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DETERMINATION OF THE TERMS USED IN THE TITLES OF ECOLOGY PUBLICATIONS AND ANALYSIS OF THEIR TEMPORAL CHANCE

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Abstract

Ecology studies in recent years have become widespread in numerous fields. Therefore, new topics, concepts and terminology appear in ecology resources. Trend setting in ecological studies and so the studies to investigate changes of use of concept and terms from past to present are remarkable in recent years. Terms used in the titles of the publications of two important ecological sciences journals such as "*Journal of Ecology*" and "*Ecology*" and their changes have been analyzed in this study. In this context, the studies appeared in the *Journal of Ecology* were analyzed in total of three groups containing articles, reports and total group where both articles and reports are included; while the studies that take place in *Ecology*, by being classified in the form of articles, reports, other publications and their sums. 79397 words, in total, were obtained from titles of 6563 ecology publications of *Journal of Ecology*. Of those, 66157 words were involved in articles, and 13240 words in the titles of the other ecology publications. Similarly, total 167250 words were obtained from 15709 publication titles of *Ecology*. 136413 of those words were involved in articles; 14021 words in reports and notes, and also 16816 words in other ecology publications. Both journals gave publicity to the terminology of botany. This feature is more pronounced in the *Journal of Ecology*. The ones which ranked in the top 100 within the publishing groups of both journals are important terms of ecology. Among the publishing groups of journals, top ranking terms are *plant, forest, vegetation, species, soil, ecology, growth,* and *community*. In the article titles of *Journal of Ecology*, there are 21 terms which ranked in the top 100 between the years 1913 and 2013 and took part in all time periods of decade. Also in *Ecology* journal, there are 62 terms which appeared in all decadal periods between the years 1920 and 2013. For the terms, the time periods of entering the top 100 were influenced by the general trends of ecology and the developments in other fields.

Key Words:*Journal of Ecology*, *Ecology* , Ecological terms

Özet

Ekoloji çalışmaları son yıllarda birçok alanda yaygınlaşmıştır. Buna bağlı olarak yeni konular, kavramlar ve terimler ekoloji kaynaklarında yer almaktadır. Ekoloji çalışmalarında eğilim belirleme ve geçmişten günümüze kavram ve terim kullanımının değişimlerinin incelenmesine yönelik çalışmalar son yıllarda dikkat çekmektedir. Bu çalışmada ekoloji bilimlerinin iki önemli dergisi "Journal of Ecology" ve "Ecology" dergilerinin yayın başlıklarında kullanılan terimler ve değişimleri incelenmiştir. Bu kapsamda Journal of Ecology dergisinde yer alan çalışmalar; makaleler, raporlar ve makale ile raporların toplamı olarak üç grupta; Ecology dergisinde yer alan çalışmalar ise; makaleler, raporlar, diğer yayınlar ve toplamları şeklinde gruplandırılarak analiz edilmiştir. Journal of Ecology dergisinin 6563 ekoloji yayınının başlığından toplam 79397 kelime elde edilmiştir. Bunların 66157 kelimesi makalelerde, 13240 kelime ise diğer ekoloji yayınlarının başlıklarında yer almıştır. Benzer şekilde ecology dergisinin 15709 ekoloji yayın başlığından toplam 167250 kelime elde edilmiştir. Bunların 136413 kelimesi makalelerde, 14021 kelime rapor ve

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notlarda ve 16816 kelime ise diğer ekoloji yayınlarında yer almıştır. Her iki dergide bitkibilim terimlerine yer vermiştir. Bu özellik Journal of Ecology dergisinde daha belirgindir. Her iki derginin yayın gruplarında ilk yüze giren terimler ekolojinin önemli terimleridir. Dergilerin yayın gruplarında en üst sıralarda plant, forest, vegetation, species, soil, ecology, growth, communty terimleri yer almaktadır. Journal of Ecology dergisini makale başlıklarında 1913 - 2013 arasında ilk yüze giren terimlerin onar yıllık dönemlerin hepsinde yer alan 21 terim bulunmaktadır. Ecology dergisinde de 1920 - 2013 arasında onar yıllık dönemlerin hepsinde yer alanlar 62 terim bulunmaktadır. Terimlerin ilk yüze girme dönemleri ekolojinin genel eğilimleri ve diğer alanlardaki gelişmelerden etkilenmiştir.

