# AN ECOLOGICAL GLOSSARY

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COMPILED BY

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# PREFACE

ECOLOGY, being the science of communities—essentially an observational study—has acquired during its existence a vocabulary rich in descriptive terms. It has been my purpose in the preparation of this Glossary to bring together and make available the more technical and restricted usages of terms which have been and are in the ecological literature. While no pretense is made that the list is by any means exhaustive, nearly all of the technical terms encountered in a diligent search of the current periodicals and texts are included. Any comment, criticism, or additions from the users of this Glossary will be of material aid in the preparation of a supplement or second edition in the future, and will of course be welcomed.

Certain other publications which will be of aid to the ecologist may be cited:

Committee on Nomenclature, Ecological Society of America, 1933—Tentative glossary of Ecological terms, compiled by the committee . . . . (Preliminary and revised mimeographed lists are being prepared yearly, notice of availability being announced in the Proceedings of the Society, published in Ecology, usually in April of each year).

Henderson, I. F. Dictionary of scientific terms. Oliver & Boyd, London. (several editions)

Jackson, B. D. 1928. A glossary of botanic terms with their derivation and accent. Duckworth, London. (second edition)

Jager, E. C. 1930. A dictionary of Greek and Latin

combining forms used in zoological names. Thomas, Springfield, Illinois.

Knox, A. 1904. Glossary of geographical and topographical terms. Stanford, London.

Parker & Smith. Dictionary of entomological terms. Paris. (in preparation)

Roller, D. 1929. The terminology of physical science. Univ. Okla. Press, Norman,

Smith, J. B. 1906. Glossary of entomology. Brooklyn Entomological Society, Brooklyn, N.Y.

In the presentation of the terms with their definitions an attempt is made to present after each term a reference to the first use of the term or to a more available work or standard text in which the term is used or discussed. Unfortunately this was not always possible and many terms have a "dictionary definition" only. Where two or more concepts are employed in the usage of a single term, the most frequently used sense (in ecology) or the usage or sense approved by the author and editor is placed first. In most cases this will be found to agree with the recommendations of the Ecological Society's Committee on Nomenclature.

To avoid unnecessary confusion the term Community is substituted in the older definitions and in citations where other than the usual usage of terms is employed (e.g., Formation, Association, etc.). The terms Association and Society are begun with capital letters when used in the community sense; small letters are used when the implication is less definite. Quotation marks are used only where the author cited explains but does not define the term.

Certain obsolete and teleologic terms are included for

the sake of completeness and for aid in interpreting the older literature. It is not meant to revive these terms of the past although some may warrant reconsideration. The use of terms implying teleology should not be tolerated.

To effect an economy of space singulars and plurals of the same term are omitted, except in cases where the form is so different as to create confusion. In certain cases the same grammatical forms are not followed in successive citations under a given term; since most of the definitions are unedited citations, the reason is apparent.

Standard abbreviations are used in the designation of the journal references and for the most part for books; frequently recurring references are given by author and date only, with the exception of quotations from Jackson's Dictionary of Botanic Terms where the designation is "J:". References by authors cited by name and date will be found in the bibliography on pages 298 ff. The name of an author appearing in parentheses with a citation indicates that the term is being defined in the sense of that author. The following system of abbreviation is used:

= indicating synonym
cf "compare"; often indicating antonym
see a cross reference to terms of similar meaning
Of/ "of or pertaining to"; a designation to place definitions of adjectives in correct grammatical style, and effect an economy of space.

It is strongly recommended that certain terms originally used for plants or animals alone be extended in usage to include all organisms. New terms certainly do have a place in the literature if they are actually needed; when introduced all new terms should be adequately defined in clear concise language in footnotes, in the text, or in a sec-

tion devoted to terminology. In any event it is important that no ambiguity exist as to the exact meaning of terms as used in any ecological paper. The common names of the Communities of North America used in the Naturalist's Guide to the Americas (1926) should be used wherever possible.

