SOILS AND FOREST CONFERENCE

June 5-8, 1939

Monday morning, June 5. Petersham, Mass.

Mr. Behre, Chairman.

Mr. Shepard welcomed group. Recording Committee appointed: Messrs. Westveld, Thorp, and Gast, Secretary.

Mr. Kellogg. The Purpose and Objectives of the Conference. Soil survey is expensive. Large percentage of survey area is under forests. Should soils to be used for forests in predictable future be surveyed? Mapping is on basis of characteristics found to be important in use for agricultural crops. Survey of soils under forests are classified on agricultural criteria.

Phases such as stoniness, slope and accelerated erosion under cultivation are separated. Do these deserve equal attention in mapping soils for agriculture and forests?

Exchange of information between foresters and soils men is desirable so that forest management experience can be utilized. The soil surveyors would welcome definite suggestions as to characters to be recognized and thought worthy of separation in mapping of soils under forests.

Mr. Behre supported objectives. The question: How can soil surveys more effectively serve the needs of forest managers?

Mr. Shepard believed the quality of the soil fundamental to forest management, and forest managers would profit greatly if the information on soils were available on maps. The basis of classification should be determined.

Mr. Behre would distinguish the characters important to management. To this end there were the possibilities of individual effort and of a comprehensive research program.

Mr. Cline suggested that the possible value of soil maps had not been given fair trial. Usually they were not referred to. Only within a year had he made use of them in connection with the Worcester County study. Mr. Tedrow's observations on soil seemed significant in connection with farm woodlot management.

Mr. Baldwin agreed. The lack of maps for areas in which foresters were working a handicap. Soil moisture conditions most important and should be included in addition to texture as a basis for classification.

Mr. Chandler suggested the need for correlation of forest productivity with the morphology of the soil. It is necessary to determine which of the morphological characters of the soil are important. Some may be associated with soil moisture.

Mr. Thorp stated that morphological characters are used by the Soil Survey in classifying soils.

Mr. Kellogg emphasized the difference between classification (taxonomic) and mapping categories. The classification is used by men working in the field. Unfortunately, mapping is, necessarily, gross. All the taxonomic units which may be distinguished in the field can not be put on the map. The TVA maps, scale 16 inches to a mile (1/3,960), are examples of detailed mapping.

Mr. Westveld suggested that forest soil surveys will have their greatest value if they provide the basis for reconstructing the climax forest types for the regions covered, since climax forest types are important guides in the determination of correct silvicultural practices. Efforts should be directed to perfecting a technique of forest soil classification which will yield this fundamental information.

Mr. Sims stated that texture (meaning structural soil characters) is important in infiltration and the rate at which rain water becomes ground water and is released. There is undoubtedly an influence of land management practices on soil characteristics. From watershed standpoint, broad classification and broad mapping units are desirable, but other characters than those now used should be considered.

Mr. Kellogg stressed importance of definitions: viz., texture versus structure.

Mr. Lunt concurred that fine distinction may not be mapped, but such differences may be important to forest managers.

Mr. Westveld remarked that detailed soil map of Gale River Experimental Forest (in much greater detail than general survey) showed close relationship between soil types and forest types. Therefore the basic classification units appear to be satisfactory.

Mr. Coile observed that in southern Coastal Plain and the Piedmont Plateau the Soil Survey maps were helpful. Apparently some of the types are not different in productivity and could be grouped. The need is to extend the mapping into unsurveyed areas.

Mr. Thorp. Problems of Soil Classification in Forested Areas. The basis for classification consists of four groups (1) color texture, structure, consistence profiles; (2) mineral composition (parent material) and pH; (3) drainage conditions prior to clearing indicated by mottling and color; (4) natural vegetation. Have not used forest or vegetational types except in general way.

Factors about soil-forest relations:

(1) Known

(a) Texture affects water holding capacity.
(b) Structure and consistence profile affect growth (hardpan is especially important).
(c) pH greatly affects composition.
(d) Mineral index is very closely related to composition.
(e) In soil tension zones such as at Petersham great soil group (soil type in European sense) is not fixed, in fact may gradually be changed by forest type.

(2) Not known

(a) What is the dividing line between successful and unsuccessful production of certain forest types?