Anahtar Kelimeler: Journal of Ecology dergisi, Ecology dergisi, ekoloji terimleri

1. INTRODUCTION

About the genesis of ecological information, miscellaneous ideas have been proposed. Some scientists, due to their habits, show the ancient Greek period as the beginning of ecological information (Egerton, 2001). Also, according to the studies of those who are dealing with traditional ecological knowledge, ecological information can be found in every society (Berkes, 2008). In general ecology texts, however, the roots of ecology are taken as far as the18th century, ecology is still directly initiated by the definition made by Ernst Haeckel in 1866 (Brewer, 1988; Ricklefs, 1993).

It has been the subject of researches how issues are handled in written sources belonging to the time periods when studies and opinions were presented without identifying the ecological knowledge. From the books during these time periods, one can obtain such important information about ecology. For example; "Principles of Geology" by Charles Lyell (Wilkinson, 2002), and Lamarck's works (Ghilarov, 1998). In the early stages, ecology studies had been published in the journals of other fields (Graham and Dayton, 2002). First publication of ecology journals started in early 1900s and those journals have made a significant contribution to the knowledge of ecology through their publications until today.

The number of journals whose names "eco" and its derivatives has increased in recent years. In the list of Science Citation Index Expanded Journal; "Ecology" appears in 69, "Ecosystem" in 6, and "Ecological" in 15 journal titles. Also, there are 11 journal names which include the terms starting with "Eco". Similarly, in the list of Social Sciences Citation Index Journal; "Ecology" appears in 4 and "Ecological" in 3 journal titles. The total number of journals in the two lists is 108 (ip-science.thomsonreuters.com). Also, there are a lot of journals that publish ecology studies, nevertheless their names do not include above mentioned words. When non-SCI journals are also added to those, it becomes evident that ecology is one of the most important study fields of the 21st century. According to data from Websites "Web of Science" and "Google Scholar", a rapid increase in ecological publications has been seen in the period from 1985 until 2013 (Pautasso, 2014). Ecology originates from biological sciences, and when compared to the other sub-disciplines, increase in its publications is above medium (Pautasso, 2012). Also, when looked at the areas of indexed journals, ecology maintains its characteristics of being a field of physical sciences. However, its relations with the social sciences began from the earliest times (Griffith, 1934; Adams, 1935). In fact, it penetrates into the fields of philosophy and religion that are other sources of information (Kinsley, 1995).

Thus, journals that are issued regarding ecology create such an important archive for us. In a lot of areas, it provides long-term evaluation, and opportunity to identify and compare the trends. Thereby, it allows for carrying out topic or term scaled studies (Graham and Dayton, 2002; Krebs, 2006; Dauvin, et al., 2008). Terminology studies have been carried out since the early days of the ecology journals. In recent years, these studies are also performed directly on the term itself. Discussions on nomenclature have become intense (Hustich, 1979; Rykiel, 1985; Hodges, 2008; Magnusson, 2013; Prado and El-Hani, 2013). If long-termed nomenclature studies were made in ecology journals, it would pave the way for us to determine the areas on which ecological knowledge focuses. If those studies were made in sub-disciplines, it would help us explain the general trends of ecology (Du-ning. and Xiu-zhen, 1999).

Journal of Ecology and *Ecology* are the most important long-term publishing journals of classical ecology. *Journal of Ecology* and *Ecology* themselves have been the subject of studies (Wardle, 2010; Nobis and Wohlgemuth, 2004). In this study, analysis of temporal change of terms and term use of these two journals is intended. To achieve this goal, terms used in the titles of ecology publications were based on. Thus, It was attempted to reveal the trends of ecology from past to present.

