	.1400+00
CONS.-OVERSTORY					.1120+00	.1640+00	.1550+00	.1450+00	.1300+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY					.1400-01	.3000-01	.2300-01	.1800-01	.1000-01
CONS.-ROOTS-TOTAL					.6000-02	.9000-02	.1200-01	.1600-01	.2100-01
CONS.-UNDERSTORY					.6000-02	.9000-02	.1200-01	.1800-01	.2100-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL					.2000-02	.4000-02	.1400-01	.1300-01	.1700-01
LITTERFALL-TOTAL		.6400+00	.5420+00	.5400+00	.1220+00	.1860+00	.1720+00	.1640+00	.1460+00
LITTERFALL-LEAF			.3420+00		.1190+00	.1810+00	.1660+00	.1560+00	.1360+00
LITTERFALL-FLOWER,FRUIT			.9200-01						
LITTERFALL-BRANCH			.1080+00		.2000-02	.3000-02	.4000-02	.4000-02	.6000-02
LITTERFALL-BOLE					.1000-02	.1000-02	.2000-02	.4000-02	.6000-02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.2220+01	.7900+00	.1099+01	.7900+00	.5000+00	.5000+00	.5000+00	.5000+00	.5000+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.3330+01	**	**	**					
STEM FLOW	.1280+01	.1060+01	.2340+01	.4630+01					
LEACHING- SOIL LAYERS						.8000-01	.1000+00	.1000+00	.1200+00
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION	.1460+01								

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF SULFUR(S) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 6 KAZIMOV MORDOVA	SITE 7 KAZIMOV MORDOVA	SITE 8 KAZIMOV MORDOVA	SITE 9 KAZIMOV MORDOVA	SITE 10 KAZIMOV MORDOVA	SITE 11 KAZIMOV MORDOVA	SITE 12 KAZIMOV MORDOVA	SITE 13 KAZIMOV MORDOVA	SITE 14 KAZIMOV MORDOVA
CONSUMPTION-TOTAL	.1730+00	.2170+00	.1340+00	.1880+00	.1960+00	.2080+00	.2130+00	.2240+00	.2030+00
CONS.-FOLIAGE-TOTAL	.1620+00	.1720+00	.1130+00	.1620+00	.1660+00	.1790+00	.1830+00	.1890+00	.1710+00
CONS.-OVERSTORY	.1110+00	.7300-01	.9200-01	.1370+00	.1490+00	.1510+00	.1590+00	.1480+00	.1300+00
CONS.-GROW-OVERSTORY									
CONS.-GROW-UNDERSTORY	.5100-01	.9900-01	.2100-01	.2500-01	.2400-01	.2800-01	.2900-01	.3300-01	.4100-01
CONS.-ROOTS-TOTAL	.2000-02	.1100-01	.8000-02	.1000-01	.1200-01	.1100-01	.1100-01	.1000-01	.8000-02
CONS.-UNDERSTORY	.2000-02	.1100-01	.8000-02	.1000-01	.1200-01	.1100-01	.1100-01	.1000-01	.8000-02
CONS.-EMBRACEOUS									
CONS.-GROW-TOTAL	.4000-02	.3400-01	.1300-01	.1600-01	.1600-01	.1800-01	.1900-01	.2500-01	.2400-01
LITTERFALL-TOTAL	.1560+00	.1750+00	.9700-01	.1530+00	.1650+00	.1800+00	.1870+00	.1930+00	.1750+00
LITTERFALL-LEAF	.1630+00	.1700+00	.9400-01	.1490+00	.1590+00	.1740+00	.1810+00	.1880+00	.1710+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.2000-02	.3000-02	.2000-02	.3000-02	.4000-02	.4000-02	.4000-02	.3000-02	.2000-02
LITTERFALL-BOLE	.1000-02	.2000-02	.1000-02	.1000-02	.2000-02	.2000-02	.2000-02	.2000-02	.2000-02
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.6000+00	.6000+00	.6000+00	.6000+00	.6000+00	.6000+00	.6000+00	.6000+00	.6000+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS			.1000+00	.1120+00	.1150+00	.1310+00	.1120+00	.1070+00	.9600-01
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

*FIN

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF SULFUR(S) IN UNITS OF GRAM/SQ.METER/YEAR

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	SITE 15 KAZIM'OV MOROZOVA	SITE 16 KAZIM'OV MOROZOVA	SITE 17 KAZIM'OV MOROZOVA
CONSUMPTION-TOTAL	.1920+00	.1810+00	.1770+00
CONS.-FOLIAGE-TOTAL	.1620+00	.1510+00	.1460+00
CONS.-OVERSTORY	.1170+00	.9800-01	.8700-01
CONS.-WOOD-OVERSTORY			
CONS.-WOOD-UNDERSTORY	.4500-01	.5300-01	.5900-01
CONS.-ROOTS-TOTAL	.6000-02	.4000-02	.3000-02
CONS.-UNDERSTORY	.6000-02	.4000-02	.3000-02
CONS.-HERBACEOUS			
CONS.-WOOD-TOTAL	.2400-01	.2600-01	.2800-01
LITTERFALL-TOTAL	.1670+00	.1550+00	.1510+00
LITTERFALL-LEAF	.1630+00	.1520+00	.1480+00
LITTERFALL-FLOWER,FRUIT			
LITTERFALL-BRANCH	.2000-02	.1000-02	.1000-02
LITTERFALL-BOLE	.2000-02	.2000-02	.2000-02
LITTERFALL-FRASS			
LITTERFALL-EPIPHYTS			
ATMOSPHERIC INPUT			
PRECIPITATION	.5000+00	.5000+00	.5000+00
DRY PARTICULATES(DUST)			
GASEOUS FIXATION			
LEACHING			
LEAF WASH			
STEM FLOW			
LEACHING- SOIL LAYERS	.8100-01	.7400-01	.8200-01
OUTPUT			
OUTPUT-WIND EROSION			
OUTPUT-WATER EROSION			
OUTPUT-PERCOLATION			

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF POTASSIUM(K) IN UNITS OF GRAMS/SQ.METER

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	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	DAG BISKUP-SKY	SOLLING B1	SOLLING B3	SOLLING P4	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN
OVERSTORY LEAVES	.2680+01	.3890+01	.4300+01		.2464+01	.3143+01	.2692+01	.1100+01	**
FRUITS,FLOWERS				.1805+01					.1600+01
BRANCHES-SUM	.5540+01	.6110+01	.8000+01		.4207+01	.3740+01	.2050+01	.8500+01	.9400+01
BRANCHES-BARK		.1500+01			.8143+00	.8294+00	.3775+00		
BRANCHES-WOOD		.3620+01			.3352+01	.2913+01	.2077+01		
BOLE-SUM	.3350+01	.1131+02	.4930+02		.2055+02	.1337+02	.7270+01	.1750+02	.2076+02
BOLE-BARK		.3420+01			.3030+01	.2470+01	.8387+00	.1500+01	.1660+01
BOLE-WOOD		.7830+01			.1752+02	.1090+02	.6435+01	.1600+02	.1910+02
STANDING DEAD	.1775+02	.3200+00	0.						
SUM-OVERSTORY	.3732+02		.6160+02		.2750+02	.2030+02	.1302+02	.2710+02	
UNDERSTORY-LEAVES	.4300+00	.7100+00	.5000-01						0.
UND. FRUITS,FLOWERS									0.
UND. BRANCHES-SUM	.8500+00	.1000+01							0.
UND. BRANCHES-BARK			**						0.
UND. BRANCHES-WOOD			.1200+00						0.
UND. BOLE-SUM	.7400+00	.1260+01	**						0.
UND. BOLE-BARK			**						0.
UND. BOLE-WOOD			**						0.
UND. STANDING DEAD		.2000-01	**						0.
SUM-UNDERSTORY	.1820+01		.1700+00					.7000+00	0.
HERBACEOUS (FIELD)	.2100+00	.1300+01						.1000+00	
EPIPHYTES-TOTAL									
TOTAL PLANTS	.3917+02		.6177+02					.2790+02	.3100+02
LIVING ROOTS-SUM	.6850+01	.1128+02	.8500+00		.5550+01			.1140+02	
LIVING ROOTS >5 MM		.7300+01	.8500+00		.5011+01	.3195+01	.3454+01	.5900+01	
LIVING ROOTS 2-5 MM		.1080+01						**	
LIVING ROOTS <2 MM		.2500+01			.5312+00			.5500+01	
DEAD ROOTS		.1990+01							
SOIL TOP ORGANIC	.4800+00	.1200+01	.1020+01		.8300+01	.1230+02	.8500+01	.1400+01	.7800+00
ROOTING ZONE	.5530+02							.1930+02	
INTENSIVE ROOTED		.1532+02			.3870+02	.5500+02	.5070+02		
EXTENSIVE ROOTED		.1006+02							
SUBSOIL		.5000-01							
HETEROTROPHS-SUM	.9360-01								
ABOVEGROUND CONSUMERS	.1400-02	.7000-02							
DECOMPOSER FAUNA	.2830-01	.1100+00							
DECOMPOSER FLORA	.5900-02								

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF POTASSIUM(K) IN UNITS OF GRAMS/SQ.METER

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	KONGLUND BEECH 1 NIHLGARD	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR SEGSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2
OVERSTORY LEAVES	**	**	**	.3450+01	.6700+01	.4800+01	.3600+01	.1188+02	.9444+01
FRUITS,FLOWERS	.2300+01	.3000+01	.3700+01						
BRANCHES-SUM	.2280+02	.6000+01	.1380+02	.8870+01	.3800+01	.2400+01	.1940+01	.1831+02	.1670+02
BRANCHES-BARK								.2366+01	.2065+01
BRANCHES-WOOD								.1594+02	.1392+02
BOLE-SUM	.2010+02	.1780+02	.2830+02	.2937+02	.9900+01	.8900+01	.4440+01	.9933+01	.9800+01
BOLE-BARK	.1900+01	.3000+01	.2700+01			.2400+01		.4939+01	.4874+01
BOLE-WOOD	.1820+02	.1480+02	.2560+02			.6500+01		.4995+01	.4929+01
STANDING DEAD						.4000+00			
SUM-OVERSTORY						.1650+02	.9980+01	.4010+02	.3420+02
UNDERSTORY-LEAVES	0.		0.						
UND. FRUITS,FLOWERS	0.		0.						
UND. BRANCHES-SUM	0.		0.						
UND. BRANCHES-BARK	0.		0.						
UND. BRANCHES-WOOD	0.		0.						
UND. BOLE-SUM	0.		0.						
UND. BOLE-BARK	0.		0.						
UND. BOLE-WOOD	0.		0.						
UND. STANDING DEAD	0.		0.						
SUM-UNDERSTORY	0.		0.					0.	0.
HERBACEOUS (FIELD)	.8000+00	.1800-01	.7200+00		.7000+00				
EPIPHYTES-TOTAL									
TOTAL PLANTS	.4500+02		.4650+02	.4170+01			.9980+01		
LIVING ROOTS-SUM	.7900+01	.1200+01			.2400+01	.6100+01	.3870+01		
LIVING ROOTS >5 MM	.6000+01	.8000+00							
LIVING ROOTS 2-5 MM	**	**							
LIVING ROOTS <5 MM	.1900+01	.4000+00							
DEAD ROOTS									
SOIL TOP ORGANIC	.1040+01	.6630+00	.4600+00	.9200+01	.3200+01	.4040+02		.4100+01	.1150+02
ROOTING ZONE				.1400+03	.2340+02	.1420+02			
INTENSIVE ROOTED								.5460+02	.3420+02
EXTENSIVE ROOTED									
SUBSOIL				.1300+03		.2620+02			
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF POTASSIUM(K) IN UNITS OF GRAMS/SQ.METER

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	SOLLING F3	KONGLUND SPRUCE NIHLGARD	N.TAIGA RUDNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.1232+02	**	.4094+01	.7625+01	.2394+01	.3886+01	.5200+01	.5455+01	.7342+01
FRUITS,FLOWERS		.3100+01							
BRANCHES-SUM	.1119+02	.1120+02	.2613+01	.6580+01	.8440+00	.1214+01	.1612+01	.1754+01	.9381+01
BRANCHES-BARK	.1670+01								
BRANCHES-WOOD	.9520+01								
BOLE-SUM	.1051+02	.1722+02	.4890+01	.1348+02	.9900+00	.2030+01	.3370+01	.3830+01	.4391+01
BOLE-BARK	.3321+01	.6900+01			.4170+00	.7700+00	.1200+01	.1368+01	.1380+01
BOLE-WOOD	.7185+01	.1030+02			.5730+00	.1260+01	.2170+01	.2462+01	.3001+01
STANDING DEAD					.1170+00	.2590+00	.3710+00	.4330+00	.4580+00
SUM-OVERSTORY	.3400+02				.4345+01	.7385+01	.1055+02	.1147+02	.1416+02
UNDERSTORY-LEAVES		0.			0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS		0.			0.	0.	0.	0.	0.
UND. BRANCHES-SUM		0.			0.	0.	0.	0.	0.
UND. BRANCHES-BARK		0.			0.	0.	0.	0.	0.
UND. BRANCHES-WOOD		0.			0.	0.	0.	0.	0.
UND. BOLE-SUM		0.			0.	0.	0.	0.	0.
UND. BOLE-BARK		0.			0.	0.	0.	0.	0.
UND. BOLE-WOOD		0.			0.	0.	0.	0.	0.
UND. STANDING DEAD		0.			0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.			0.	0.	0.	0.	0.
HERBACEOUS (FIELD)			.1359+01		.5460+00	.5710+00	.1171+01	.8400+00	.6600+00
EPIPHYTES-TOTAL			.3710+00						
TOTAL PLANTS		.4370+02			.4891+01	.8360+01	.1198+02	.1231+02	.1482+02
LIVING ROOTS-SUM		.6500+01	.6863+01		.6640+00	.1093+01	.1799+01	.2252+01	.2565+01
LIVING ROOTS >5 MM		.5900+01			.4650+00	.8390+00	.1357+01	.1825+01	.2101+01
LIVING ROOTS 2-5 MM		**			.9100-01	.1460+00	.1990+00	.2530+00	.2720+00
LIVING ROOTS <5 MM		.6000+00			.1080+00	.1140+00	.1540+00	.1740+00	.1920+00
DEAD ROOTS					.7800-01	.1420+00	.1890+00	.2390+00	.2690+00
SOIL TOP ORGANIC	.1050+02	.1500+01			.1166+01	.1658+01	.2981+01	.3414+01	.2363+01
ROOTING ZONE									
INTENSIVE ROOTED	.3400+02								
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF POTASSIUM(K) IN UNITS OF GRAMS/SQ.METER