The appendix includes certain tables and maps which it is hoped will serve as a useful supplement to the Glossary. Many of the maps are rapidly becoming inaccessible since the original works are out of print and it was considered advisable to bring them together in one place. Acknowledgments for the use of certain of the maps are included in the appendix.

I wish to express my appreciation to Drs. A. O. Weese, Paul B. Sears, and J. E. Weaver and to the Library staff of the Missouri Botanical Library for aid in making available certain out-of-the-way literature. I also wish to express my thanks to Dr. Weese for cooperation in the editing of the compilation, and to him and other members of the University of Oklahoma Ecology Seminar for their aid and encouragement throughout its preparation.

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# THE DEVELOPMENT OF ECOLOGICAL NOMENCLATURE

In examining a history of the science of ecology one is impressed by the fact that prior to the beginning of the twentieth century there was little organized thought towards the construction of a definite system of ecological nomenclature. The reason is immediately obvious: Any nomenclature or system of terminology is based upon a system of concepts and it was not until the close of the nineteenth century that serious co-ordination of previously collected data and concepts was attempted. The outstanding figure in this latter movement was Eugene Warming who undertook in *Plantesamfund* (1895) to effect such a coordination. This date serves as a turning point in the history of a field of thought the literature of which was widely scattered and whose workers were for the most part widely separated.

A brief résumé of the history of ecology prior to Warming will perhaps lead to a better understanding of the place and relative lateness of the position of nomenclature in the field. Early studies on succession in peat bogs and the first serious studies on zoogeography took place in the period from 1729 to 1840 and serve as the first period in the history of ecology. Such men as Buffon, von Humboldt, A. P. deCandolle, Linnaeus, Fabricius, Darwin, Grisebach, and Ste. Hilaire characterized the period.

A second period, 1840-1870, was characterized by the application of the theories of phyto- and zoogeography, and the development of the concept of the interaction of

organisms. Workers were Steenstrup, von Post, the de-Candolles, Dana, Haeckel, Huxley, Agassiz, Ste. Hilaire, and Grisebach.

Following this came a ten year period from 1870 to 1880 which saw the birth of the concept of the community, considerations on physiological adaptations, and comments on the fitness of the environment. Here we find the names of Grisebach, A. deCandolle, Möbius, Espinas, Forel, Wallace, Blytt, and Drude.

The next period seems to be shorter than any preceding, from 1880 to 1887-88; it was characterized by studies on the interaction of organisms with environmental factors. S. A. Forbes, Semper, Heliprin, Sachs, von Oettingin, Hult, and Drude attract our attention here and with the men of the next period laid the foundation for many of the present concepts of community functions.

The period 1887-88—1895 may well be termed the pre-Warming period; significant researches here were along the first quantitative lines, with physiological criteria rapidly replacing the older concepts of the community. Workers of greater importance were Bessey, Forbes, Möbius, Merriam, Andersson, Sernander, Warming, and Schimper.

A crystallization of the ecological knowledge of the time began with the successive appearances of the publications of Warming (1895), Schimper (1898), and Engler (1899). Since the publication of *Plantesamfund* was in Danish, its general effectiveness was probably somewhat delayed, and its honors were shared somewhat with Schimper's *Pflanzengeographie auf physiologischer Grundlage*. The influence of these works was to call attention

to the need of some sort of definite system of ecological nomenclature and classification.

This need was voiced to the scientific world by Warburg at the seventh International Geographic Congress (September 1899) at Berlin. His suggestions were (1900) that a definite and consistent principle should be followed. He pointed out that the "understandability" which Warming used for the layman should be for the scientists of all countries as well, and proposed a classification using Greek as a linguistic basis. Concerning himself only with the nomenclature of communities and considering that "biological phytogeography is now so well developed that one cannot go astray in the choice of principles and names," he suggested that an elaborate, comprehensive system of phytogeography be outlined which was to serve for once and for all. The Congress appointed a commission composed of Drude, Engler, Grabner, and Hock to work out a system to be presented before the next congress.