2. MATERIALS AND METHODS

2.1. Materials

The first issue of the *Journal of Ecology* was published in 1913, whereas *Ecology* began publishing in 1920. There are various types of publications in scientific journals. The most important types of publications are articles. Today, typically, scientific papers are comprised of the following parts: Title, Authors' Names, and Institutional Affiliations - Abstract - Key words - Introduction - Methods - Results - Discussion and Results. Even though, use of abstract section in both journals can be traced back to the 1930s, abstracts were located at end of the papers in the time periods in question. Moving the abstract section to the beginning of the paper was possible in 1977 for the *Journal of Ecology*, and in 1964 for *Ecology*. In the *Journal of Ecology*, use of key word section is seen after 1992 and in *Ecology* after 1974. Incorporating abstract (summary) and key words into the works after certain years has limited their use in long-term studies. In addition to this, their frequency and array in the ecology publication were also examined according to key word groups (Pautasso, 2013a; b; Borrett et al., 2014). Publication titles were preferred since they provide possibility to carry out long term study concerning use of terminology in aforesaid journals.

For both journals, all publications published between 1980 - 2013 were scanned in Webpage; http://apps.webofknowledge.com/. 3335 pieces of studies were found in the *Journal of Ecology* for the specified period. Also, the distribution of the studies according to the given names in the journals is; Article 2995, Review 125, Book Review 110, Editorial Material 43, Letter 18, Correction addition 16, Correction 13, Item about an individual 6, Note 3, Biographical item 3, Proceeding paper 2 and News item 1. For the specified period, 8934 pieces of studies were found in the *Ecology*. Again, the distribution of the studies is; Article 8041, Note 301, Editorial Material 207, Review 180, Book Review 70, Correction 66, Correction addition 39, Letter 27, Reprint 1, Proceeding paper 1 and Biographical item 1.

Also, with the publications of journals published pre-1980, for the *Ecology* http://www.esajournals.org/ and for the *Journal of Ecology* http://onlinelibrary.wiley.com WebPages were utilized.

Between 1913 - 1979, there are a total of 4267 pieces of ecology publication in the *Journal of Ecology*. According to their publication by type; 1932 Article, Review 1258, Notice 413, British Ecological Society 229, Biological Flora of the British Isles 167, Plate 67, Ecological Society of America 55, Notices of Publications of General Bearing 29, Notices of Publications on British Vegetation 25 and others 92 pieces were published. Also, Ecology has 6986 publications; 3779 article, 47 book note/notices, Book reviews 168, Books and Monographs Received for Review 86, Commentary 32, Correction 3, Corrigenda 6, Corrigendum 2, Ecological literature received 30, Errata/e 8, Erratum 6, Notes and Comment 805, Notice 6, Obituary 3, Report 645, Review 1357 and Supplement 3.

7602 in the *Journal of Ecology* and 15920 in *Ecology*, there are a total of 23522 pieces of publication. Within the scope of the study, among ecology publications the ones without proper publication qualifications were excluded from the study. For example, the names of "Plates" and "Map" that appear in the contents section of earlier issues of the *Journal of Ecology* were removed. In addition, titles such as recurrent meeting announcements, repetitive publication presentations and member lists were also excluded from the study. For example; Meeting at Bedford College, London, Summer Meeting at Aberystwyth, Annual Meeting at University College, London, Easter Meeting at Imperial College, London, Accounts for 1938, Accounts Published or in Preparation, Advances in Ecological Research, Advances in Agronomy, British Medical Bulletin, Antarctic Ecology, Environmental Conservation, Progress in Botany, Progress in Soil Biology and List of Members etc.

Since publications in languages other than English were included in the first issues of the *Journal of Ecology*, those ecology publications, even if few in number, were excluded from the study. A similar situation was also applied to non-English publications taking place in the book reviews. In addition, studies published under the title of "the British flora prior to 1980" and so the studies having only species name in the title were excluded from evaluation.