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	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.2600+01	.4350+01	.2800+01	.4640+01	.5000+01	.5560+01	.5870+01	.5810+01	.5510+01
FRUITS+FLOWERS							.3000-01	.9000-01	.1100+00
BRANCHES-SUM	.9380+00	.1539+01	.8400+00	.1380+01	.1570+01	.1850+01	.1850+01	.2180+01	.2140+01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1470+01	.1820+01	.9700+00	.2960+01	.3940+01	.5110+01	.7470+01	.8120+01	.1106+02
BOLE-BARK	.5360+00	.6500+00	.3500+00	.1050+01	.1380+01	.1750+01	.2500+01	.2670+01	.3600+01
BOLE-WOOD	.9340+00	.1170+01	.6200+00	.1910+01	.2560+01	.3360+01	.4970+01	.5450+01	.7460+01
STANDING DEAD	.1900+00	.2380+00	.7000-01	.2300+00	.2900+00	.3900+00	.4800+00	.5700+00	.5600+00
SUM-OVERSTORY	.5198+01	.7947+01	.4680+01	.9210+01	.1080+02	.1291+02	.1556+02	.1677+02	.1938+02
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS+FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.2199+01	.2959+01	.1050+01	.1290+01	.1200+01	.1390+01	.1370+01	.2150+01	.2030+01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.7397+01	.1051+02	.5730+01	.1050+02	.1200+02	.1430+02	.1696+02	.1892+02	.2141+02
LIVING ROOTS-SUM	.9710+00	.1337+01	.9300+00	.2110+01	.2370+01	.3240+01	.4370+01	.4380+01	.6150+01
LIVING ROOTS >5 MM	.7300+00	.1023+01	.6700+00	.1580+01	.1820+01	.2570+01	.3590+01	.3990+01	.5070+01
LIVING ROOTS 2-5 MM	.1150+00	.1700+00	.1300+00	.2400+00	.3300+00	.4000+00	.5000+00	.6100+00	.6500+00
LIVING ROOTS <5 MM	.1260+00	.1440+00	.1300+00	.1900+00	.2200+00	.2700+00	.3300+00	.3800+00	.4300+00
DEAD ROOTS	.1250+00	.1750+00	.7000-01	.1700+00	.1800+00	.2400+00	.2800+00	.3400+00	.3100+00
SOIL TOP ORGANIC	.4011+01	.4200+01	.2620+01	.2780+01	.2880+01	.3300+01	.3700+01	.3900+01	.4440+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF POTASSIUM(K) IN UNITS OF GRAMS/SQ.METER

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	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES	.4350+01	.4130+01	.3770+01	.3500+01	.6043+01	.2350+01
FRUITS,FLOWERS	.1200+00	.1000-01	.1300+00			
BRANCHES-SUM	.2230+01	.2160+01	.2210+01	.1490+01	.1106+02	.3400+01
BRANCHES-BARK						
BRANCHES-WOOD						
BOLE-SUM	.1155+02	.1299+02	.1232+02	.4770+01	.3849+02	.1512+02
BOLE-BARK	.3770+01	.4130+01	.3320+01			.1172+02
BOLE-WOOD	.7790+01	.8750+01	.8900+01			.3400+01
STANDING DEAD	.5000+00	.5000+00	.5200+00	.2100+00		
SUM-OVERSTORY	.1940+02	.1981+02	.1995+02	.1000+02		.2147+02
UNDERSTORY-LEAVES	0.	0.	0.	.3000-01		
UND. FRUITS,FLOWERS	0.	0.	0.			
UND. BRANCHES-SUM	0.	0.	0.			
UND. BRANCHES-BARK	0.	0.	0.			
UND. BRANCHES-WOOD	0.	0.	0.			
UND. BOLE-SUM	0.	0.	0.			
UND. BOLE-BARK	0.	0.	0.			
UND. BOLE-WOOD	0.	0.	0.			
UND. STANDING DEAD	0.	0.	0.			
SUM-UNDERSTORY	0.	0.	0.			.2410+01
HERBACEOUS (FIELD)	.2130+01	.2520+01	.2730+01	.2300+01		
EPIPHYTES-TOTAL						
TOTAL PLANTS	.2160+02	.2233+02	.2174+02			
LIVING ROOTS-SUM	.6750+01	.6900+01	.7120+01	.6900+01	.7963+01	.5170+01
LIVING ROOTS >5 MM	.5650+01	.5760+01	.5960+01			
LIVING ROOTS 2-5 MM	.6800+00	.7000+00	.7200+00			
LIVING ROOTS <5 MM	.4200+00	.4400+00	.4400+00			
DEAD ROOTS	.2900+00	.2700+00	.3400+00			
SOIL TOP ORGANIC	.4920+01	.5330+01	.5960+01	.4500+01		.1590+01
ROOTING ZONE						
INTENSIVE ROOTED						
EXTENSIVE ROOTED						
SUBSOIL						
HETEROTROPHS-SUM						
ABOVEGROUND CONSUMERS						
DECOMPOSER FAUNA						
DECOMPOSER FLORA						

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF POTASSIUM(K) IN UNITS OF GRAM/SQ.M

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	OAKRIDGE RETCHLE SHUGART	MEATHOP SATCHELL	ROUGUET LOSSAINT RAFF	SOLLING B1	SOLLING B3	SOLLING B4	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.1100+00	.1520+00	.5800+00	.1030+00	.6470-01	.7270-01	**	**	**
BRANCHES-BARK		.4400-01		.2252-01	.1427-01	.2323-01	**	**	**
BRANCHES-WOOD		.3300-01		.8051-01	.5039-01	.4948-01	**	**	**
BOLE-SUM	.2000+00	.3450+00	.3100+00	.5593+00	.6030+00	.5070+00	**	**	**
BOLE-BARK		.1040+00		.8211-01	.1126+00	.5842-01	**	**	**
BOLE-WOOD		.2300+00		.4770+00	.4967+00	.4484+00	**	.8930+00	.1660+01
STANDING DEAD		.7000-02					.1670+01		
SUM-OVERSTORY	.3100+00								
UNDERSTORY-LEAVES								0.	0.
UND. FRUITS,FLOWERS								0.	0.
UND. BRANCHES-SUM	.6000-02							0.	0.
UND. BRANCHES-BARK								0.	0.
UND. BRANCHES-WOOD								0.	0.
UND. BOLE-SUM	.8000-02							0.	0.
UND. BOLE-BARK								0.	0.
UND. BOLE-WOOD								0.	0.
UND. STANDING DEAD								0.	0.
SUM-UNDERSTORY	.1400-01							0.	0.
HERBACEOUS (FIELD)		.2400+00					.3000+00		
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.7000-01	.6570+00					.6800+00		
LIVING ROOTS >5 MM	.3500-01	.4230+00		.1285+00	.9158-01	.1827+00			
LIVING ROOTS 2-5 MM	.3500-01	.6200-01							
LIVING ROOTS <5 MM		.1660+00							
DEAD ROOTS									
SOIL TOP ORGANIC	.1000-02								
ROOTING ZONE	.2600-01								
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS		.8000-02							
DECOMPOSER FAUNA		.1300+00							
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF POTASSIUM(K) IN UNITS OF GRAM/SQ.M

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	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLINS F1	SOLLINS F2	SOLLINS F3
OVERSTORY LEAVES			.4000-02	.2700+00		.1800+00			
FRUITS,FLOWERS									
BRANCHES-SUM	**	**	.1000+00	.1500+00	.3100+00	.1300+00	.3310+00	.2540+00	.3750+00
BRANCHES-BARK	**	**					.5070-01	.3299-01	.5587-01
BRANCHES-WOOD	**	**					.3410+00	.2207+00	.3189+00
BOLE-SUM	**	**	.2240+00		.3300+00	.5700+00	.2690+00	.2000+00	.4890+00
BOLE-BARK	**	**		.1700+00			.1375+00	.9960-01	.1548+00
BOLE-WOOD	.8900+00	.1620+01		.2500+00			.1350+00	.1008+00	.3345+00
STANDING DEAD									
SUM-OVERSTORY					.6400+00	.8800+00	.2600+01	.1860+01	.2800+01
UNDERSTORY-LEAVES		0.							
UND. FRUITS,FLOWERS		0.							
UND. BRANCHES-SUM		0.							
UND. BRANCHES-BARK		0.							
UND. BRANCHES-WOOD		0.							
UND. BOLE-SUM		0.							
UND. BOLE-BARK		0.							
UND. BOLE-WOOD		0.							
UND. STANDING DEAD		0.							
SUM-UNDERSTORY		0.							
HERBACEOUS (FIELD)			0.						
EPIPHYTES-TOTAL			0.						
TOTAL PLANTS						.8800+00			
LIVING ROOTS-SUM				.7000-01	.3400+00	.2900+00			
LIVING ROOTS >5 MM									
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC			0.	.5300+00					
ROOTING ZONE			0.	-.1990+01					
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL			0.						
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA			0.						

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF POTASSIUM(K) IN UNITS OF GRAM/SQ.M

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	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIM*OV MOROZOVA	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA
OVERSTORY LEAVES FRUITS,FLOWERS		.3400-01	.5900-01	.8700-01	.9900-01	.9400-01	.4000-01	.6400-01	.1530+00
BRANCHES-SUM	**	.1300-01	.2400-01	.3200-01	.3300-01	.4400-01	.1800-01	.2900-01	.3800-01
BRANCHES-BARK	**								
BRANCHES-WOOD	**								
BOLE-SUM	**	.5600-01	.1050+00	.1440+00	.1560+00	.1700+00	.2400-01	.3500-01	.8300-01
BOLE-BARK	**	.1800-01	.3200-01	.5200-01	.5000-01	.5600-01	.3000-01	.3400-01	.3100-01
BOLE-WOOD	.2500+00	.3800-01	.6700-01	.9200-01	.1060+00	.1140+00	.5400-01	.6100-01	.5200-01
STANDING DEAD		.2000-02	.5000-02	.7000-02	.8000-02	.9000-02	.4000-02	.5000-02	.1100-01
SUM-OVERSTORY		.1050+00	.1930+00	.2700+00	.2960+00	.3170+00	.1460+00	.1930+00	.2850+00
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)		.1300-01	.2900-01	.2200-01	.1000-01	.5000-02	.4100-01	.1800-01	.7000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS		.1180+00	.2220+00	.2920+00	.3060+00	.3220+00	.1870+00	.2110+00	.2920+00
LIVING ROOTS-SUM		.2500-01	.3900-01	.5500-01	.7300-01	.8800-01	.3200-01	.4600-01	.6000-01
LIVING ROOTS >5 MM		.1700-01	.2800-01	.4100-01	.6000-01	.7100-01	.2400-01	.3500-01	.4100-01
LIVING ROOTS 2-5 MM		.4000-02	.6000-02	.3000-02	.7000-02	.1000-01	.4000-02	.6000-02	.1100-01
LIVING ROOTS <5 MM		.4000-02	.5000-02	.6000-02	.6000-02	.7000-02	.4000-02	.5000-02	.8000-02
DEAD ROOTS		.2000-02	.3000-02	.4000-02	.5000-02	.5000-02	.2000-02	.3000-02	.1000-01
SOIL TOP ORGANIC		.6000-02	.9000-02	.2100-01	.2000-01	.1300-01	.1600-01	.1400-01	.1600-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF POTASSIUM(K) IN UNITS OF GRAM/SQ.M