Flahault, stirred by Warburg's arguments and realizing that a need for clarification existed, read before the first International Botanical Congress at Paris (October 1900) a paper (1900) dealing mostly with the nomenclature of topographic and vegetational units, stressing priority in the designation of the regions, and for the most part using the vernacular in his designations. No general system of names was proposed for the actual types of communities, most of the paper being devoted to the ranking of communities and regions (as Region, Association, Society, etc.). In his words: "The great phytogeographic regions are characterized by a peculiar vegetable landscape, by a *type of vegetation* which reflects a distinct result of the reaction of climate on the plants. Good common sense has

distinguished by special terms the sum of biologic characters appropriate to each of these types. Science has but to accept them."

Clements proposed in 1902 a "system of nomenclature for phytogeography" (1902) based on the habitat as a criterion using terms of Greek and Latin construction. With it was offered a system of rules in the form of a code which included the recognition of priority, and restricted the validity of proposed terms; among the restrictions were the provisions that all terms should be proposed by botanists and be compounds of the classical languages of Greek and Latin. A permanent commission of phytogeographical nomenclature was proposed to pass on all terms, the system resembling somewhat that of the systematic biologists. In 1904 Clements added a series of terms dealing with the several types of succession, and in 1905 both proposed lists were slightly modified in the glossary of *Research Methods.*

In an editorial footnote, Engler (1902, article of Clements) protested against the adoption of the principle of priority, indicating that such a system would be impracticable for concepts which might later prove erroneous.

The Vienna Congress (1905) appointed Flahault and Schröter as members of a commission to set forth propositions to be presented before the next Congress. Olsson-Seffer (1905) in the same year proposed a scheme for the construction of new terms in which clarity of meaning and conciseness of concept were the keynotes. Any attempt at rulings of priority, or of the resorting to the classical languages was discouraged; vernacular terms were considered acceptable so long as they were not linked with ambiguity.

The commission headed by Flahault and Schröter appointed by the Vienna Congress obtained by means of a form circular sent around before the Congress at Brussels, the attitudes and opinions of the principal phytogeographers of the time. Opinions and suggestions were gathered together in the *Phytogeographische Nomenklatur*, published by the Congress (1910); chief among the contributors were the committee, Harshberger, Jaccard, Diels, and a British committee composed of Tansley and Moss. Farlow and Atkinson (1910) reported that the Congress rejected Clements' proposals both in respect to priority and the proposition that the terms should be from the classical languages. "Terminology is very different from nomenclature and must be subject to change in order to bring it into harmony with the change of ideas in the interpretation of facts." A commission was again appointed to continue the work, which had really been progressing in a constructive manner, and to report at the London Congress in 1915. The War made this Congress impracticable and it was not until 1926 that the work of the Congress was resumed.

During the sixteen years which followed, nomenclature and concepts grew and metamorphosed rapidly. Terms and concepts ran the gauntlet of natural selection and public opinion, many falling out of the literature entirely. Among the more important papers on the theoretical aspect of the question appearing during this period were those of Moss (1910), Brockman-Jerosch & Rubel (1912), Pavillard (1912), Braun & Furrer (1913), Shelford (1913), Clements (1916), Samuelsson (1916), Gleason (1917), Nichols (1917), DuRietz, Fries, & Tengwall (1918), McDougall (1918), Pearsall (1918), Pavillard (1919), Clements

(1920), Hansen (1921), Klugh (1923), Nichols (1923), Yapp (1925), Cooper (1926), Pearse (1926), Shelford (1926), and Tansley & Chipp (1926). During this period the later system of Clements became more widely accepted in America and Britain; that of the earlier Du-Rietz school in Northern Europe, and that of the Braun-Blanquet-Rübel school in Southern Europe.