The assessment of the studies was made according to the journals and groups of the publication types. In the creation of groups; articles form a group, report publications create a group, whereas other than these create the group of others and total group comprise them all. In this context, the *Journal of Ecology* was evaluated in three groups as articles, other publications and the sum of the two. Also, *Ecology* was grouped into; articles, reports, other publications and their sums (Table 1).

Table 1: Publication groups and the numbers of the journals used within the scope of the study

Journal Name	Period	Articles	Reports	Others	Total
Journal of Ecology	1913 - 2013	4848		1715	6563
Ecology	1920 - 2013	11820	1438	2451	15709
Total		16668	1438	4166	22272

2.2. The creation and analysis of data sets

From titles of ecology publications mentioned above, symbols such as "• < « ( ) { } ., £ ■ * ♦ „ :" and figures were removed. Genus, species and author names used in the definitions of organisms were excluded from the evaluation.

After the removal of the above-stated symbols and other parts, in the remaining ones, publications titles were arrayed one under the other to conduct a word analysis. Then, the titles were divided into words in an Excel environment. A total of 79397 words were obtained from 6563 ecology publication titles of the *Journal of Ecology*. 66157 of those were included in the articles, while the other 13240 words appeared in ecology publications. Similarly, a total of 167250 words were obtained from 15709 ecology publication titles of *Ecology*. 136413 of those in the articles, 14021 words in reports and notes and 16816 words appeared in other ecology publications.

In the sorted titles above, the year of publication is added next to the words. Repetitive words in 79397 titles of the *Journal of Ecology* were combined in Excel and a list containing 8235 words that are used in journals was created. Similarly, a list containing 14259 words that are made free of repetition was also obtained from 167250 words of *Ecology*. Later, in word list, the words in two columns composed of years and words were made to be counted by date. Thus, word x year matrix containing all the words was obtained. The words which have the quality to be a term were taken from the list according to the following criteria and they were made to be arrayed according to maximum number of occurrences. In this way, term x year matrix was obtained. These operations were made on each journal and subgroups.

Terms criteria; 1) Terms that are written as a single word were accepted. 2) By utilizing the dictionary, it was determined if the word was a term in ecology (Allaby, 1998). 3) For the different spelling of the words, the use of authors was based on. E.g. the term "fresh water" was sometimes used as a compound word; "freshwater". Therefore, these terms were individually evaluated as "fresh water and freshwater,". 4) Some affixes that do not radically change the semantic meaning of the terms were considered to be the same. Verbs, adverbs, affixes or word stems were excluded from evaluation. In the cases where the term "plant" takes plural suffix "-s"; it was considered to be the same and it was shown as "plant-(s)" and "-" sign indicates where the suffix is added. In such terms, while "-" sign states where the affix is added, it also indicates that the affix used outside the brackets is more frequently encountered than the ones in brackets. For example, in the "predator-ion (or, ors ory) term" representation; "predation" is more frequently used but the terms predator, predators and predatory are less frequently used.

2.3. Calculation of index values

Calculation of index values of the terms which ranks in the top 100 according to the frequency of use in publication titles is made as the following procedure. Index values are calculated over 1000 articles.

Calculation of index values of symbols and terms for the *Journal of Ecology*;

Total publication (Ecology publications) index (JE_{ti}) = (number of x term/ number of total publication)*1000

Article publications index (JE_{ai}) = (number of x term/ number of articles)*1000

Other publications index (JE_{oi}) = (number of x term/ number of other publications)*1000

Calculation of index values of symbols and terms for *Ecology*;

Total publication (Ecology publications) index (E_{ti}) = (number of x term/ Total number of total publication)*1000

Article publications index (E_{ai}) = (number of x term/ number of articles)*1000

Report publications index (E_{ri}) = (number of x term/ number of report publications)*1000

Other publications index (E_{oi}) = (number of x term/ number of other publications)*1000

Time-dependent analysis of the terms; For the journals and sub-groups, the terms are ranked

according to frequency of use and the ones in top hundred were evaluated in the study. Article data were used to determine the time-dependent changes of the terms. In the term x year matrix belonging to the articles, the number of terms are added up in time periods of decade. Thus, between the years 1913-2013 and 1920-2013, two data sets belonging to decadal periods were obtained. The difference between the numbers of articles in the journals and the total numbers of the terms has made comparison difficult. To that end, "article usage index" of the term was calculated.