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	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
OVERSTORY LEAVES	.1070+00	.7100-01	.3600-01		-.1000-01	-.2000-01	-.2600-01	-.3100-01	-.4100-01
FRUITS,FLOWERS				.4000-02	.3000-02	.2000-02	.1000-02		
BRANCHES-SUM	.3100-01	.2500-01	.2000-01	.1200-01	.8000-02	.5000-02	.3000-02	.1000-02	.1000-02
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1300+00	.1440+00	.1500+00	.1430+00	.1230+00	.9100-01	.6800-01	.2900-01	.4000-02
BOLE-BARK	.4600-01	.5000-01	.5000-01	.4300-01	.4100-01	.3000-01	.2200-01	.1000-01	.2000-02
BOLE-WOOD	.8400-01	.9400-01	.1000+00	.9500-01	.8200-01	.6100-01	.4600-01	.1900-01	.2000-02
STANDING DEAD	.1200-01	.1000-01	.3000-02	.4300-02	.2000-02	0.	0.	0.	-.2000-02
SUM-OVERSTORY	.2800+00	.2500+00	.2140+00	.1630+00	.1260+00	.7800-01	.4500-01	-.2000-02	-.3800-01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.7000-02	.9000-02	.1100-01	.1300-01	.1600-01	.1600-01	.2000-01	.2200-01	.2500-01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.2870+00	.2590+00	.2250+00	.1760+00	.1420+00	.3400-01	.6500-01	.2000-01	-.1300-01
LIVING ROOTS-SUM	.7200-01	.7800-01	.8000-01	.7500-01	.6300-01	.3800-01	.2200-01	.9000-02	.3000-02
LIVING ROOTS >5 MM	.5900-01	.6000-01	.6300-01	.6000-01	.5000-01	.3100-01	.1700-01	.7000-02	.3000-02
LIVING ROOTS 2-5 MM	.1000-01	.1100-01	.1000-01	.9000-02	.8000-02	.4000-02	.3000-02	.1000-02	0.
LIVING ROOTS <5 MM	.7000-02	.7000-02	.7000-02	.6000-02	.5000-02	.3000-02	.2000-02	.1000-02	0.
DEAD ROOTS	.8000-02	.7000-02	.5000-02	.2000-02	.1000-02			0.	-.1001-02
SOIL TOP ORGANIC	.1800-01	.2100-01	.2400-01	.2900-01	.2900-01	.3000-01	.3000-01	.2900-01	.2900-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF POTASSIUM(K) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	FINLAND HAVAS	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES		.4700-01
FRUITS,FLOWERS		
BRANCHES-SUM	.2800+00	.1040+00
BRANCHES-BARK		
BRANCHES-WOOD		
BOLE-SUM	.5000-02	.3360+00
BOLE-BARK		.9200-01
BOLE-WOOD		.2440+00
STANDING DEAD	.5000-02	
SUM-OVERSTORY		.4870+00
UNDERSTORY-LEAVES		
UND. FRUITS,FLOWERS		
UND. BRANCHES-SUM		
UND. BRANCHES-BARK		
UND. BRANCHES-WOOD		
UND. BOLE-SUM		
UND. BOLE-BARK		
UND. BOLE-WOOD		
UND. STANDING DEAD		
SUM-UNDERSTORY		
HERBACEOUS (FIELD)		
EPIPHYTES-TOTAL		
TOTAL PLANTS		
LIVING ROOTS-SUM		
LIVING ROOTS >5 MM		
LIVING ROOTS 2-5 MM		
LIVING ROOTS <5 MM		
DEAD ROOTS		
SOIL TOP ORGANIC		
ROOTING ZONE		
INTENSIVE ROOTED		
EXTENSIVE ROOTED		
SUBSOIL		
HETEROTROPHS-SUM		
ABOVEGROUND CONSUMERS		
DECOMPOSER FAUNA		
DECOMPOSER FLORA		

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF POTASSIUM(K) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	ROUSQUET LOSSAINT RAFF	SOLLING B1	SOLLING B3	SOLLING B4	HESTEHVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD
CONSUMPTION-TOTAL	.1700+00				.1698+00				
CONS.-FOLIAGE-TOTAL				.1470+00		.1458+00			
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL			.1020+01				.9190+00	.1140+01	.1440+01
LITTERFALL-LEAF	.6200+00	.1720+01	.1110+01	.1595+01	.1752+01	.1695+01	.7490+00	.7330+00	
LITTERFALL-FLOWER,FRUIT		.4000-01	.3500+00				.8500-01	.2150+00	
LITTERFALL-BRANCH		.1100+00	.1600+00				.1670-01	.1830+00	
LITTERFALL-BOLE		.3000-01					.6900-01		
LITTERFALL-GRASS	.1700+00	.8000-01							
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION		.3300+00	.2400+00	.3700+00			.1090+01	.2800+00	.1900+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.1630+01	.3030+01		.1590+01			.1690+01	**	**
STEM FLOW	.9000-01	.4800+00	.2130+00	.6590+00			.4370+00	.1310+01	.1120+01
LEACHING- SOIL LAYERS	.3900+00		.6500+00						
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION		.8300+00		.2580+00					

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF POTASSIUM(K) IN UNITS OF GRAM/SQ.METER/YEAR

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	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	SHIGAYMA KITAZAWA	SOLLINS F1	SOLLINS F2	SOLLINS F3
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL									
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.7200+00	.1540+01	.8000+00	.2700+00	.1390+01	.5092+00	.1270+01		
LITTERFALL-LEAF	.3300+00	.1110+01	.4910+00			.4271+00	.7675+00	.6976+00	.6631+00
LITTERFALL-FLOWER,FRUIT	.2030+00	.2800+00	.1080+00			.4300-02			
LITTERFALL-BRANCH	.1270+00	.1600+00	.1220+00			.4250-01	.5005+00		
LITTERFALL-BOLE			.2800-01						
LITTERFALL-GRASS						.1880-01			
LITTERFALL-EPIPHYTS			.5100-01			.4300-02			
ATMOSPHERIC INPUT									
PRECIPITATION	.1290+00	.1700+00	.1100-01	.8000-01			.3700+00		
DRY PARTICULATES(DUST)					.1640+00				
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	.2160+01	.1070+01	.1170+01		.2774+01		
STEM FLOW	.3610+01	.1720+01		.1600+00					
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION			.2250+00	.1000+00					

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF POTASSIUM(K) IN UNITS OF GRAM/SQ.METER/YEAR

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	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA
CONSUMPTION-TOTAL		.6890+00	.1309+01	.1512+01	.2258+01	.2337+01	.1254+01	.2407+01	.1208+01
CONS.-FOLIAGE-TOTAL		.5290+00	.9390+00	.1302+01	.1700+01	.1681+01	.1075+01	.1375+01	.8630+00
CONS.-OVERSTORY		.4470+00	.8160+00	.1099+01	.1535+01	.1580+01	.5970+00	.8650+00	.6700+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY		.8200-01	.1830+00	.2030+00	.1650+00	.1010+00	.4370+00	.1110+01	.1900+00
CONS.-ROOTS-TOTAL		.1140+00	.2200+00	.3040+00	.3340+00	.3800+00	.1650+00	.2180+00	.1700+00
CONS.-UNDERSTORY		.1140+00	.2200+00	.3040+00	.3340+00	.3800+00	.1650+00	.2180+00	.1700+00
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL		.4600-01	.9000-01	.2060+00	.2240+00	.2760+00	.7300-01	.2140+00	.1780+00
LITTERFALL-TOTAL	.1070+01	.5290+00	.1011+01	.1327+01	.1754+01	.1742+01	.1071+01	.1984+01	.5800+00
LITTERFALL-LEAF		.4840+00	.9130+00	.1199+01	.1609+01	.1576+01	.9570+00	.1890+01	.7010+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH		.2100-01	.4000-01	.5400-01	.6200-01	.7300-01	.2600-01	.4600-01	.3100-01
LITTERFALL-BOLE		.2400-01	.5200-01	.7400-01	.8300-01	.9300-01	.3800-01	.4800-01	.1800-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.1900+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**	**	**	**	**	**
STEM FLOW	.2520+01	.1800+00	.2700+00	.3500+00	.4200+00	.4600+00	.3100+00	.4400+00	.2600+00
LEACHING- SOIL LAYERS			.1800+00	.2000+00	.2500+00	.3000+00			.2000+00
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF POTASSIUM(K) IN UNITS OF GRAM/SQ.METER/YEAR

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	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL	.1715+01	.1756+01	.1831+01	.1807+01	.1940+01	.1715+01	.1554+01	.1436+01	.1367+01
CONS.-FOLIAGE-TOTAL	.1218+01	.1234+01	.1280+01	.1263+01	.1370+01	.1232+01	.1140+01	.1073+01	.1030+01
CONS.-OVERSTORY	.9720+00	.1024+01	.1065+01	.1079+01	.1006+01	.9040+00	.8150+00	.6830+00	.6060+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.2400+00	.2100+00	.2150+00	.1900+00	.3640+00	.3280+00	.3250+00	.3900+00	.4270+00
CONS.-ROOTS-TOTAL	.2550+00	.2760+00	.2330+00	.2820+00	.2580+00	.2040+00	.1650+00	.1100+00	.8300-01
CONS.-UNDERSTORY	.2550+00	.2760+00	.2330+00	.2820+00	.2580+00	.2040+00	.1650+00	.1100+00	.8300-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.2420+00	.2460+00	.2580+00	.2560+00	.3120+00	.2790+00	.2490+00	.2530+00	.2510+00
LITTERFALL-TOTAL	.1209+01	.1260+01	.1352+01	.1387+01	.1495+01	.1348+01	.1245+01	.1800-01	.1135+01
LITTERFALL-LEAF	.1115+01	.1153+01	.1229+01	.1260+01	.1368+01	.1240+01	.1150+01	.1090+01	.1057+01
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.4700-01	.5200-01	.5500-01	.5300-01	.4700-01	.3400-01	.3200-01		.1300-01
LITTERFALL-BOLE	.4700-01	.5500-01	.6800-01	.7400-01	.8000-01	.7400-01	.6300-01	.6200-01	.5500-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00	.1000+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**		**	**	**	**
STEM FLOW	.2800+00	.2900+00	.3100+00	.2900+00		.2800+00	.2600+00	.2400+00	.1800+00
LEACHING- SOIL LAYERS	.2180+00	.2230+00	.2400+00	.2140+00	.1980+00	.1950+00	.1840+00	.2100+00	.1640+00
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF POTASSIUM(K) IN UNITS OF GRAM/SQ.METER/YEAR

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	FINLAND HAVAS	MALAYSIA BULLOCK	MANAUS KLINGE,R ODRIGUEZ	EUCALYPTUS ATTIWILL
CONSUMPTION-TOTAL				
CONS.-FOLIAGE-TOTAL				
CONS.-OVERSTORY				
CONS.-WOOD-OVERSTORY				
CONS.-WOOD-UNDERSTORY				
CONS.-ROOTS-TOTAL				
CONS.-UNDERSTORY				
CONS.-HERBACEOUS				
CONS.-WOOD-TOTAL				
LITTERFALL-TOTAL	.9800+00			.2650+00
LITTERFALL-LEAF	.5500+00	.8034+01	.9350+00	
LITTERFALL-FLOWER,FRUIT			.1400+00	
LITTERFALL-BRANCH	**	.5590+00	.1300+00	.9600-01
LITTERFALL-BOLE	.6000-02	.7680+00		.1180+00
LITTERFALL-GRASS				
LITTERFALL-EPIPHYTS				.6700-01
ATMOSPHERIC INPUT				
PRECIPITATION	.2000+00	**		
DRY PARTICULATES(DUST)		.9990+00		
GASEOUS FIXATION				
LEACHING				
LEAF WASH		**		.1136+01
STEM FLOW		.4039+01		
LEACHING- SOIL LAYERS				
OUTPUT				
OUTPUT-WIND EROSION				
OUTPUT-WATER EROSION				
OUTPUT-PERCOLATION				

@FIN

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CALCIUM(CA) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	ROUGUET LOSSAINT RAPP	BAB BISKUP-SKY	SOLLING B1	SOLLING B3	SOLLING B4	WESTERVN THAMDRUP ET AL	LANGAWOD BEECH 2 LINDGREN
OVERSTORY LEAVES	.7495+01	.4190+01	.7000+01		.1111+01	.1747+01	.1431+01	.2400+01	**
FRUITS.FLOWERS	.3520+00			.1990+00					.2000+01
BRANCHES-SUM	.7150+02	.1374+02	.4570+02		.7661+01	.6846+01	.1181+02	.3400+02	.2580+02
BRANCHES-BARK		.1010+02			.6265+01	.4212+01	.7821+01		
BRANCHES-WOOD		.3640+01			.2396+01	.2656+01	.3994+01		
BOLE-SUM	.8780+02	.3010+02	.3290+03		.2152+02	.2163+02	.1911+02	.4330+02	.2000+02
BOLE-BARK		.2216+02			.9634+01	.8513+01	.6738+01	.2080+02	.1120+02
BOLE-WOOD		.7940+01			.1189+02	.1312+02	.1237+02	.2250+02	.8800+01
STANDING DEAD	.4310+01	.2170+01	0.						
SUM-OVERSTORY	.1716+03		.3817+03		.3050+02	.3020+02	.3260+02	.7970+02	
UNDERSTORY-LEAVES	.7300+00	.1140+01	.1200+00						0.
UND. FRUITS.FLOWERS	.6440+01								0.
UND. BRANCHES-SUM	.1390+01	.2230+01							0.
UND. BRANCHES-BARK			**						0.
UND. BRANCHES-WOOD			.2900+00						0.
UND. BOLE-SUM	.3520+01	.2710+01	0.						0.
UND. BOLE-BARK			0.						0.
UND. BOLE-WOOD			0.						0.
UND. STANDING DEAD		.2600+00	0.						0.
SUM-UNDERSTORY	.6696+01		.4100+00					.1700+01	0.
HERBACEOUS (FIELD)	.7210+00	.6100+00						.2000+00	
EPIPHYTES-TOTAL									
TOTAL PLANTS	.1294+03		.3821+03					.8160+02	.4780+02
LIVING ROOTS-SUM	.1280+02	.2353+02	.1147+02		.4600+01			.2540+02	
LIVING ROOTS >5 MM	.5200+01	.1430+02	.1147+02		.4028+01	.2568+01	.2765+01	.1510+02	
LIVING ROOTS 2-5 MM		.2720+01						**	
LIVING ROOTS <5 MM	.7600+01	.6390+01			.5844+00			.1030+02	
DEAD ROOTS	.1890+01	.7370+01							
SOIL TOP ORGANIC	.1056+02	.1010+02	.3612+02		.9100+01	.1180+02	.8600+01	.8300+01	.5600+01
ROOTING ZONE	.3784+03							.2310+03	
INTENSIVE ROOTED		.2094+02			.2680+02	.2800+02	.2450+02		
EXTENSIVE ROOTED		.1557+03							
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS	.4000-03	.8000-02							
DECOMPOSER FAUNA	.3450-01	.5000+00							
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CALCIUM(CA) IN UNITS OF GRAMS/SQ.METER