(b) What is the nutrient supplying power of the soil?

(c) To what extent is there correlation between soil type and forest type?

The following are definitions of special terms used (as defined in U.S.D.A. Yearbook, 1938, Soils and Men, pp 1162-1180).

Great Soil Group (soil classification)-- A group of soils having common internal soil characteristics; includes one or more families of soils. Among the zonal soils, each great soil group includes the soils having common internal characteristics developed through the influence of environmental forces of broad geographic significance, especially vegetation and climate; among the intrazonal soils, each great soil group includes the soils having common internal characteristics developed through the influence of environmental forces of both broad and local significance; among the azonal soils each great soil group includes similar soils that are without developed characteristics, owing to the influence of some local condition of parent material or relief.

Soil Series--A group of soils having genetic horizons similar as to differentiating characteristics and arrangement in the soil profile. except for the texture of the surface soil, and developed from a particular type of parent material. A series may include two or more soil types differing from one another in the texture of the surface soils.

Soil Type-- A group of soils having genetic horizons similar as to differentiating characteristics, including texture and arrangement in the soil profile, and developed from a particular type of parent material.

Soil Phase--That part of a soil unit or soil type having minor variations in characteristics used in soil classification from the characteristics normal for the type, although they may be of great practical importance. The variations are chiefly in such external characteristics as relief, stoniness, or accelerated erosion.

Mr. Kellogg stated that soil morphology is largely determined by vegetation. Soils under grass and under forest may differ within themselves yet form two quite distinct groups of soils with many characteristics in common. The homogeneity depends on the extent of geographical regions compared. Glinka put climate first and vegetation second in their influence on soil formation. It is now suggested that vegetation--controlled by climate--be considered primary.

Mr. Mitchell. Nitrogen Nutrition and Growth of Forest Trees of Northeast.--
In pot culture tests of pine seedlihgs, the dry matter increases with increased supplies of nitrogen up to point of toxicity. The yield increments become successively smaller with each additional increase in available nitrogen--an instance of the law of asymptotic diminishing returns algebraically expressed by the Mitscherlich formula. Similar results wereobtained in the nursery except optimum supplies were not reached. Fertilized seedlings showed outstanding growth in the second year. Analyses of whole plants and tops showed asymptotic relation between applied fertilizer and content by analysis. For extension of results to older trees, quarter-acre sample plots were fertilized in hardwood stands of varied composition on soils of differing fertility. Effects in chemical content of foliage were apparent in the year of fertilization, increases in growth the year following fertilization. The relation between nitrogen applied and content in foliage could be expressed algebraically with Mitscherlich formula, as for young pines, and provided basis for graphical fitting of data.

The soil differed for the various plot series, and the nitrogen content of the foliage of unfertilized plot indicated the basic nitrogen level of the soil without fertilizer. That the foliage analyses of both fertilized and unfertilized plots from all series could be fitted to a common Mitscherlich curve indicated the correctness of the projected relationship between nitrogen supply and foliage analysis. The optimum nitrogen supply is taken as the amount at which only small further increases in leaf content of nitrogen result from additional increments of fertilizer. This follows because the foliage content and radial increment curves flatten at the same nitrogen supply points. The optimum supply for red, white, and chestnut oaks, trembling aspen and red maple are 300-400 pounds nitrogen per acre. These are the nitrogen deficiency tolerant trees. Pignut hickory, sugar maple, birch, black gum growth curves break at 400-500. This is the intermediate group. The nitrogen demanding group comprises white ash, yellow poplar and basswood, whose curves break at 500-600 pounds per acre. Nitrogen-tolerant out-grow the other trees on the poorest soils; the increment is higher and they dominate the stand. The intermediate group makes poorer growth and the nitrogen demanding makes the poorest growth on the nitrogen-deficient soils. The occurrence of a species on a site of given nitrogen concentration is determined not by the actual nitrogen-concentration in the foliage, but rather by the proportion which the concentration represents of the optimum nitrogen concentration for that species.

(Ref. Mitchell, H.L. and R. F. Chandler, Jr. The nitrogen nutrition and growth of certain deciduous trees of northeastern United States. With a discussion of the principles and practice of foliar diagnosis as applied to forest trees. Black Rock Forest Bul. No. 11, 1939. In press.)