First, publication numbers of articles in the journals for decadal periods are determined (Table 2 and 3). Then, the total number of articles (4848 for the *Journal of Ecology*, 11820 for *Ecology*) was adopted as 100 and their periodic distributions were calculated. Later, total of each term was accepted to be 100 and their periodic distributions were calculated. Also, the difference between the two distributions was calculated to be the index value of periodical article use of the term.

Article usage index (A_{ui}) value is = Article distribution - term distribution.

The similarity of the publication groups was determined with Sorensen method by using Presence-Absence data of top hundred terms (Magurran, 1988, 2004; Legendre and Legendre, 1998). Analysis was carried out in the CAP 4 packaged software.

Table 2: The number of articles of the *Journal of Ecology* and the article usage index are as follows

	1913-1920	1921-1930	1931-1940	1941-1950	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	1913-2013
Number of articles	96	145	232	115	327	506	559	696	717	1043	412	4848
Article distribution	2,0	3,0	4,8	2,4	6,7	10,4	11,5	14,4	14,8	21,5	8,5	100
plant-(s)	12	15	34	13	34	74	84	108	133	319	151	977
plant-(s) distribution	1,2	1,5	3,5	1,3	3,5	7,6	8,6	11,1	13,6	32,7	15,5	100
plant-(s) (A_{ui})	-0,8	-1,5	-1,3	-1,0	-3,3	-2,9	-2,9	-3,3	-1,2	11,1	7,0	

Table 3: The number of articles of *Ecology* and example of article usage index

	1920	1921-1930	1931-1940	1941-1950	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	1920-2013
Number of articles	24	388	388	333	619	783	1399	1797	2131	3163	795	11820
Article distribution	0,2	3,3	3,3	2,8	5,2	6,6	11,8	15,2	18,0	26,8	6,7	100,0
plant-(s)	6	41	28	21	37	39	85	156	252	404	130	1199
plant-(s) distribution	0,5	3,4	2,3	1,8	3,1	3,3	7,1	13,0	21,0	33,7	10,8	100,0
plant-(s) (A_{ui})	0,3	0,1	-0,9	-1,1	-2,2	-3,4	-4,8	-2,2	3,0	6,9	4,1	

3. RESULTS AND DISCUSSION

3.1. Characteristics of two journals

The *Journal of Ecology* has been published for 101 years, and *Ecology* for 94 years. There are differences in the sense of term use between the types of publication of both journals. Index values of the terms used in the *Journal of Ecology* were higher than the other (Appendix 1 and 2). For example, JE_{ti} value of the term plant- (s) is 191,5 in the *Journal of Ecology*, while 94 E_{ti} value was found in *Ecology*. (Appendix 1 and 2). A similar situation is also observed in the articles and other types of works. Publication number of *Ecology* is 2.4 times more than the publication number of the other journal (Table 1). Due to increase in the topics studied over the years, the term use has also been diversified. Therefore, despite the use of terms in great

deal of numbers in *Ecology*, index values of the terms were found to be lower.

50 important concepts of ecology were determined by the study conducted by Cherret (1986) among the members of The British Ecological Society, later on, network ecology was developed by adding 13 new concepts to that list (Borrett et al., 2014). One-word concepts in Cherrett and Borrett et al. lists overlap with some of the terms that rank in the top 100 in the groups. In particular, the terms such as *species, community, ecosystem, landscape, succession,* are the terms both rank in top hundred and that are found in the lists. A similar situation is also valid for the topics used for the study on ecological articles between the years 1980 and 2010. One-word topics of *distribution, evolution, genetics, grazing* were examined in the said study (Carmel et al., 2013). These concepts are the terms which ranks in top hundred among publication groups.