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	KONGLUND BEECH I NIHLGARD	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SHIGAYMA KITAZAWA	SOLLING FI
OVERSTORY LEAVES	**	**	**	.2310+01	.7400+01	.1700+01	.1280+01		.7026+01
FRUITS.FLOWERS	.2000+01	.3000+01	.4200+01						
BRANCHES-SUM	.3810+02	.8200+01	.3860+02	.2217+02	.1090+02	.2800+01	.2260+01		.7469+01
BRANCHES-BARK									.1137+01
BRANCHES-WOOD									.6347+01
BOLE-SUM	.2010+02	.4470+02	.4810+02	.3482+02	.1220+02	.1120+02	.5050+01		.2476+02
BOLE-BARK	.9000+01	.2470+02	.2750+02			.3800+01			.1381+02
BOLE-WOOD	.1110+02	.2000+02	.2040+02			.7400+01			.1295+02
STANDING DEAD						.3000+01			
SUM-OVERSTORY						.1870+02	.8590+01		.4130+02
UNDERSTORY-LEAVES	0.		0.						
UND. FRUITS.FLOWERS	0.		0.						
UND. BRANCHES-SUM	0.		0.						
UND. BRANCHES-BARK	0.		0.						
UND. BRANCHES-WOOD	0.		0.						
UND. BOLE-SUM	0.		0.						
UND. BOLE-BARK	0.		0.						
UND. BOLE-WOOD	0.		0.						
UND. STANDING DEAD	0.		0.						
SUM-UNDERSTORY	0.		0.						0.
HERBACEOUS (FIELD)	.9000-01	.6600-01	.1580+01		.9000+00				
EPIPHYTES-TOTAL									
TOTAL PLANTS	.4030+02		.9240+02	.6280+01			.8590+01		
LIVING ROOTS-SUM	.4200+01	.1720+02			.3700+01	.6200+01	.3300+01		
LIVING ROOTS >5 MM	.3300+01	.1420+02							
LIVING ROOTS 2-5 MM	**	**							
LIVING ROOTS <5 MM	.9000+00	.3000+01							
DEAD ROOTS									
SOIL TOP ORGANIC	.3420+01	.6892+01	.6310+01	.4730+02	.1370+02	.2799+03		.1442+02	.8300+01
ROOTING ZONE				.6000+03	.7410+02	.9000+02			
INTENSIVE ROOTED									.2830+02
EXTENSIVE ROOTED									
SUBSOIL				.7000+03		.1899+03			
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CALCIUM(CA) IN UNITS OF GRAMS/SQ.METER

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	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIHLGARD	N.TAIGA RUDNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.4974+01	.6050+01	**	.7278+01	.6000+01	.6040+01	.8354+01	.9900+01	.8475+01
FRUITS,FLOWERS			.6000+00						
BRANCHES-SUM	.4530+01	.3534+01	.8600+01	.1147+02	.9635+01	.2673+01	.3480+01	.3994+01	.3606+01
BRANCHES-BARK	.9925+00	.7890+00							
BRANCHES-WOOD	.5541+01	.2745+01							
BOLE-SUM	.2641+02	.1954+02	.2830+02	.9780+01	.3033+02	.3460+01	.5800+01	.4460+01	.9270+01
BOLE-BARK	.1363+02	.9847+01	.1680+02			.1484+01	.2290+01	.3030+01	.3160+01
BOLE-WOOD	.1278+02	.9694+01	.1150+02			.1976+01	.3510+01	.5650+01	.6110+01
STANDING DEAD						.4100+00	.7400+00	.9550+00	.1053+01
SUM-OVERSTORY	.3800+02	.2920+02				.1268+02	.1821+02	.2353+02	.2280+02
UNDERSTORY-LEAVES			0.			0.	0.	0.	0.
UND. FRUITS,FLOWERS			0.			0.	0.	0.	0.
UND. BRANCHES-SUM			0.			0.	0.	0.	0.
UND. BRANCHES-BARK			0.			0.	0.	0.	0.
UND. BRANCHES-WOOD			0.			0.	0.	0.	0.
UND. BOLE-SUM			0.			0.	0.	0.	0.
UND. BOLE-BARK			0.			0.	0.	0.	0.
UND. BOLE-WOOD			0.			0.	0.	0.	0.
UND. STANDING DEAD			0.			0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.			0.	0.	0.	0.
HERBACEOUS (FIELD)				.1427+01		.4610+00	.8600+00	.9680+00	.8470+00
EPIPHYTES-TOTAL				.2590+00					
TOTAL PLANTS			.4590+02			.1304+02	.1907+02	.2450+02	.2365+02
LIVING ROOTS-SUM			.4500+01	.9994+01		.1883+01	.2652+01	.3391+01	.3532+01
LIVING ROOTS >5 MM			.3700+01			.1419+01	.2124+01	.2783+01	.2924+01
LIVING ROOTS 2-5 MM			**			.2340+00	.3120+00	.3700+00	.3870+00
LIVING ROOTS <5 MM			.8000+00			.2280+00	.2160+00	.2380+00	.2210+00
DEAD ROOTS						.2280+00	.3370+00	.3740+00	.3750+00
SOIL TOP ORGANIC	.2480+02	.7200+01	.4790+01			.1077+02	.1580+02	.8837+01	.2657+02
ROOTING ZONE									
INTENSIVE ROOTED	.1600+02	.1700+02							
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CALCIUM(CA) IN UNITS OF GRAMS/SQ.METER

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	SITE 5 KAZIMOV MORDOVA	SITE 6 KAZIMOV MORDOVA	SITE 7 KAZIMOV MORDOVA	SITE 8 KAZIMOV MORDOVA	SITE 9 KAZIMOV MORDOVA	SITE 10 KAZIMOV MORDOVA	SITE 11 KAZIMOV MORDOVA	SITE 12 KAZIMOV MORDOVA	SITE 13 KAZIMOV MORDOVA
OVERSTORY LEAVES	.7989+01	.6830+01	.4094+01	.5340+01	.8830+01	.9510+01	.1058+02	.1116+02	.1106+02
FRUITS,FLOWERS								.5000-01	.1700-01
BRANCHES-SUM	.3655+01	.3080+01	.2734+01	.2400+01	.3920+01	.4480+01	.5250+01	.5580+01	.6220+01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.1033+02	.3990+01	.4680+01	.2500+01	.7610+01	.1013+02	.1319+02	.1908+02	.2088+02
BOLE-BARK	.3122+01	.1590+01	.1630+01	.9000+00	.2670+01	.3480+01	.4900+01	.6260+01	.6700+01
BOLE-WOOD	.7210+01	.2450+01	.3050+01	.1600+01	.4990+01	.6670+01	.8790+01	.1282+02	.1418+02
STANDING DEAD	.1082+01	.5190+00	.6120+00	.1900+00	.6000+00	.7500+00	.1000+01	.1240+01	.1460+01
SUM-OVERSTORY	.2306+02	.1491+02	.1398+02	.1093+02	.2096+02	.2487+02	.2997+02	.3719+02	.3979+02
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.4990+00	.2163+01	.2905+01	.8900+00	.1090+01	.1050+01	.1250+01	.1280+01	.2010+01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.2376+02	.1658+02	.1638+02	.1132+02	.2200+02	.2592+02	.3142+02	.3839+02	.4180+02
LIVING ROOTS-SUM	.4547+01	.2332+01	.2225+01	.1790+01	.3950+01	.4420+01	.6050+01	.8150+01	.9300+01
LIVING ROOTS >5 MM	.3946+01	.1823+01	.1783+01	.1310+01	.3220+01	.3580+01	.4980+01	.6840+01	.7790+01
LIVING ROOTS 2-5 MM	.3760+00	.2690+00	.2500+00	.2400+00	.4300+00	.5000+00	.6500+00	.7900+00	.9100+00
LIVING ROOTS <5 MM	.2250+00	.2450+00	.1920+00	.1900+00	.3000+00	.3400+00	.4200+00	.5200+00	.6000+00
DEAD ROOTS	.4770+00	.3010+00	.2780+00	.1300+00	.3100+00	.3300+00	.4600+00	.6300+00	.6300+00
SOIL TOP ORGANIC	.1620+02	.1631+02	.1080+03	.7760+01	.8250+01	.6550+01	.9800+01	.1090+02	.1140+02
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF CALCIUM(CA) IN UNITS OF GRAMS/SQ.METER

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	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	CHAKIA BANDHU	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES	.1048+02	.9410+01	.7860+01	.7180+01	.4060+01	.9024+01	.8340+01	.2350+01
FRUITS,FLOWERS	.9300+00	.2500+00	.2800+00	.2600+00			.1000+00	
BRANCHES-SUM	.4110+01	.6520+01	.6190+01	.6330+01	.5010+01	.5745+02	.9951+02	.6920+01
BRANCHES-BARK								
BRANCHES-WOOD								
BOLE-SUM	.2844+02	.2970+02	.3312+02	.3168+02	.1558+02	.1644+03	.1921+03	.2170+02
BOLE-BARK	.9040+01	.9500+01	.1040+02	.9880+01				.1892+02
BOLE-WOOD	.1940+02	.2020+02	.2272+02	.2180+02				.2780+01
STANDING DEAD	.1440+01	.1280+01	.1280+01	.1340+01	.4600+00			
SUM-OVERSTORY	.4670+02	.4716+02	.4864+02	.4679+02	.2540+02		.2951+03	.3097+02
UNDERSTORY-LEAVES	0.	0.	0.	0.	.1000-02		.2400+00	
UND. FRUITS,FLOWERS	0.	0.	0.	0.				
UND. BRANCHES-SUM	0.	0.	0.	0.			.3200+01	
UND. BRANCHES-BARK	0.	0.	0.	0.				
UND. BRANCHES-WOOD	0.	0.	0.	0.				
UND. BOLE-SUM	0.	0.	0.	0.			.1930+01	
UND. BOLE-BARK	0.	0.	0.	0.				
UND. BOLE-WOOD	0.	0.	0.	0.				
UND. STANDING DEAD	0.	0.	0.	0.				
SUM-UNDERSTORY	0.	0.	0.	0.			.5130+01	.2660+01
HERBACEOUS (FIELD)	.1860+01	.2090+01	.2380+01	.2790+01	.2100+01			
EPIPHYTES-TOTAL								
TOTAL PLANTS	.4856+02	.4925+02	.5104+02	.4953+02			.3002+03	
LIVING ROOTS-SUM	.1148+02	.1240+02	.1288+02	.1330+02	.7700+01	.3162+02	.4907+03	.7320+01
LIVING ROOTS >5 MM	.9770+01	.1087+02	.1106+02	.1135+02				
LIVING ROOTS 2-5 MM	.1050+01	.1080+01	.1150+01	.1270+01				
LIVING ROOTS <5 MM	.6600+00	.6590+00	.6800+00	.6800+00				
DEAD ROOTS	.5800+00	.5500+00	.5000+00	.6500+00				
SOIL TOP ORGANIC	.1320+02	.1460+02	.1580+02	.1790+02	.2070+02			.6390+01
ROOTING ZONE								
INTENSIVE ROOTED							.8040+03	
EXTENSIVE ROOTED							.4821+03	
SUBSOIL								
HETEROTROPHS-SUM								
ABOVEGROUND CONSUMERS								
DECOMPOSER FAUNA								
DECOMPOSER FLORA								

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	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING B1	SOLLING B3	SOLLING B4	HESTEMVN THAMDRUP ET AL	LANGAMOD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIMLGARD
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.4200+00	.3940+00	.2170+01	.1872+00	.1180+00	.2820+00	**	**	**
BRANCHES-BARK		.2800+00		.1276+00	.7245-01	.1666+00	**	**	**
BRANCHES-WOOD		.9400-01		.5755-01	.4594-01	.9516-01	**	**	**
BOLE-SUM	.1840+01	.8900+00	.2100+01	.5848+00	.9660+00	.1332+01	**	**	**
BOLE-BARK		.6400+00		.2611+00	.3880+00	.4693+00	**	**	**
BOLE-WOOD		.2300+00		.3237+00	.5980+00	.8623+00	**	.1600+01	.2480+01
STANDING DEAD		.6100-01					.4000+01		
SUM-OVERSTORY	.2260+01								
UNDERSTORY-LEAVES								0.	0.
UND. FRUITS,FLOWERS								0.	0.
UND. BRANCHES-SUM	.1300-01							0.	0.
UND. BRANCHES-BARK								0.	0.
UND. BRANCHES-WOOD								0.	0.
UND. BOLE-SUM	.3600-01							0.	0.
UND. BOLE-BARK								0.	0.
UND. BOLE-WOOD								0.	0.
UND. STANDING DEAD								0.	0.
SUM-UNDERSTORY	.4900-01							0.	0.
HERBACEOUS (FIELD)		.2200+00					.6500+00		
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.1310+00	.1428+01					.1400+01		
LIVING ROOTS >5 MM	.6600-01	.8560+00		.1033+00	.7361-01	.1469+00			
LIVING ROOTS 2-5 MM	.6600-01	.1790+00							
LIVING ROOTS <5 MM		.3960+00							
DEAD ROOTS									
SOIL TOP ORGANIC	.1500-01								
ROOTING ZONE	.1790+00								
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA		.9700+00							