Mr. Chandler. The Importance of Calcium Content of Forest Tree Foliage.
The mineral nutrient content of forest tree foliage gives three important kinds of information: (1) estimates of the relative amount of various constituents returned to the soil; (2) estimates--in conjunction with other data--of the minimum requirement and absorbing activity of various species for given nutrient elements; (3) estimates--supplemented by other data--of the relative available supply of an element in the soil; this aids in evaluating the factors influencing site quality. This paper is concerned with points 1 and 3.

Studies of seasonal trends in foliar calcium content indicate that this element does not evince the autumnal migration into woody portions of trees characteristic of nitrogen and phosphorus. Therefore, leaf samples obtained from the tree just previous to leaf-fall will provide satisfactory analytical material for estimating the amount of calcium deposited by the litter, and will, at the same time, obviate the occurrence of litter weathering. Conifers continue to accumulate calcium in their needles as long as they remain on the tree.

The more common forest trees of the northeastern United States can be placed in three groups according to the calcium content of their mature leaves. Those containing more than 2 percent are: tulip poplar, red cedar, basswood, black locust, mockernut hickory, bitternut hickory, white cedar, hop hornbeam, trembling aspen, white ash, and black cherry. Those containing between 1 and 2 percent are: shagbark hickory, American elm, sugar maple, Norway spruce, white oak, red oak, yellow birch, chestnut oak, white pine, and balsam fir. Those containing less than 1 percent calcium are: red maple, hemlock, red pine, beech, Scotch pine, and red spruce.

We are interested in the above figures as representing the calcium returned to the soil, for the following reasons:

1. The pH and percentage base saturation of the surface soil is affected by the amount of calcium in the litter.

2. Generally, the process of nitrification is enhanced by high-calcium foliage.

3. The rate and degree of incorporation of organic matter into the soil is correlated with calcium content of foliage.

4. The physical structure of the soil is generally improved by high-calcium foliage.

The above relationships apply particularly to acid soils. Trees growing on a highly calcareous soil (Farmington loam) and on a moderately acid soil (Lordstown silt loam) did not significantly differ in calcium content of foliage.

Trees growing on moderately acid soil (Essex sandy loam) and on very acid soil (Beckett sandy loam) showed a 50 percent reduction in foliar calcium content of sugar maple trees on the very acid soil as compared to similar material from the moderately acid soil. The nitrogen and phosphorus content of leaves from these soils did not vary significantly.

(Ref. Data for above paper unpublished.) Chandler, R.F., Jr. A study of certain calcium relationships and base exchange properties of forest soils. Jour. For. 35 (1): 27-32, Jan.1937.)

Mr. Gast. Soil changes in the Succession of Pine Followed by Hardwood. Reviewed findings on the Harvard Forest concerning depths of A and B horizons following change in composition which follows cutting of old field pine on Gloucester, Charlton, Paxton in the region. The major change in depth and structure of A_1 and B believed to result from earthworm activity and the amount of change determined by the amount of food preferred by fauna most active in triturating and transporting organic debris.

(Ref. Fisher, R.T. Soil changes and silviculture on the Harvard Forest. Ecology 9(1):6-11, Jan.1928.

Griffith, B.G., E.W.Hartwell, and T.E.Shaw. The evolution of soils as affected by the old field white pine-mixed hardwood succession in central New England. Introduction by R.T.Fisher. Conclusion by P.R.Gast. Harvard Forest Bul. 15, pp.1-82, 1930.

Gast, P.R. Contrasts between the soil profiles developed under pines and hardwoods. Jour. Forestry 35(1):11-16, Jan.1937.)

Monday afternoon, June 5. Field trip, Harvard Forest.
Gloucester, Whitman (Peru, Leicester) soils. Charlton.

The dominant development of hardwoods, especially ash, on less perfectly drained soil (Peru, Leicester) in a complex with Gloucester was noted.