Ecological information provides a basis for solving environmental issues encountered in today's world. With the aim of making the ecological data into a political issue, 100 questions that are determined by the scientists at various levels in Britain are grouped under 13 headings (Sutherland et al., 2013). In particular, the titles of *climate, invasion and forestry* are the terms which directly rank in the top 100 in the groups. Also, an important portion of the terms that appear inside the questions takes part among the top hundred terms. Therefore, an important portion of the terms used in ecological studies will be further utilized in the social sciences, and more in particular, in politics. Accordingly, it becomes even more important to know what the terms of ecology are and how their changes are.

According to the top 100 terms used in the publication titles of the *Journal of Ecology*, Sorensen similarity of the publication types is higher than the other journal (Table 4). Decrease in the reports group in *Ecology* after 1970 might have weakened their relationships. It was determined that similarities between articles and the others are more in the *Ecology*. It shows that the topics considered to be important in the others group in the *Journal of Ecology* are more differentiated than the articles.

When both journals began publishing, they also called for the studies that were carried out in other disciplines where ecology-related studies were conducted. (Tansley, 1913, Moore, 1920). However, it was explicitly stated that vegetation studies (divided into two as Britain and overseas countries) would be accepted under the titles of *Journal of Ecology* and it was announced that plant physiology, plant anatomy and floristic plant geography publications would be accepted also within the text (Tansley, 1913). Until today, both journals have maintained the importance they attached to vegetation (Appendix 1 - 4). Hence, in the *Journal of Ecology*, with 100,3, JE_{ti} value of the term *"vegetation"* was ranked as the third, whereas in *Ecology*, with 28,4, E_{ti} value was placed on the 19th row. (Appendix 1 and 2). However, in *Ecology*, the terms for zoology were placed on higher ranks. For example, *"predator-ion (or, ors ory)"*, *"herbivore-y (e, es)"*, *"fish- (es)"* E_{ti} values were on the higher ranks among the top 100 terms, similarly E_{ai} values were placed on higher ranks (Appendix 2). Judging by the terms used in the publication titles between 1978-2002, the *Journal of Ecology* was determined to be a botany-oriented journal (Nobis, M. and Wohlgemuth, T., 2004). According to the findings of the study, it was found that journal's botanical feature has existed since its beginning and that it maintains this feature nowadays. On the other hand, a similar assessment is not being made for *Ecology*. This situation may result from the difference in natural structure between the Continents of Europe and America. The nature of the European continent has been destroyed by humans but the nature of the New world is less impaired. The facts that there are deserts in the Americas and the closest desert to Europe is in Africa significantly cause the term *"desert-(s)"* to be placed on higher ranks in *Ecology* both in total and in article titles. Similarly, the situation that Britain is an island state (and has colonial relations with lots of islands) could have caused the term *"island-(s)"* to be more frequently used in the *Journal of Ecology*. Tundra is also one of the world's major ecosystems (Schultz, 2005). Besides, the fact that the term *"tundra"* is rarely encountered in both journals (Appendix 1 and 2) may arise from the presence of said tundras in the north of Canada and Asia.

Table 4: Sorensen similarity index of journal publication groups

Journals		Ecology				Journal of Ecology		
		E_{ai}	E_{ri}	E_{oi}	E_{ti}	JE_{ai}	JE_{oi}	JE_{ti}
Ecology	E_{ai}							
	E_{ri}	0,69						
	E_{oi}	0,83	0,68					
	E_{ti}	0,96	0,73	0,86				
Journal of Ecology	JE_{ai}	0,64	0,56	0,61	0,66			
	JE_{oi}	0,61	0,58	0,66	0,64	0,72		
	JE_{ti}	0,65	0,59	0,63	0,67	0,96	0,76	