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	LINNEBJR ANDERS-SON	OVED LINDGREN NIMLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3
OVERSTORY LEAVES			.2000-02	.3200+00		.6400-01			
FRUITS,FLOWERS									
BRANCHES-SUM	**	**	.7000-01	.2200+00	.3600+00	.1526+00	.1600+00	.1038+00	.1183+00
BRANCHES-BARK	**	**					.2420-01	.1585-01	.2639-01
BRANCHES-WOOD	**	**					.1358+00	.8787-01	.9171-01
BOLE-SUM	**	**	.9100-01		.3800+00	.6440+00	.7230+00	.5400+00	.9100+00
BOLE-BARK	**	**		.2000+00			.3733+00	.2785+00	.4590+00
BOLE-WOOD	.2030+01	.3160+01		.2000+00			.3501+00	.2615+00	.4514+00
STANDING DEAD									
SUM-OVERSTORY					.7400+00	.6600+00	.2030+01	.1460+01	.2000+01
UNDERSTORY-LEAVES		0.							
UND. FRUITS,FLOWERS		0.							
UND. BRANCHES-SUM		0.							
UND. BRANCHES-BARK		0.							
UND. BRANCHES-WOOD		0.							
UND. BOLE-SUM		0.							
UND. BOLE-BARK		0.							
UND. BOLE-WOOD		0.							
UND. STANDING DEAD		0.							
SUM-UNDERSTORY		0.							
HERBACEOUS (FIELD)			0.						
EPIPHYTES-TOTAL			0.						
TOTAL PLANTS						.8600+00			
LIVING ROOTS-SUM				.1000+00	.3000+00	.2490+00			
LIVING ROOTS >5 MM									
LIVING ROOTS 2-5 MM									
LIVING ROOTS <5 MM									
DEAD ROOTS									
SOIL TOP ORGANIC			0.	.1100+00					
ROOTING ZONE			0.	-.1150+01					
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL			0.						
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA			0.						
DECOMPOSER FLORA			0.						

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF CALCIUM(CA) IN UNITS OF GRAM/SQ.M

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	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIMIROV MORDZOVA	SITE 2 KAZIMIROV MORDZOVA	SITE 3 KAZIMIROV MORDZOVA	SITE 4 KAZIMIROV MORDZOVA	SITE 5 KAZIMIROV MORDZOVA	SITE 6 KAZIMIROV MORDZOVA	SITE 7 KAZIMIROV MORDZOVA	SITE 8 KAZIMIROV MORDZOVA
OVERSTORY LEAVES FRUITS,FLOWERS		.8500-01	.1330+00	.1650+00	.1390+00	.1310+00	.1040+00	.9600-01	.2910+00
BRANCHES-SUM	**	.4700-01	.6600-01	.1700-01	.7600-01	.8100-01	.5700-01	.4900-01	.1070+00
BRANCHES-BARK	**								
BRANCHES-WOOD	**								
BOLE-SUM	**	.1960+00	.3010+00	.3690+00	.3790+00	.3970+00	.2260+00	.2470+00	.2120+00
BOLE-BARK	**	.8700-01	.1120+00	.1300+00	.1250+00	.1240+00	.8900-01	.8600-01	.7600-01
BOLE-WOOD	.1200+01	.1090+00	.1890+00	.2390+00	.2540+00	.2730+00	.1390+00	.1590+00	.1360+00
STANDING DEAD		.8000-02	.1500-01	.1900-01	.2000-01	.2000-01	.1000-01	.1200-01	.2900-01
SUM-OVERSTORY		.3360+00	.5150+00	.6300+00	.6140+00	.6290+00	.3990+00	.4040+00	.6390+00
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)		.1100-01	.2600-01	.2000-01	.1300-01	.8000-02	.4000-01	.1300-01	.6000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS		.3470+00	.5410+00	.6500+00	.6270+00	.6370+00	.4390+00	.4170+00	.6470+00
LIVING ROOTS-SUM		.7600-01	.9600-01	.1120+00	.1130+00	.1180+00	.8300-01	.7700-01	.1120+00
LIVING ROOTS >5 MM		.5700-01	.7400-01	.8900-01	.9900-01	.9800-01	.6400-01	.6100-01	.8200-01
LIVING ROOTS 2-5 MM		.1000-01	.1300-01	.1400-01	.1110-01	.1280-01	.1000-01	.9000-02	.1700-01
LIVING ROOTS <5 MM		.9000-02	.9000-02	.9000-02	.8000-02	.8000-02	.9000-02	.7000-02	.1300-01
DEAD ROOTS		.5000-02	.7000-02	.8000-02	.8000-02	.8000-02	.6000-02	.6000-02	.1800-01
SOIL TOP ORGANIC		.4200-01	.9300-01	.5800-01	.1510+00	.7100-01	.6800-01	.3550+00	.4900-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.2040+00	.1360+00	.6800-01		-.1900-01	-.3900-01	-.4800-01	-.5800-01	-.7800-01
FRUITS,FLOWERS				.8000-02	.6000-02	.3000-02	.2000-02	.1000-02	
BRANCHES-SUM	.8900-01	.7000-01	.6500-01	.3300-01	.2200-01	.1500-01	.7000-02	.4000-02	.4000-02
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.3330+00	.3710+00	.3870+00	.3670+00	.3130+00	.2340+00	.1150+00	.7400-01	.9000-02
BOLE-BARK	.1160+00	.1260+00	.1300+00	.1210+00	.1010+00	.7400-01	.6500-01	.2400-01	.3000-02
BOLE-WOOD	.2170+00	.2450+00	.2570+00	.2460+00	.2120+00	.1600+00	.1200+00	.5000-01	.6000-02
STANDING DEAD	.3000-01	.2500-01	.1900-01	.1100-01	.5000-02	.1000-02	-.2000-02	-.3000-02	-.4000-02
SUM-OVERSTORY	.6560+00	.6020+00	.5290+00	.4190+00	.3290+00	.2040+00	.1340+00	.1800-01	-.6900-01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.8000-02	.9000-02	.1100-01	.1300-01	.1600-01	.1600-01	.2000-01	.2200-01	.2600-01
EPIPHYTES-TOTAL									
TOTAL PLANTS	.6640+00	.6110+00	.5400+00	.4320+00	.3450+00	.2200+00	.1540+00	.4000-01	-.4300-01
LIVING ROOTS-SUM	.1340+00	.1460+00	.1480+00	.1400+00	.1180+00	.7000-01	.4200-01	.1700-01	.6000-02
LIVING ROOTS >5 MM	.1080+00	.1170+00	.1220+00	.1170+00	.1000+00	.5900-01	.3600-01	.1400-01	.5000-02
LIVING ROOTS 2-5 MM	.1600-01	.1800-01	.1600-01	.1400-01	.1100-01	.7000-02	.4000-02	.2000-02	.1000-02
LIVING ROOTS <5 MM	.1000-01	.1100-01	.1000-01	.9000-02	.7000-02	.4000-02	.2000-03	.1000-02	
DEAD ROOTS	.1500-01	.1300-01	.8000-02	.4000-02	.2000-02	0.	0.	0.	-.2000-02
SOIL TOP ORGANIC	.5400-01	.6300-01	.7200-01	.8600-01	.9000-01	.9400-01	.9400-01	.9000-01	.9000-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF CALCIUM(CA) IN UNITS OF GRAM/50.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	FINLAND HAVAS	CHAKIA BANDHU	EUCALYP-TUS ATTI-ILL
OVERSTORY LEAVES FRUITS,FLOWERS			.2700-01
BRANCHES-SUM	.1310+01	.2550+01	.1880+00
BRANCHES-BARK			
BRANCHES-WOOD			
BOLE-SUM	.1000-01	.6050+01	.1980+00
BOLE-BARK			.1730+00
BOLE-WOOD			.2500-01
STANDING DEAD	.1000-01		
SUM-OVERSTORY			.4130+00
UNDERSTORY-LEAVES			
UND. FRUITS,FLO-ERS			
UND. BRANCHES-SUM			
UND. BRANCHES-BARK			
UND. BRANCHES-WOOD			
UND. BOLE-SUM			
UND. BOLE-BARK			
UND. BOLE-WOOD			
UND. STANDING DEAD			
SUM-UNDERSTORY			
HERBACEOUS (FIELD)			
EPIPHYTES-TOTAL			
TOTAL PLANTS			
LIVING ROOTS-SUM			
LIVING ROOTS >5 MM			
LIVING ROOTS 2-5 MM			
LIVING ROOTS <5 MM			
DEAD ROOTS			
SOIL TOP ORGANIC		**	
ROOTING ZONE		**	
INTENSIVE ROOTED		**	
EXTENSIVE ROOTED			
SUBSOIL			
HETEROTROPHS-SUM			
ABOVEGROUND CONSUMERS			
DECOMPOSER FAUNA			
DECOMPOSER FLORA			

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CALCIUM(CA) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OAKRIDGE REICHLE SHUGART	MEATHOP SATCHELL	ROUQUET LOSSAINT RAFF	SOLLING B1	SOLLING B3	SOLLING B4	HESTEHVN THAMDRUP ET AL	LANGARDD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD
CONSUMPTION-TOTAL	.3200+00								
CONS.-FOLIAGE-TOTAL				.6785-01	.9422-01	.7749-01			
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.9902+01		.6390+01				.3595+01	.2930+01	.3170+01
LITTERFALL-LEAF	.7773+01	.5920+01	.4090+01	.1624+01	.1783+01	.1726+01	.2942+01	.2180+01	
LITTERFALL-FLOWER,FRUIT	.4090+00	.1800+00	.5300+00				.5700-01	.2110+00	
LITTERFALL-BRANCH	.7610+00	.1300+01	.1790+01				.2350+00	.5330+00	
LITTERFALL-BOLE	.8590+00	.9300+00					.3640+00		
LITTERFALL-GRASS	.3200+00	.5900+00							
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.1051+00	.6900+00	.1170+01	.1260+01			.1320+01	.4500+00	.3500+00
DRY PARTICULATES(DUST)	.9459+00								
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.1403+01	.2280+01		.2200+01			.1200+01	**	**
STEM FLOW	.4200-01	.5200+00	.2330+01	.4270+00			.1700+00	.1600+00	.6600+00
LEACHING- SOIL LAYERS	.2740+01		.7800+00						
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION		.5980+01		.8400+00					

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CALCIUM(CA) IN UNITS OF GRAM/SQ.METER/YEAR

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	LINNEBJR ANDERS-SON	OVED LINDGREN NIHLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR BESSEL	DUKE FOREST MURPHY	SHIGAYMA KITAZAWA	SOLLING F1	SOLLING F3	SOLLING F2
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL									
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL	.4140+01	.6750+01	.6730+01	.1110+01	.2617+01	.2404+01	.1700+01		
LITTERFALL-LEAF	.2550+01	.5030+01	.4639+01			.1374+01	.1417+01	.1290+01	.1357+01
LITTERFALL-FLOWER,FRUIT	.8200+00	.5400+00	.2060+00			.8800-02			
LITTERFALL-BRANCH	.7740+00	.1130+01	.1440+01			.3029+00	.1993+00		
LITTERFALL-BOLE			.3370+00						
LITTERFALL-GRASS						.6860-01			
LITTERFALL-EPIPHYTS			.4600-01			.2580-01			
ATMOSPHERIC INPUT									
PRECIPITATION	.5330+00	.4100+00	.2330+00	.2800+00			.1260+01		
DRY PARTICULATES(DUST)					.2910+00				
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	.2300+00	.3500+00	.4510+00		.3160+01		
STEM FLOW	.1095+01	.7500+00		.1100+00					
LEACHING- SOIL LAYERS									
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION			.5032+01	.4500+00					

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CALCIUM(CA) IN UNITS OF GRAM/SQ.METER/YEAR