Mr. Johnston. The Soil Fauna in Mor and Mull Soils Under White Pine and Succeeding Hardwoods. Studies to determine the important differences between typical mor and mull faunal communities were initiated in the autumn of 1930 at the Harvard Forest. Soil samples were taken periodically during the open seasons of four successive years, and subjected to routine population analyses. The entire population of worms, insects, mites, spiders, centipedes, etc., was obtained by treating samples in devices for automatic collection. The composite values from nine habitats of different ages all growing upon Gloucester and Charlton soils are given below for a square meter. The average populations were computed by weighting seasonal and vertical variations.

Macrofaunal Numbers and Weights per Square Meter

Faunal Groups	White Pine Cover Type Mor Soil				Mixed Hardwoods Cover Type Mull Soil			
	Number of Individuals	Grams Min.	Max.	Mean	Number of Individuals	Grams Min.	Max.	Mean
Earthworms	10 to 30	3.0	9.0	4.0	15 to 55	7.7	27.0	13.6
Large insect larvae	170 to 500	0.1	6.5	2.2	30 to 400	0.1	0.8	0.3
Mites and springtails	40,000 to 120,000	2.0	6.5	4.3	20,000 to 55,000	1.3	2.8	2.1
Miscellaneous	200 to 1,000	0.7	4.8	2.4	130 to 1,200	0.3	4.5	1.6
Predaceous species	5,000 to 25,000	0.8	4.0	2.0	1,500 to 8,000	0.6	1.4	0.9
Total	45,000 to 135,000	9.0	21.0	14.9	27,000 to 62,500	4.0	30.0	18.5

The soil animals are really a definite part of the entire forest community; because of their abundance, size, and food relationships they are a distinct part characterized by an amazingly complex composition.

The mor soils have considerably larger populations than the mull, but the minute mites and springtails far exceed other species. However, there was a relatively small increase in the number of species inhabiting mull, and among these several important animals such as the largest earthworm or "night crawler." When the aggregate weights of mor and mull communities are compared, a significant relationship with mull is noted. Although less densely populated, the annual feeding activity is greater where earthworms are abundant, and aggregate weight bears an inverse relation to numerical abundance.

In population analyses it is important to separate the animals into their two principal dynamic categories, namely, saprophagous, or "key industry" forms which convert the dead organic matter into simpler substances; and predaceous-parasitic forms which obtain nourishment by devouring other living species. The predaceous were to the saprophagous species in ratios of from 1:20 to 1:5. A proportionately large number of predators in one mull habitat did not seriously limit the beneficial feeding activity. This indicates that faunal composition is much more important than large populations which lack certain species.

That the food relationship is a primary environmental factor was more clearly shown by the correlation of the vertical distribution of the fauna with physical and chemical factors of the A and B horizons. Based upon density of animals per unit volume of soil, quantity of organic matter influenced the fauna most, while moisture content and compactness were the next most important factors. The mor profile has its greatest population density in the A horizon, especially H layer and A_1, and low density in the B horizon. While the mull profile exhibited somewhat greater density in the contrastingly broad A_1 horizon, the decrease of faunal abundance with depth was less pronounced throughout the B_2.

Following this lead, field and laboratory experimentation upon the differential selection and rate of acceptance of the palatable litter components was performed. For this study the predominant species of earthworms and large insect larvae were used. Results clearly showed how important stand composition and litter components are, these organisms exhibiting preference for broadleaf litter rather than pine, and soft-textured foliage such as white ash, white birch, poplar, and basswood, to the more firm red oak. Where white ash was very abundant, the fresh litter was mixed with the mineral soil and digested in six months, while a single annual litter fall of pine was but 30 percent digested at the end of two years.

To find the annual quantity of litter digested by the several faunas, exact experiments to measure oxygen consumption of individual animals as a function of temperature were performed. Warburg micro-respirometers, with vessels designed to accomodate animals of the sizes and habits of Transition Zone fauna, were used. By computing the total annual oxygen consumption per square meter, corrected for temperature variation, and calculating the organic matter equivalent of the oxygen used in respiration, the proportion of litter digested by the fauna was determined. It varied from 4 percent to 10 percent of the mean annual litter fall. For pine this was 375 grams, and for hardwoods 425 grams dry weight per square meter.