3.2. *Tendency of the Term Studies Published in the Journals*

In the *Journal of Ecology*, terminology is shown as a research subject, and the change of relevant studies is specified periodically (Hutchings et al., 2012). Both journals have attached importance to the terms and included term studies since the earliest times. Even, terminology and concept studies were published directly as articles in both journals. Especially in early periods, term studies on vegetation are encountered (Hansen, 1921; Yapp, 1922; Harshberger, 1923; Shelford, 1926; Gleason, 1927; Thoday, 1933; Tansley, 1935; Phillips, 1935a; b; c; Carpenter, 1936; Clements, 1936; Spurr, 1952; Mason and Langenheim, 1957; McMillan, 1959; Udvardy, 1959; Rowe, 1961; Mason and Langenhem, 1961; Kozlovsky, 1968; Inouye, 1980; Wheeler and Proctor, 2000), and sometimes it is used as sub title within the texts (Klugh, 1923). Term studies in question are generally on *"vegetation"* and in particular they comprise the terms of *"succession", "climax", "habitat"* and etc. Except for climax, these terms take place in top hundred in both journals (Appendix 1 and 2). While vegetation and succession less frequently take place in article titles, habitat still attracts attention (Appendix 3 and 4). Plant ecology and vegetation studies Clements and Tansley carried out in the early years of the journals have deeply affected the era (Shantz, 1945; Tansley, 1947; Hutchings et al., 2012). Those plant centered studies and discussions of the early stages of the journals continue to maintain their existence even today.

3.3. Change of Time-Dependent Term Use

In the article titles of the *Journal of Ecology*, among the terms which ranked in the top 100 between the years 1913 and 2013, there are 21 terms which appear in all periods of decade (Appendix 3). Also, in *Ecology*, there are 62 terms which are common in all decadal periods between the years 1920 - 2013 (Appendix 4). The terms, which enter the top 100, eventually vary faster than the other journal. This may stem from the publication strategies of the journals or it may result from the number of the publications as well. In addition, the terms encountered in every era may directly be the names of the research fields. For example, the research fields of ecology such as *"vegetation"*, *"forest"*, *"succession"* (Hutchings et al., 2012) are the terms which enter the first hundred and which are common in every time period.

Some of the first hundred terms which are the most commonly used in the articles started to be used in the article titles after a certain time (Table 5). As this situation stems from the general trends of ecology, it is closely related to technological developments as well. Debates on identification and grouping of plant and animal communities have continued for ages (Golley, 1993). After Tansley's definition of the term *ecosystem* in 1935, this term started to be used in both journal (Table 5). In recent years, use of the term ecosystem has further increased and Mkg values in both journals are over 6.5 (Appendix 3 and 4). Depending on changes in global conditions, the terms *"arid", "landscape"* and *"diversity"* have appeared in the titles (Table 5 - 7). This situation supports the findings of Nobis and Wohlgemuth, 2004. Appearance of the terms *"pattern-(s, ed, ing)"* and *"spatial"*, is after 1940s for the first one and the latter after 1950s. These dates are also the development periods of computer technologies. The terms which entered the top 100 among article tittles according to time periods are presented in Table 5. A_{ui} values of major portion of these terms are positive (+) values (Appendix 3 and 4).

Table 5. The terms which, for the first time, began to be seen in the top 100 among the article titles of both journals in decadal periods

Decadal periods	*Ecology*	*Journal of Ecology*
1931 - 1940	"native-(s)", "poll-en(inated,ination)", "heterogene-ity(ous)", "breeding", "densit-y(ies)", "competiti-on(ve)" ve "predat-ion(or,ors,ory)	"scotland", "graz-ing(ed)", "temperate", "germination", "size", "densit-y(ies)", "abundance-(s)", "range-(s,land,lands)", "carbon", "flower-(s,ing)", "ecosystem-(s)", "seedling-(s)", "variation-(s)"
1941 - 1950	"lizard-(s)", "trophic", "dispersal" ve "pattern-(s,ed,ing)"	"mineral-(s)", "local", "invasi-on(ons,ve)", "diversity", "pattern-(s,ed,ing)"
1951 - 1960	"productivity", "reef-(s)", "coral-(s)", "ecosystem-(s)", "nutrient-(s)", "prey", "spatial" ve "demograph-y(ic)"	"fung-(i,al)", "mortality", "stand-(s)", "savanna-(s)", "lowland-(s)", "mediterranean", "canop-y(ies)", "productivity", "genetic-(s)", "reproducti-on(ve)", "interaction-(s)" ve "spatial"
1961 - 1970	"diversity", "foraging", "coexist-ence(ing)", "interaction-(s)" ve "disturbance-(s)"	"arid", "shrub-(s)", "temporal", "native-(s)", "phenolog-y(ies,ical)" ve "disturbance-(s)"
1971 - 1980	"landscape-(s)", "web-(s)" ve "herbivor-y(e,es)"	"stress", "demograph-y(ic)", "herb", "clone-(s,al)", "landscape-(s)" ve "herbivor-y(e,es)
1981 - 1990		"heterogene-ity(ous)"