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	KONGLUND SPRUCE NIHLGARD	SITE 1 KAZIM*OV MOROZOVA	SITE 2 KAZIM*OV MOROZOVA	SITE 3 KAZIM*OV MOROZOVA	SITE 4 KAZIM*OV MOROZOVA	SITE 5 KAZIM*OV MOROZOVA	SITE 6 KAZIM*OV MOROZOVA	SITE 7 KAZIM*OV MOROZOVA	SITE 8 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL		.2035+01	.3319+01	.4104+01	.4224+01	.4420+01	.2992+01	.3866+01	.2543+01
CONS.-FOLIAGE-TOTAL		.1513+01	.2490+01	.3030+01	.3135+01	.3256+01	.2249+01	.3093+01	.1938+01
CONS.-OVERSTORY		.1442+01	.2328+01	.2865+01	.2974+01	.3155+01	.1904+01	.1933+01	.1679+01
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY		.7100-01	.1620+00	.1670+00	.1610+00	.1010+00	.4450+00	.1100+01	.1530+00
CONS.-ROOTS-TOTAL		.3950+00	.6300+00	.7730+00	.7890+00	.8290+00	.4790+00	.5040+00	.4550+00
CONS.-UNDERSTORY		.3950+00	.6300+00	.7730+00	.7890+00	.8290+00	.4790+00	.5040+00	.4550+00
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL		.1270+00	.1990+00	.2990+00	.3000+00	.3350+00	.1640+00	.2690+00	.2500+00
LITTERFALL-TOTAL	.1980+01	.1571+01	.2601+01	.3179+01	.3320+01	.3464+01	.2372+01	.3195+01	.1677+01
LITTERFALL-LEAF		.1419+01	.2339+01	.2852+01	.2987+01	.3113+01	.2119+01	.2977+01	.1541+01
LITTERFALL-FLOWER+FRUIT									
LITTERFALL-BRANCH		.6900-01	.1140+00	.1360+00	.1350+00	.1340+00	.9100-01	.8600-01	.8900-01
LITTERFALL-BOLE		.8300-01	.1490+00	.1910+00	.1990+00	.2170+00	.1070+00	.1220+00	.4700-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.3500+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**	**	**	**	**	**
STEM FLOW	.1390+01	.2400+00	.3500+00	.4600+00	.5300+00	.5900+00	.3700+00	.5600+00	.4500+00
LEACHING- SOIL LAYERS			.2000+00	.2100+00	.3000+00	.4000+00			.2100+00
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CALCIUM(CA) IN UNITS OF GRAM/SQ.METER/YEAR

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	SITE 9 KAZIM*OV MOROZOVA	SITE 10 KAZIM*OV MOROZOVA	SITE 11 KAZIM*OV MOROZOVA	SITE 12 KAZIM*OV MOROZOVA	SITE 13 KAZIM*OV MOROZOVA	SITE 14 KAZIM*OV MOROZOVA	SITE 15 KAZIM*OV MOROZOVA	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA
CONSUMPTION-TOTAL	.3713+01	.3361+01	.4153+01	.4208+01	.4113+01	.3626+01	.3266+01	.2911+01	.2572+01
CONS.-FOLIAGE-TOTAL	.2703+01	.2860+01	.2939+01	.3062+01	.3013+01	.2711+01	.2497+01	.2208+01	.2054+01
CONS.-OVERSTORY	.2511+01	.2679+01	.2912+01	.2979+01	.2931+01	.2425+01	.2192+01	.1946+01	.1647+01
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.1920+00	.1820+00	.1870+00	.1940+00	.3220+00	.2860+00	.3050+00	.3620+00	.4070+00
CONS.-ROOTS-TOTAL	.6750+00	.7310+00	.7710+00	.7420+00	.6740+00	.5340+00	.4350+00	.2900+00	.2170+00
CONS.-UNDERSTORY	.6750+00	.7310+00	.7710+00	.7420+00	.6740+00	.5340+00	.4350+00	.2900+00	.2170+00
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.3350+00	.3700+00	.3930+00	.4040+00	.4320+00	.3810+00	.3330+00	.3130+00	.3010+00
LITTERFALL-TOTAL	.2747+01	.3007+01	.3253+01	.3396+01	.3361+01	.3024+01	.2774+01	.2462+01	.2319+01
LITTERFALL-LEAF	.2494+01	.2717+01	.2924+01	.3053+01	.3022+01	.2739+01	.2530+01	.2250+01	.2115+01
LITTERFALL-FLOWER+FRUIT									
LITTERFALL-BRANCH	.1330+00	.1480+00	.1550+00	.1520+00	.1330+00	.9600-01	.9200-01	.5200-01	.3700-01
LITTERFALL-BOLE	.1200+00	.1420+00	.1740+00	.1910+00	.2060+00	.1890+00	.1670+00	.1600+00	.1670+00
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00	.2300+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	**	**	**		**	**	**	**
STEM FLOW	.4600+00	.4800+00	.4500+00	.4400+00		.3700+00	.3300+00	.2930+00	.2100+00
LEACHING- SOIL LAYERS	.2310+00	.2310+00	.2240+00	.2320+00	.2320+00	.1870+00	.2030+00	.1940+00	.1820+00
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF CALCIUM(CA) IN UNITS OF GRAM/SQ.METER/YEAR

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	FINLAND HAVAS	MALAYSIA BULLOCK	MANAUS KLINGE,R ODRIGUEZ	CHAKIA BANDHU	EUCALYP-TUS ATTIWILL
CONSUMPTION-TOTAL					
CONS.-FOLIAGE-TOTAL				.4270+00	
CONS.-OVERSTORY				.4170+00	
CONS.-WOOD-OVERSTORY				.1200-01	
CONS.-WOOD-UNDERSTORY					
CONS.-ROOTS-TOTAL					
CONS.-UNDERSTORY					
CONS.-HERBACEOUS					
CONS.-WOOD-TOTAL					
LITTERFALL-TOTAL	.1260+01			.1846+02	.9750+00
LITTERFALL-LEAF	.7800+00	.5492+01	.1236+01	.9330+01	
LITTERFALL-FLOWER,FRUIT			.7500-01	**	
LITTERFALL-BRANCH	**	.2897+01	.6150+00	**	.7320+00
LITTERFALL-BOLE	.1000-01	.3299+01			.2310+00
LITTERFALL-GRASS					
LITTERFALL-EPIPHYTS					.1340+00
ATMOSPHERIC INPUT					
PRECIPITATION	.4500+00	**			.2010+00
DRY PARTICULATES(DUST)		.1274+01			
GASEOUS FIXATION					
LEACHING					
LEAF WASH		**			.6270+00
STEM FLOW		.1890+00			
LEACHING- SOIL LAYERS					
OUTPUT					
OUTPUT-WIND EROSION					
OUTPUT-WATER EROSION					
OUTPUT-PERCOLATION					

WFIN

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF MAGNESIUM(MG) IN UNITS OF GRAMS/SQ.METER

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	MEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	BAB BISKUP-SKY	SOLLING B1	SOLLING B3	SOLLING B4	HESTEMYN THANDRUP ET AL	LANGARDO BLECH 2 LINDGREN	KONGLUND BLECH 1 NIMLGARD
OVERSTORY LEAVES	.9500+00	.9000+00		.2169+00	.2481+00	.2072+00	.4000+00	**	**
FRUITS,FLOWERS			.1490+00					.4700+00	.6800+00
BRANCHES-SUM	.8000+00	.2200+01		.8050+00	.5730+00	.1095+01	.2690+01	.2690+01	.4090+01
BRANCHES-BARK	.2400+00			.2369+00	.1801+00	.3832+00			
BRANCHES-WOOD	.5600+00			.5682+00	.3872+00	.6615+00			
BOLE-SUM	.8500+00	.1170+02		.5670+01	.1793+01	.2380+01	.5360+01	.5350+01	.5700+01
BOLE-BARK	.5600+00			.1857+01	.4094+00	.3301+00	.3700+00	.5200+00	.5500+00
BOLE-WOOD	.1290+01			.4009+01	.1384+01	.2099+01	.4990+01	.4830+01	.5150+01
STANDING DEAD	.1230+00	0.							
SUM-OVERSTORY		.1480+02		.6700+01	.2620+01	.3630+01	.8400+01		
UNDERSTORY-LEAVES	.2400+00	.1000-01						0.	0.
UND. FRUITS,FLOWERS								0.	0.
UND. BRANCHES-SUM	.2500+00							0.	0.
UND. BRANCHES-BARK		**						0.	0.
UND. BRANCHES-WOOD		.1000+00						0.	0.
UND. BOLE-SUM	.3000+00	0.						0.	0.
UND. BOLE-BARK		0.						0.	0.
UND. BOLE-WOOD		0.						0.	0.
UND. STANDING DEAD	.1000-01	0.						0.	0.
SUM-UNDERSTORY		.1100+00					.2000+00	0.	0.
HERBACEOUS (FIELD)	.1800+00						.6000-01		.1000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS		.1491+02					.8660+01	.8510+01	.1096+02
LIVING ROOTS-SUM	.3080+01	.7200+00		.1160+01			.9230+01		.1350+01
LIVING ROOTS >5 MM	.1600+01	.7200+00		.9259+00	.5903+00	.6401+00	.2170+01		.9900+00
LIVING ROOTS 2-5 MM	.3500+00						**		**
LIVING ROOTS <5 MM	.1130+01			.2391+00			.2060+01		.3600+00
DEAD ROOTS	.9300+00								
SOIL TOP ORGANIC	.8100+00	.9400+00		.3400+01	.4400+01	.3300+01	.1050+01	.5200+00	.4800+00
ROOTING ZONE							.2200+01		
INTENSIVE ROOTED	.2830+01			.4000+01	.4500+01	.3800+01			
EXTENSIVE ROOTED	.6320+01								
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA	.4000-01								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF MAGNESIUM(MG) IN UNITS OF GRAMS/SQ.METER

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	LINNEBJR ANDERS-SON	OVED LINDGREN NIMLGARD	ANDREWS EXP.FOR. GRIER	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3
OVERSTORY LEAVES	**	**	.9400+00	.1500+01	.7900+00	.5900+00	.5648+00	.3999+00	.1788+01
FRUITS.FLOWERS	.1000+01	.9700+00							
BRANCHES-SUM	.4000+01	.3920+01		.1000+01	.6100+00	.4900+00	.1971+01	.1720+01	.2116+01
BRANCHES-BARK							.1645+00	.1436+00	.2590+00
BRANCHES-WOOD							.1807+01	.1577+01	.1859+01
BOLE-SUM	.3700+01	.7430+01		.2000+01	.2920+01	.1560+01	.3069+01	.3030+01	.2252+01
BOLE-BARK	.1200+01	.6000+00			.6500+00		.1118+01	.1104+01	.6540+00
BOLE-WOOD	.2500+01	.6830+01			.2270+01		.1961+01	.1926+01	.1594+01
STANDING DEAD					.3000+00				
SUM-OVERSTORY					.4620+01	.2630+01	.5600+01	.5200+01	.6200+01
UNDERSTORY-LEAVES		0.							
UND. FRUITS.FLOWERS		0.							
UND. BRANCHES-SUM		0.							
UND. BRANCHES-BARK		0.							
UND. BRANCHES-WOOD		0.							
UND. BOLE-SUM		0.							
UND. BOLE-BARK		0.							
UND. BOLE-WOOD		0.							
UND. STANDING DEAD		0.							
SUM-UNDERSTORY		0.					0.	0.	0.
HERBACEOUS (FIELD)	.2500-01	.3100+00		.1800+00					
EPIPHYTES-TOTAL									
TOTAL PLANTS		.1213+02				.2630+01			
LIVING ROOTS-SUM	.2700+01			.6000+00	.2190+01	.1390+01			
LIVING ROOTS >5 MM	.1700+01								
LIVING ROOTS 2-5 MM	**								
LIVING ROOTS <5 MM	.1000+01								
DEAD ROOTS									
SOIL TOP ORGANIC	.8650+00	.2800+00	.8000+01	.4000+01	.4290+02		.2000+01	.4600+01	.4400+01
ROOTING ZONE			.4300+03	.1090+02	.1150+02				
INTENSIVE ROOTED							.3500+01	.3800+01	.3600+01
EXTENSIVE ROOTED									
SUBSOIL			.3900+03		.4090+02				
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF MAGNESIUM(MG) IN UNITS OF GRAMS/SQ.METER

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	KONGLUND SPRUCE NIHLGARD	N.TAIGA RODNEVA ET AL	TAIGA KARPOV, RODIN	SITE 1 KAZIMIROV MOROZOVA	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	**	.1312+01	.1126+01	.1140+01	.1392+01	.1428+01	.1295+01	.1065+01	.1170+01
FRUITS,FLOWERS	.2500+00								
BRANCHES-SUM	.1820+01	.1032+01	.1410+01	.4080+00	.5340+00	.5440+00	.5760+00	.5670+00	.4440+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.3890+01	.1956+01	.3370+01	.3300+00	.5800+00	.9640+00	.1168+01	.1438+01	.9200+00
BOLE-BARK	.2140+01			.1370+00	.2240+00	.3560+00	.3710+00	.4770+00	.1560+00
BOLE-WOOD	.1750+01			.1910+00	.3560+00	.6080+00	.7970+00	.9610+00	.2620+00
STANDING DEAD				.4100-01	.7400-01	.1060+00	.1240+00	.1500+00	.5400-01
SUM-OVERSTORY				.1919+01	.2580+01	.3042+01	.3112+01	.3210+01	.2088+01
UNDERSTORY-LEAVES	0.			0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.			0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.			0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.			0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.			0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.			0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)		.3840+00		.3690+00	.2120+00	.1990+00	.1570+00	.1220+00	.3640+00
EPIPHYTES-TOTAL		.6100-01							
TOTAL PLANTS	.6920+01			.2288+01	.2792+01	.3241+01	.3269+01	.3332+01	.2952+01
LIVING ROOTS-SUM	.1050+01	.2290+01		.3260+00	.3730+00	.4850+00	.4210+00	.4380+00	.3050+00
LIVING ROOTS >5 MM	.4900+00			.2320+00	.2950+00	.4070+00	.3490+00	.3990+00	.2190+00
LIVING ROOTS 2-5 MM	**			.4600-01	.4200-01	.4300-01	.4500-01	.5500-01	.4400-01
LIVING ROOTS <5 MM	.1400+00			.4800-01	.3600-01	.3500-01	.2700-01	.3400-01	.4200-01
DEAD ROOTS				.4000-01	.4800-01	.5400-01	.4500-01	.5100-01	.3900-01
SOIL TOP ORGANIC	.7500+00			.5519+01	.2943+01	.1540+01	.2078+01	.3872+01	.5514+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF MAGNESIUM(MG) IN UNITS OF GRAMS/SQ.METER