With increasing age of cover types the faunas became more abundant and complex. This is due partly to the slow rate of invasion into newly established stands upon either former agricultural land, or rapid type change following clear-cutting of pine. Under 50-year old stands both mor and mull communities have larger animals, but the predominant species of communities apparently most beneficial to soil fertility occur under stands with a high proportion of soft-textured foliage. Species were rated predominant on basis of numerical abundance and size plus effect upon transformation of litter. Correlations between morphological, physical, and chemical differences of the contrasting horizons clearly showed that forest cover, through the faunal activities of feeding, burrowing, vertical and lateral movements, and manner of voiding excrement (crumb structure of mull), changed the soil type in Trnsition Zone. Where rapid comminution and digestion of humus occur, increased tilth and tree growth are found.

Knowledge of beneficial communities indicates the possibility of obtaining improvement or maintenance of desirable fertility levels by controlling stand composition. Thinnings, improvement cuttings, and mixed plantings provide means for planned soil improvement on forested lands.

(Ref. Bornebusch, C.H. The fauna of forest soils. Det Forstlige Forsøgsvaesen i Danmark. Copenhagen, 1930.

Jacot, A.P. Soil structure and soil biology. Ecology XVII (3): 359-379. 1936.

Johnston, J.W. The macrofauna of soils as affected by certain [illegible] coniferous and hardwood types on the Harvard Forest. Unpublished doctoral thesis, Harvard University Library, 108 pp., bibl., and appen., 1936.

Romell, L.G. An example of myriopods as mull formers. Ecology XVI: 67-71, 1935.)

Mr. Thorp and Mr. Heiberg discussed description of complex profiles. Such result from different soil-building processes accompanying vegetational stages in succession, possibly with intermediate tillage. Concluded that objective description most important; identification of horizons by less objective A, B designations less certain, hence less desirable.

The pronounced soil transformations as described from Petersham were questioned. The soils specialists believed that the deeper B horizons observed in the mosaic of shallower and deeper locales under hardwoods had been present under previous stands of pine with podzolising tendencies. The Harvard Forest interpretation had been based on the belief in shallower B horizons under pine from evidence of simultaneous measurements on soils under stands of various ages. The need for periodic observation of given areas evidenced by conflict of opinion.

Monday evening, June 5. Petersham.

Mr. Thorp cited the use of a mapping unit, the complex, composed of two (or more) taxonomic units. The separation of the taxonomic units in mapping frequently inexpedient. Rather than map as the major type--which may be only slightly more important tha n the minor type--use of the "complex" desirable.

Mr. Latimer stressed the preliminary character of reconnaissance survey which gave data for most county maps now available for New England.

The soil identified by observation of profile. The boundary of soil type delimited by topography sometimes assisted by vegetational boundaries.

Mr. Heiberg observed that use of forest types as guide to boundaries of soil types might lead to false correlations.

Mr. Kellogg asserted that error has resulted from attempt to use forest types for identification of soils. Soils are not only factor in determining forest types. Distribution of forest types on an island in a lake in Michigan correlated with prevailing west moisture-laden wind which resulted in hardwoods on west and pine on east.

Mr. Huberman inquired about checking of mapping precision.

Mr. Thorp replied that in detailed mapping the boundaries did not necessarily coincide with those of reconnaissance surveys. Further, field men's identification subject to verification by inspectors. Inspectors visit parties and assist "correlation", which uses both field and laboratory descriptions in producing uniformity in soil taxonomy. Difficult correlation problems are reviewed by principal surveyors.

Mr. Kellogg invited a discussion of terms used in description of forest stands:

Forest cover type. A plant association identified by the dominant trees, one to three names being taken (compounded) for the type name. "Forest type" is strictly an ecological term, but used commonly as synonymous with abbreviated term "cover type" which more appropriately suggests composition according to commercially valuable species. May be "Temporary" or "Permanent" (see below).

(Ref. Com. on Forest Types, Soc. Amer.For. Forest Cover types of the eastern United States. Jour. Forestry 30(4): 451-498, April 1932.)

Climax (permanent) type. The most mesophytic plant association which, in the absence of catastrophe, maintains itself on the area.

Site quality. The potential productivity of a given area expressed by one of several relative or absolute measures.