At the meeting of the fourth International Botanical Congress* at Ithaca, N.Y., 1926, the older committee (appointed in 1910) made no report, being of the opinion that recommendations of this sort should be in the hands of the younger schools of thought. Accordingly, little was done at this Congress by committees, although papers on concepts of ecological units were presented by Nichols, Gleason, DuRietz, and DelVillar. Prior to the convening of the fifth Congress several rather important contributions were made by Soo (1927), Braun-Blanquet (1928), Rübel (1928), Weaver & Clements (1929), Tansley (1920), Braun-Blanquet & Pavillard (1930), and Du-Rietz (1930a,b). The latter author made a particularly brilliant contribution comparing existing systems of ecological classification, proposing a compromise system, and illustrating all of the extant systems in a single comparative chart (*see* appendix I). This, together with papers by Nichols and Phillips, was presented before the Cambridge Congress in 1930. The paper of DuRietz led to a better mutual understanding on the part of the divergent schools. Phillips urged the consideration of the community as a biotic entity; his proposal met with approval by Tansley, Rübel, Salisbury, and Shantz. A commission headed by DuRietz and consisting of Cowles, Diels, Do-

* International Congress of Plant Sciences.

min, Gleason, Jaccard, Maire, Nordhagen, Phillips, Rübel, Stojanoff, Szafer, Tansley, and Vierhapper, was appointed with instructions to make a report before the sixth Congress to be held at Amsterdam in 1935.

Outstanding papers since the fifth Congress have been those of Phillips (1931, 1934, 1935) and Shelford (1931, 1932), and the preliminary and revised lists of terms offered by the committee on ecological nomenclature of the Ecological Society of America (1933-34). This committee has stated some "basic principles" of nomenclature (1933) which appear to be much more acceptable and workable than any other set thus far proposed (with the possible exception of Olsson-Seffer 1905). They are:

1. Natural growth of ecological nomenclature should not be hampered by rules.
2. Restricted scientific usage should not violate common literary or general scientific usage.
3. Words long used in a broad sense should not be used in a new, special meaning.
4. Uniformity of usage is desirable in the same field or in closely related fields; if a relatively new word is commonly accepted in one branch of science it should be adopted in other branches when it is needed there.
5. New words should be coined only when there is a distinct need. It is desirable that ecological literature be intelligible to as wide a field of readers as possible. It is not necessary to have a separate term for every slight difference of meaning.
6. Words are tools of thought. An exact term may aid in clarifying a clearcut distinct concept. Ambiguous or inaccurate use of terms may obscure a

definite concept. The development or formulation of a concept may be hindered by the too early coining of new terms or definitions as well as the failure to use precise terms.

The sixth International Botanical Congress met in Amsterdam in September 1935. The twelfth International Zoological Congress met at Lisbon later in the same month, including ecology for the first time on its program. At the former Congress a sectional meeting devoted to the problems of ecological nomenclature was held in which the merits of the various systems of concepts and criteria were discussed. Concepts were decidedly at variance, and the conclusions of the section were well expressed by G. E. DuRietz: "As long as there is no general agreement in the fundamental *concepts* of phytosociology, any attempt of attaining at an agreement in the terminology of these concepts seems futile. The main thing at present appears to be to parallelize the different phytosociological systems in the right way. We must know when different systems have a certain concept in common, and what this concept is called in the different systems. And we must know the different meanings of a certain term in different systems. Above all, we must get rid of the widespread belief that there is *one* fundamental unit of phytosociology and that the term 'association' must be reserved for this unit . . . . Experiences from the phytogeographical terminology resolutions of the Brussels Congress have sufficiently demonstrated the futility of any congress resolutions which have not behind them an overwhelming majority of workers in the science concerned. A continued free discussion of phytosociological concepts and terms seems to be the best way to a future general agreement."

It is hoped that this volume will serve in clarifying the concepts and usages of the more common systems of terminology and nomenclature, and that the ultimate goal of international understanding be more rapidly reached through its use. The biotic interaction of organisms forms the basic framework for all communities. The establishment of any system of criteria or terms which omits any portion of the community in recognizing and designating communities is only a partial completion of the task. Joint action and co-operation on the part of workers in both the fields of botany and zoology—the parts of an arbitrarily divided biology—is necessary before a real international system of ecological terminology is possible.