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	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.7500+00	.7700+00	.1270+01	.1370+01	.1530+01	.1610+01	.1600+01	.1610+01	.1360+01
FRUITS,FLOWERS						.1000-01	.2000-01	.3000-01	.3000-01
BRANCHES-SUM	.3660+00	.3200+00	.5300+00	.6000+00	.7100+00	.7600+00	.8400+00	.8200+00	.8800+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.5200+00	.2800+00	.8400+00	.1120+01	.1460+01	.2120+01	.2320+01	.3160+01	.3300+01
BOLE-BARK	.1920+00	.1100+00	.3100+00	.4000+00	.5200+00	.7400+00	.7900+00	.1070+01	.1120+01
BOLE-WOOD	.3280+00	.1700+00	.5300+00	.7200+00	.9400+00	.1380+01	.1530+01	.2090+01	.2180+01
STANDING DEAD	.6800-01	.2000-01	.7000-01	.8000-01	.1100+00	.1400+00	.1600+00	.1600+00	.1400+00
SUM-OVERSTORY	.1704+01	.1390+01	.2710+01	.3170+01	.3810+01	.4640+01	.4990+01	.5680+01	.5710+01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.7400+00	.1800+00	.2000+00	.2000+00	.2500+00	.2500+00	.3600+00	.3500+00	.4000+00
EPIPHYTES-TOTAL									
TOTAL PLANTS	.2444+01	.1570+01	.2910+01	.3373+01	.4060+01	.4890+01	.5300+01	.6030+01	.6110+01
LIVING ROOTS-SUM	.2270+00	.2500+00	.5600+00	.6300+00	.8600+00	.1140+01	.1330+01	.1640+01	.1800+01
LIVING ROOTS >5 MM	.1730+00	.1900+00	.4600+00	.5000+00	.7000+00	.9600+00	.1070+01	.1360+01	.1530+01
LIVING ROOTS 2-5 MM	.3000-01	.3000-01	.6000-01	.8000-01	.1000+00	.1200+00	.1500+00	.1400+00	.1700+00
LIVING ROOTS <5 MM	.9400-01	.3000-01	.9000-01	.6000-01	.6000-01	.8000-01	.9000-01	.1000+00	.1000+00
DEAD ROOTS	.3000-01	.2000-01	.4000-01	.6000-01	.6000-01	.8000-01	.9000-01	.8000-01	.8000-01
SOIL TOP ORGANIC	.2160+02	.1360+01	.1440+01	.1490+01	.1710+01	.1920+01	.2020+01	.2300+01	.2650+01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO AMOUNTS OF MAGNESIUM(MG) IN UNITS OF GRAMS/SQ.METER

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	SITE 16 KAZIM*OV MOROZOVA	SITE 17 KAZIM*OV MOROZOVA	FINLAND MAVAS	MALAYSIA BULLOCK	EUCALYP-TUS ATTIWILL
OVERSTORY LEAVES	.1130+01	.1090+01	.6500+00	.7790+00	.2700+01
FRUITS,FLOWERS	.4000-01	.4000-01			
BRANCHES-SUM	.8300+00	.8600+00	.5400+00	.4782+01	.3480+01
BRANCHES-BARK					
BRANCHES-WOOD					
BOLE-SUM	.3680+01	.3520+01	.1890+01	.1705+02	.1255+02
BOLE-BARK	.1230+01	.1170+01			.1022+02
BOLE-WOOD	.2950+01	.2350+01			.2350+01
STANDING DEAD	.1900+00	.1500+00	.8000-01		
SUM-OVERSTORY	.5820+01	.5610+01	.3060+01		.1873+02
UNDERSTORY-LEAVES	0.	0.	.6000-02		
UND. FRUITS,FLOWERS	0.	0.			
UND. BRANCHES-SUM	0.	0.			
UND. BRANCHES-BARK	0.	0.			
UND. BRANCHES-WOOD	0.	0.			
UND. BOLE-SUM	0.	0.			
UND. BOLE-BARK	0.	0.			
UND. BOLE-WOOD	0.	0.			
UND. STANDING DEAD	0.	0.			
SUM-UNDERSTORY	0.	0.			.1810+01
HERBACEOUS (FIELD)	.4600+00	.5200+00	.5300+00		
EPIPHYTES-TOTAL					
TOTAL PLANTS	.6260+01	.6130+01			
LIVING ROOTS-SUM	.1890+01	.1900+01	.1200+01	.1645+01	.4100+01
LIVING ROOTS >5 MM	.1570+01	.1630+01			
LIVING ROOTS 2-5 MM	.1700+00	.1700+00			
LIVING ROOTS <5 MM	.1000+00	.1000+00			
DEAD ROOTS	.7000-01	.9000-01			
SOIL TOP ORGANIC	.2760+01	.3030+01	.8800+01		.3560+01
ROOTING ZONE					
INTENSIVE ROOTED					
EXTENSIVE ROOTED					
SUBSOIL					
HETEROTROPHS-SUM					
ABOVEGROUND CONSUMERS					
DECOMPOSER FAUNA					
DECOMPOSER FLORA					

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.M

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	HEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING B1	SOLLING B3	SOLLING B4	WESTERVN THAMDRUP ET AL	LANGAROD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIMLGARD	LINNEBJR ANDERS-SON
OVERSTORY LEAVES									
FRUITS,FLOWERS									
BRANCHES-SUM	.2600-01	.1600+00	.1950-01	.9900-02	.2500-01	**	**	**	**
BRANCHES-BARK	.7000-02		.5830-02	.3201-02	.9142-02	**	**	**	**
BRANCHES-WOOD	.1700-01		.1365-01	.6699-02	.1576-01	**	**	**	**
BOLE-SUM	.4600-01	.7000-01	.1541+00	.8170-01	.1660+00	**	**	**	**
BOLE-BARK	.1600-01		.4491-01	.1866-01	.2299-01	**	**	**	**
BOLE-WOOD	.4000-01		.1092+00	.6308-01	.1428+00	**	.2500+00	.3400+00	.1100+01
STANDING DEAD	.2000-02					.5400+00			
SUM-OVERSTORY									
UNDERSTORY-LEAVES							0.	0.	
UND. FRUITS,FLOWERS							0.	0.	
UND. BRANCHES-SUM							0.	0.	
UND. BRANCHES-BARK							0.	0.	
UND. BRANCHES-WOOD							0.	0.	
UND. BOLE-SUM							0.	0.	
UND. BOLE-BARK							0.	0.	
UND. BOLE-WOOD							0.	0.	
UND. STANDING DEAD							0.	0.	
SUM-UNDERSTORY							0.	0.	
HERBACEOUS (FIELD)	.5000-01					.2400+00			
EPIPHYTES-TOTAL									
TOTAL PLANTS									
LIVING ROOTS-SUM	.1740+00					.2400+00			
LIVING ROOTS >5 MM	.4800-01		.2374-01	.1692-01	.3376-01				
LIVING ROOTS 2-5 MM	.2100-01								
LIVING ROOTS <5 MM	.6500-01								
DEAD ROOTS									
SOIL TOP ORGANIC									
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA	.4000-01								
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OVED LINDGREN NIMLGARD	THOMPSON RES.CNTR GESSEL	DUKE FOREST MURPHY	TRIANGLE MURPHY	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIMLGARD	SITE 1 KAZIMIROV MORDZOVA
OVERSTORY LEAVES		.5000-01		.3000-01					.1600-01
FRUITS,FLOWERS									
BRANCHES-SUM	**	.2000-01	.7900-01	.3300-01	.4210-01	.2730-01	.7090-01	**	.4000-02
BRANCHES-BARK	**				.3500-02	.2294-02	.8660-02	**	
BRANCHES-WOOD	**				.3860-01	.2501-01	.6217-01	**	
BOLE-SUM	**		.1160+00	.1980+00	.8290-01	.6190-01	.1050+00	**	.1800-01
BOLE-BARK	**	.2000-01			.3020-01	.2254-01	.3048-01	**	.4000-02
BOLE-WOOD	.4100+00	.5000-01			.5270-01	.3939-01	.7491-01	.1900+00	.1200-01
STANDING DEAD									.1000-02
SUM-OVERSTORY			.1960+00	.2610+00	.2200+00	.1600+00	.4600+02		.4100-01
UNDERSTORY-LEAVES	0.							0.	0.
UND. FRUITS,FLOWERS	0.							0.	0.
UND. BRANCHES-SUM	0.							0.	0.
UND. BRANCHES-BARK	0.							0.	0.
UND. BRANCHES-WOOD	0.							0.	0.
UND. BOLE-SUM	0.							0.	0.
UND. BOLE-BARK	0.							0.	0.
UND. BOLE-WOOD	0.							0.	0.
UND. STANDING DEAD	0.							0.	0.
SUM-UNDERSTORY	0.							0.	0.
HERBACEOUS (FIELD)									.2000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS				.2610+00					.4300-01
LIVING ROOTS-SUM		.2000-01	.1270+00	.1060+00					.1300-01
LIVING ROOTS >5 MM									.9000-02
LIVING ROOTS 2-5 MM									.2000-02
LIVING ROOTS <5 MM									.2000-02
DEAD ROOTS									.1000-02
SOIL TOP ORGANIC									.2400-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWERT COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 2 KAZIMIROV MOROZOVA	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA
OVERSTORY LEAVES	.2200-01	.2400-01	.1800-01	.1600-01	.1700-01	.1100-01	.4200-01	.2900-01	.2000-01
FRUITS,FLOWERS									
BRANCHES-SUM	.1000-01	.1100-01	.1200-01	.1200-01	.8000-02	.5000-02	.1400-01	.1700-01	.1000-01
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.3000-01	.4100-01	.4600-01	.5300-01	.2400-01	.2700-01	.2400-01	.3700-01	.4100-01
BOLE-BARK	.1100-01	.1500-01	.1400-01	.1700-01	.9000-02	.1000-01	.9000-02	.1400-01	.1500-01
BOLE-WOOD	.1900-01	.2600-01	.3200-01	.3600-01	.1500-01	.1700-01	.1500-01	.2300-01	.2600-01
STANDING DEAD	.2000-02	.2000-02	.2000-02	.3000-02	.1000-02	.1000-02	.3000-02	.3000-02	.3000-02
SUM-OVERSTORY	.6400-01	.7800-01	.7800-01	.8400-01	.5000-01	.4400-01	.8300-01	.8100-01	.7400-01
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. FRUITS,FLOWERS	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.	0.	0.
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.	0.	0.
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.	0.	0.
HERBACEOUS (FIELD)	.8000-02	.5000-02	.3000-02		.8000-02	.2000-02	.1000-02	.1000-02	.9000-02
EPIPHYTES-TOTAL									
TOTAL PLANTS	.7200-01	.8300-01	.8100-01	.8400-01	.5800-01	.4600-01	.8400-01	.8200-01	.7600-01
LIVING ROOTS-SUM	.1300-01	.1600-01	.1200-01	.1600-01	.1100-01	.8000-02	.1600-01	.1900-01	.2100-01
LIVING ROOTS >5 MM	.9000-02	.1300-01	.1000-01	.1300-01	.7000-02	.6000-02	.1100-01	.1500-01	.1600-01
LIVING ROOTS 2-5 MM	.2000-02	.2000-02	.1000-02	.2000-02	.2000-02	.1000-02	.3000-02	.2000-02	.3000-02
LIVING ROOTS <5 MM	.2000-02	.1000-02	.1000-02	.1000-02	.2000-02	.1000-02	.2000-02	.2000-02	.2000-02
DEAD ROOTS	.1000-02	.1000-02	.1000-02	.1000-02	.1000-02	.1000-02	.3000-02	.2000-02	.2000-02
SOIL TOP ORGANIC	.1700-01	.8000-02	.1300-01	.2000-01	.2300-01	.7100-01	.8000-02	.9000-02	.1000-01
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG VARIOUS ECOSYSTEMS WITH RESPECT TO INCREMENTS OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.M