Site index. An absolute measure of site quality: the height of the dominant trees at given age. Example, indexes 50, 70,90 for white pine are 50,70, 90 feet at 50 years of age.

Mr. Thorp opened a discussion of mapping problems.

Mr. Heiberg believed that in research surveys the use of vegetational criteria should be absolutely prohibited.

Mr. Thorp stated that the ideal procedure would be for forest and soils men to work over critical areas with full records and instrumentation: rainfall, humidity, light, etc., in addition to soil and vegetational studies.

Mr. Heimburger believed that for practical (viz., not research) mapping the intensity might be varied according to the intensity of land use.

Mr. Thorp said that the complexes could be adjusted to the degree of mapping intensity.

Mr. Coile said that in the Piedmont it was possible to group several soils in a common class essentially identical for growth purposes.

Mr. Chandler and Mr. Heiberg discussed organic horizon nomenclature. Need for an additional publication to coordinate minor revisions suggested. A committee--Chandler, chairman; Coile, Gast, Heiberg, Lunt, Lutz--appointed.

Tuesday morning, June 6. Excursion, Petersham to Peterborough, N.H.
Afternoon, Peterborough to Fox Forest, Hillsboro, N.H.

Charlton, Paxton, Gloucester, Danby, Marlowe, Herman, Sudbury soils.

Mr. Kellogg invited discussion, at two places, of slope descriptions. It was the opinion of the foresters that unnecessary detail was being mapped, the differences in slopes recognized in mapping being unimportant for forest management.

In an invited discussion of "stoniness" classes it was agreed that classes of stoniness important agriculturally did not coincide with classes important for forest management. Stoniness as influencing nutrient and water supplies and logging costs were mentioned as important considerations.

Wednesday morning, June 7. Excursion, Durham, N.H.
Afternoon, Durham to Dover, N.H.

Suffield, Cole, Bressua soils, ortstein and orteide.

Mr. Kellogg discussed the relation of management to productivity. He pointed out that soils could not be ranked for productivity without first sorting for management intensity.

Mr. Westveld insisted that lack of cultural work in a forest does not necessarily relegate it in the category of an unmanaged forest, that mere protection from fire might be considered as nominal management and that such action might be classed as "Management A".

Wednesday evening, June 7. Dover, N.H.

Discussion of possibilities of research mapping projects on experimental forests. Maximum possible detail deemed advisable.

Mr. Huberman **desired evidence** of use of soil maps in forest management. Attempts of Forest Service to use maps failed. No other evidence was forthcoming.

Mr. Latimer stated that SCS was using soil maps in afforestation planning.

Mr. Thorp stated in reply to Mr. Huberman that uses of most soil maps in forestry management will have to be worked out in cooperation with soils men until foresters understand the limitations of soil classification and mapping and soils men have a better understanding of forest types and site quality. It is believed that it could be demonstrated near Washington, D.C., for example, that there are important correlations between the composition and rate of growth of forests and certain combinations of soil types. It is believed that it would be possible to group soil types on the basis of their suitability for the production of tulip-poplar and the trees that are usually associated with it. This is only one example among many possible ones.

Editorial addition. A reference bearing on this point is Joseph Kittredge, Jr. The interrelations of habitat, growth rate, and associated vegetation in the aspen community of Minnesota and Wisconsin. Ecological Monographs 8(2):152-246, 1938. "Conversely the habitat groups, which may be established most effectively on the basis of soil profiles, may be used within limits for the prediction of the average growth of aspen."

Mr. Gast observed that in planning rehabilitation of hurricane devastated areas the soil map should give some indication of areas on which thrifty hardwoods as distinguished from coniferous regrowth should be favored.

Thursday morning, June 8. Dover to North Berwick, Me., to Alfred, Me.
Afternoon, Massabesic Experimental Forest, Alfred, Me.

Berwick, Merrimac, Saugatuck, Gloucester, Brookfield, and Hinsdale soils.

Mr. Goodman provided interesting exhibition of parent rock material.

Resumé session. Noon.

The following suggestions were advanced and informally approved as the conclusions of the conference.

(1) No changes are recommended in the Soil Survey mapping methods at this time.