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 11 KAZIMIROV MOROZOVA	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	EUCALYPTUS ATTIWILL
OVERSTORY LEAVES	.1000-01		-.3000-02	-.4000-02	-.7000-02	-.8000-02	-.1100-01		.4800-01
FRUITS,FLOWERS		.1000-02	.1000-02						
BRANCHES-SUM	.8000-02	.5000-02	.3000-02	.2000-02	.1000-02	.1000-02	.1000-02	.1000+00	.1140+00
BRANCHES-BARK									
BRANCHES-WOOD									
BOLE-SUM	.4300-01	.4100-01	.3400-01	.2600-01	.1900-01	.8000-02	.1000-02	.2000-02	.1600+00
BOLE-BARK	.1600-01	.1500-01	.1200-01	.9000-02	.6000-02	.3000-02			.1200+00
BOLE-WOOD	.2800-01	.2600-01	.2300-01	.1700-01	.1300-01	.5000-02	.1000-02		.4000-01
STANDING DEAD	.2000-02	.1000-02	.1000-02					.2000-02	
SUM-OVERSTORY	.8300-01	.4800-01	.3700-01	.2200-01	.1300-01	.1000-02	-.9000-02		.3420+00
UNDERSTORY-LEAVES	0.	0.	0.	0.	0.	0.	0.		
UND. FRUITS+FLOWERS	0.	0.	0.	0.	0.	0.	0.		
UND. BRANCHES-SUM	0.	0.	0.	0.	0.	0.	0.		
UND. BRANCHES-BARK	0.	0.	0.	0.	0.	0.	0.		
UND. BRANCHES-WOOD	0.	0.	0.	0.	0.	0.	0.		
UND. BOLE-SUM	0.	0.	0.	0.	0.	0.	0.		
UND. BOLE-BARK	0.	0.	0.	0.	0.	0.	0.		
UND. BOLE-WOOD	0.	0.	0.	0.	0.	0.	0.		
UND. STANDING DEAD	0.	0.	0.	0.	0.	0.	0.		
SUM-UNDERSTORY	0.	0.	0.	0.	0.	0.	0.		
HERBACEOUS (FIELD)	.2000-02	.3000-02	.3000-02	.3000-02	.4000-02	.4000-02	.5000-02		
EPIPHYTES-TOTAL									
TOTAL PLANTS	.6500-01	.5100-01	.4000-01	.2500-01	.1700-01	.6000-02	-.4000-02		
LIVING ROOTS-SUM	.2100-01	.2000-01	.1700-01	.1000-01	.6000-02	.2000-02	.1000-02		
LIVING ROOTS >5 MM	.1700-01	.1700-01	.1400-01	.8000-02	.5000-02	.2000-02	.1000-02		
LIVING ROOTS 2-5 MM	.2000-02	.2000-02	.2000-02	.1000-02	.1000-02				
LIVING ROOTS <5 MM	.2000-02	.1000-02	.1000-02	.1000-02					
DEAD ROOTS	.1000-02	.1000-02							
SOIL TOP ORGANIC	.1100-01	.1600-01	.1600-01	.1600-01	.1600-01	.1600-01	.1600-01		
ROOTING ZONE									
INTENSIVE ROOTED									
EXTENSIVE ROOTED									
SUBSOIL									
HETEROTROPHS-SUM									
ABOVEGROUND CONSUMERS									
DECOMPOSER FAUNA									
DECOMPOSER FLORA									

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.METER/YEAR

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	HEATHOP SATCHELL	ROUQUET LOSSAINT RAPP	SOLLING 81	SOLLING 83	SOLLING 84	WESTERVN THANDRUP ET AL	LANGARDD BEECH 2 LINDGREN	KONGLUND BEECH 1 NIHLGARD	LINNEWUR ANDERS-SON
CONSUMPTION-TOTAL									
CONS.-FOLIAGE-TOTAL			.1326-01	.1341-01	.1122-01				
CONS.-OVERSTORY									
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY									
CONS.-ROOTS-TOTAL									
CONS.-UNDERSTORY									
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL									
LITTERFALL-TOTAL		.4600+00				.5370+00	.2930+00	.4300+00	.7360-00
LITTERFALL-LEAF	.8400+00	.3100+00	.1447+00	.1689+00	.1638+00	.4870+00	.2310+00		.3620+00
LITTERFALL-FLOWER,FRUIT	.1500-01	.7000-01				.1300-01	.1900-01		.2900+01
LITTERFALL-BRANCH	.9000-01	.8000-01				.1300-01	.4300-01		.8400-01
LITTERFALL-BOLE	.3000-01					.2400-01			
LITTERFALL-FRASS	.6000-01								
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.5900+00	.2100+00	.2670+00			.4300+00	.9000-01	.9100-01	.4760+00
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH	.1190+01		.3260+00			.5700+00	**	**	**
STEM FLOW	.2400+00	.3600+00	.4400-01			.1000+00	.1600+00	.2500+00	.9070+00
LEACHING- SOIL LAYERS		.8000-01							
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION	.6000+00		.2110+00						

BXOT IBP.HPA

BADD.P IBP.DATEWA

BADD.P IBP.DATENIB

COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	OVED LINDGREN NIMLGARD	ANDREWS EXP.FOR. GWIER	DUKE FOREST MURPHY	SOLLING F1	SOLLING F2	SOLLING F3	KONGLUND SPRUCE NIMLGARD	SITE 1 KAZIMIROV MORDZOVA	SITE 2 KAZIMIROV MORDZOVA
CONSUMPTION-TOTAL								.3680+00	.5330+00
CONS.-FOLIAGE-TOTAL								.2930+00	.4310+00
CONS.-OVERSTORY								.2640+00	.3910+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY								.2900-01	.4000-01
CONS.-ROOTS-TOTAL								.4200-01	.7300-01
CONS.-UNDERSTORY								.4200-01	.7300-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL								.2300-01	.2900-01
LITTERFALL-TOTAL	.5300+00	.2200+00	.6200+00	.1850+00			.3100+00	.2990+00	.4360+00
LITTERFALL-LEAF	.4360+00	.6700-01		.1278+00	.1159+00	.1101+00		.2740+00	.4030+00
LITTERFALL-FLOWER,FRUIT	.5500-01	.1150+00							
LITTERFALL-BRANCH	.4300-01	.1400-01		.5672-01				.1000-01	.1800-01
LITTERFALL-BOLE		.1800-01						.8000-02	.1600-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS		.2000-02							
ATMOSPHERIC INPUT									
PRECIPITATION	.1400+00	.1320+00		.2570+00			.9100-01	.9000-01	.9000-01
DRY PARTICULATES(DUST)			.6700-01						
GASEOUS FIXATION									
LEACHING									
LEAF WASH	**	.8000-01	.1780+00	.4800+00			**		
STEM FLOW	.2900+00						.5200+00		
LEACHING- SOIL LAYERS									.4000-01
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION		.1294+01							

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@XQT  IBP.MPA

@ADD,P  IBP.DATENA

@ADD,P  IBP.DATENJS
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COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 3 KAZIMIROV MOROZOVA	SITE 4 KAZIMIROV MOROZOVA	SITE 5 KAZIMIROV MOROZOVA	SITE 6 KAZIMIROV MOROZOVA	SITE 7 KAZIMIROV MOROZOVA	SITE 8 KAZIMIROV MOROZOVA	SITE 9 KAZIMIROV MOROZOVA	SITE 10 KAZIMIROV MOROZOVA	SITE 11 KAZIMIROV MOROZOVA
CONSUMPTION-TOTAL	.6060+00	.6980+00	.6460+00	.4400+00	.6510+00	.3790+00	.5460+00	.5860+00	.6150+00
CONS.-FOLIAGE-TOTAL	.4683+00	.5560+00	.4800+00	.3810+00	.5450+00	.2820+00	.4150+00	.4420+00	.4640+00
CONS.-OVERSTORY	.4340+00	.5250+00	.4610+00	.3150+00	.2550+00	.2510+00	.3790+00	.4060+00	.4260+00
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.3400-01	.3100-01	.1900-01	.6600-01	.2900+00	.3100-01	.3600-01	.3600-01	.3800-01
CONS.-ROOTS-TOTAL	.9100-01	.1030+00	.1160+00	.5400-01	.5800-01	.5500-01	.8000-01	.8700-01	.9100-01
CONS.-UNDERSTORY	.9100-01	.1030+00	.1160+00	.5400-01	.5800-01	.5500-01	.8000-01	.8700-01	.9100-01
CONS.-HERBACEOUS									
CONS.-WOOD-TOTAL	.4700-01	.3900-01	.5000-01	.2300-01	.4800-01	.4200-01	.5100-01	.5700-01	.6000-01
LITTERFALL-TOTAL	.4790+00	.5800+00	.5130+00	.3820+00	.5560+00	.2570+00	.4160+00	.4560+00	.4920+00
LITTERFALL-LEAF	.4400+00	.5350+00	.4620+00	.3580+00	.5300+00	.2400+00	.3850+00	.4200+00	.4520+00
LITTERFALL-FLOWER,FRUIT									
LITTERFALL-BRANCH	.1800-01	.2000-01	.2100-01	.1300-01	.1200-01	.1200-01	.1800-01	.2000-01	.2100-01
LITTERFALL-BOLE	.2100-01	.2600-01	.3000-01	.1100-01	.1400-01	.6000-02	.1300-01	.1600-01	.1900-01
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01
DRY PARTICULATES(DUST)									
GASEOUS FIXATION									
LEACHING									
LEAF WASH									
STEM FLOW									
LEACHING- SOIL LAYERS	.4000-01	.6000-01	.8000-01			.4000-01	.4300-01	.4600-01	.4600-01
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

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@XQT  IBP.HPA

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COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOLIZED, AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOLIZED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	SITE 12 KAZIMIROV MOROZOVA	SITE 13 KAZIMIROV MOROZOVA	SITE 14 KAZIMIROV MOROZOVA	SITE 15 KAZIMIROV MOROZOVA	SITE 16 KAZIMIROV MOROZOVA	SITE 17 KAZIMIROV MOROZOVA	FINLAND HAVAS	MALAYSIA BULLOCK	MANAUS KLINGE,R ODRIGUEZ
CONSUMPTION-TOTAL	.6230+00	.6160+00	.5930+00	.4970+00	.4380+00	.4080+00			
CONS.-FOLIAGE-TOTAL	.4790+00	.4700+00	.4210+00	.3930+00	.3520+00	.3300+00			
CONS.-OVERSTORY	.4370+00	.4100+00	.3680+00	.3330+00	.2810+00	.2510+00			
CONS.-WOOD-OVERSTORY									
CONS.-WOOD-UNDERSTORY	.3700-01	.6000-01	.5300-01	.6000-01	.7100-01	.7900-01			
CONS.-ROOTS-TOTAL	.8700-01	.7900-01	.6200-01	.5000-01	.3900-01	.2600-01			
CONS.-UNDERSTORY	.8700-01	.7900-01	.6200-01	.5000-01	.3900-01	.2600-01			
CONS.-ERRACEOUS									
CONS.-WOOD-TOTAL	.6200-01	.6700-01	.6000-01	.5900-01	.5200-01	.5200-01			
LITTERFALL-TOTAL	.5130+00	.5090+00	.4530+00	.4270+00	.3840+00	.3610+00	.2500+00		
LITTERFALL-LEAF	.4720+00	.4680+00	.4250+00	.3970+00	.3590+00	.3370+00	.1900+00	.2629+01	.9800+00
LITTERFALL-FLOWER,FRUIT									.5000-01
LITTERFALL-BRANCH	.2000-01	.1800-01	.1300-01	.1200-01	.7000-02	.5000-02	**	.2410+00	.2300+00
LITTERFALL-BOLE	.2100-01	.2300-01	.2100-01	.1800-01	.1800-01	.1900-01	.2000-02	.3420+00	
LITTERFALL-GRASS									
LITTERFALL-EPIPHYTS									
ATMOSPHERIC INPUT									
PRECIPITATION	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.9000-01	.1000+00	**	
DRY PARTICULATES(DUST)								.1440+00	
GASEOUS FIXATION									
LEACHING									
LEAF WASH								**	
STEM FLOW								.1840+00	
LEACHING- SOIL LAYERS	.4900-01	.3300-01	.3400-01	.3100-01	.5100-01	.3600-01			
OUTPUT									
OUTPUT-WIND EROSION									
OUTPUT-WATER EROSION									
OUTPUT-PERCOLATION									

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WXQT  IBP.HPA

WADD.P  IBP.DATENA

WADD.P  IBP.DATENSS
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COMPARISONS AMONG ECOSYSTEMS FOR FLUXES OF MAGNESIUM(MG) IN UNITS OF GRAM/SQ.METER/YEAR

(A BLANK SPACE MEANS THAT THE VALUE WAS NOT MEASURED. THE SYMBOL 0. MEANS THAT THE VALUE IS NEGLIGIBLE, EITHER BY MEASUREMENT OR IN THE JUDGMENT OF THE INVESTIGATOR. THE SYMBOL ** MEANS THAT THE COMPARTMENT WAS MEASURED JOINTLY WITH CONTIGUOUS COMPARTMENTS SIMILARLY SYMBOL(TED. AS WELL AS THE FIRST COMPARTMENT BELOW IT WHICH IS NOT SO SYMBOL(TED. THE VALUE OF THIS LOWEST COMPARTMENT IS THE TOTAL VALUE OF THE SUMMED COMPARTMENTS.)

	EUCALYP-TUS ATTIWILL
CONSUMPTION-TOTAL	
CONS.-FOLIAGE-TOTAL	
CONS.-OVERSTORY	
CONS.-WOOD-OVERSTORY	
CONS.-WOOD-UNDERSTORY	
CONS.-ROOTS-TOTAL	
CONS.-UNDERSTORY	
CONS.-HERBACEOUS	
CONS.-WOOD-TOTAL	
LITTERFALL-TOTAL	.3810+00
LITTERFALL-LEAF	
LITTERFALL-FLOWER,FRUIT	
LITTERFALL-BRANCH	.2460+00
LITTERFALL-BOLE	.1360+00
LITTERFALL-FRASS	
LITTERFALL-EPIPHYTS	.4900-01
ATMOSPHERIC INPUT	
PRECIPITATION	**
DRY PARTICULATES(DUST)	.5360+00
GASEOUS FIXATION	
LEACHING	
LEAF WASH	.1930+00
STEM FLOW	
LEACHING- SOIL LAYERS	
OUTPUT	
OUTPUT-WIND EROSION	
OUTPUT-WATER EROSION	
OUTPUT-PERCOLATION	

GFIN