(2) Soil Survey maps "gave promise of being useful in forest management."

(3) Detailed soil maps are desired on the experimental forests of the Northeastern Forest Experiment Station, the Fox, Yale, and Harvard Forests and perhaps others.

(a) Soil mapping should be done independently of forest type mapping.
(b) Organic horizon types should be identified.
(c) Indicator species distribution should be mapped.
(d) Quarter-acre sample plots should be placed, if possible, on single soil types. (Sample plots already established should be graded according to homogeneity for soil type.)
(e) Analyses of possible correlation of soil types and site qualities should be attempted.
(f) The possibilities of foliar diagnosis for nutritional levels and availability of nutrients in the soil should be explored.

(4) Another similar meeting next year is desired.

Attendance

W. R. Adams, Asst. Prof. of For., University of Vermont, Burlington, Vt.
J. R. Arno, Bot., Soil Survey, No. Berwick, Maine
Henry I. Baldwin, Asst. Forester of New Hampshire, Fox Research For., Hillsboro, N.H.
C. Edward Behre, Dir., Northeastern For. Exp. Sta., New Haven, Conn.
R. F. Chandler, Asst. Prof. of For. Soils, Cornell Univ., Ithaca, N.Y.
Gordon Chute, Northeastern Forest Exp. Sta., New Haven, Conn.
A. C. Cline, Asst. Director of the Harvard Forest, Petersham, Mass.
William H. Coates, Res. Asst., Soil Survey, Durham, N.H.
T. H. Coile, Asst. Prof. of For. Soils, Duke Univ., School For., Durham, N.C.
M. G. Eastman, Dean, Coll. Agr., Univ. of N.H., Durham, N.H.
Reeshon Feuer, Durham, N.H.
P. R. Gast, Asst. Prof. of For., Harvard Forest, Petersham, Mass.
K. V. Goodman, Soil Survey, No. Berwick, Maine (and Washington, D.C.)
Svend O. Heiberg, Assoc. Prof. of For., N.Y.St. Col. of For., Syracuse, N.Y.
C. Heimburger, Dominion For. Serv., Ottawa, Canada
M. A. Huberman, Div. of For. Management, U.S. Forest Service, Washington, D.C.
James W. Johnston, Northeastern Timber Salvage Administration, Springfield, Mass.
Charles E. Kellogg, Chief, Soil Surv. Div., U.S.D.A., Washington, D.C.
J. C. Kendall, Dir., Exp. Sta., Univ. of N.H. Durham, N.H.
W. J. Latimer, Insp., Soil Con. Serv., Soil Survey, Washington, D.C.
D. B. Lovejoy, Geol., Soil Survey, No. Berwick, Maine
Herbert Lunt, Soils Spec., Conn. Agr. Exp. Station, New Haven, Conn.
H. J. Lutz, Assoc. Prof. of For., Yale School of Forestry, New Haven, Conn.
Russell J. Lutz, For. Asst., Harvard Forest, Petersham, Mass.
W. H. Lyford, Asst. Soil Scientist, Durham, N.H.
Harold F. Morey, in charge, Massabesic Exp. Forest, Alfred, Maine
H. L. Mitchell, Asst., Dir., Black Rock Forest, Cornwall, N.Y.
Ford S. Prince, Prof. of Agronomy, Univ. of N.H., Durham, N.H.
A. E. Shearin, Asst. Soil Surveyor, Durham, N.H. (and Washington, D.C.)
Ward Shepard, Director of the Harvard Forest, Petersham, Mass.
Charles S. Simmons, Asst. Soil Surveyor, Washington, D.C.
Ivan H. Sims, Div. of For. Influences, U. S. Forest Service, Washington, D.C.
C. L. Stevens, Prof. of Forestry, Univ. of N.H., Durham, N.H.
Lewis C. Swain, Instructor in Forestry, Univ. of New Hampshire, Durham, N.H.
J. K. Taylor, Waite Institute, Adelaide, Australia
James Thorp, Soil Scientist, Soil Survey Div., U.S.D.A., Washington, D.C.
M. Westveld, Senior Silviculturist, Northeastern For. Exp. Sta., New Haven, Conn.