Use change is seen when the journals' terms that enter top five in decadal periods are examined (Table 6 and 7). However, those terms of the top 100, more particularly, the terms that enter top five are the real base of ecology. Dodson has divided ecology

studies approaches into four categories; ie, according to 1) concepts and vision, 2) living organisms, and 3) their habitat 4) applications (Dodson, 1998). Also, in our study, the terms are; predominantly for habitats (forest, river, etc..); later for topics (ecosystem, landscape, etc.), organisms (alga, bryophyte, etc.); and at the least for the applications. Among the terms that entered top five at various times, *"England"* and *"Scotland"* place names in the *Journal of Ecology* and in the other journal *"California"* city name were ascertained. (Table 6 - 7).

The changes in the presence of the terms *ecology, ecological* and *ecosystem* in the article titles according to the time demonstrate different characteristics. For both journals, the terms *ecology* and *ecological* which are common in the titles until 1980s; are less often seen in the titles later on (Fig.1). In the periods in question, studies on the ecology of an organism or population and studies on ecological factors affecting them were carried out. Also, ecosystem has taken place in the titles since 1935 when it was defined, and made its main leap after 1990s (Fig.1). Recently, issues such as identification of the various ecosystems, their cycles, and their resistance to environment are being studied. In addition, discussions on the concept of ecosystem continue (Jax, 2007). Thus, the term ecosystem remains up to date (Jax, 2007). The increase of the term *ecosystem* especially in recent years, is consistent with the conclusions Nobis and Wohlgemuth, 2004 reached.

Table 6: The terms which entered top five according to time periods among the article titles of the Journal of Ecology

Decadal periods	1	2	3	4	5
1913--1920	bryophyte-(s)	association-(s)	ecology	vegetation	marsh-(es)
1921--1930	chalk	biology/biological	river-(s)	ecology	land-(s)
1931--1940	Fen	alga-(e,l)	flora-(l)	river-(s)	bryophyte-(s)
1941-1950	chalk	alga-(e,l)	river-(s)	bog-(s)	ecology
1951--1960	Fen	ecology	alga-(e,l)	coast-(al)	dune-(s)
1961-1970	england	peat-(s)	season-(s,al)	association-(s)	bog-(s)
1971-1980	mineral-(s)	dune-(s)	lake-(s)	scotland	primary
1981-1990	age-(s)	demograph-y(ic)	litter-(fall)	scotland	phenolog-y(ies,ical)
1991-2000	clone-(s,al)	herb	heterogene-ity(ous)	size	shrub-(s)
2001-2010	invasi-on(ons,ve)	native-(s)	landscape-(s)	disturbance-(s)	dispersal
2011-2013	ecosystem-(s)	diversity	native-(s)	stress	interaction-(s)

Table 7. The terms which entered top five according to time periods among the article titles of Ecology

Decadal periods	1	2	3	4	5
1921--1930	island-(s)	water-(s)	ecological	temperature-(s)	insect-(s)
1931--1940	root-(s,ed)	pine-(s)	region-(s,al)	prairie-(s)	america-(n)
1941--1950	range-(s,land,lands)	prairie-(s)	natur-e(al, ally)	pine-(s)	lake-(s)
1951--1960	lake-(s)	california	natur-e(al, ally)	Vegetation	temperature-(s)
1961--1970	vegetation	ecology	mountain-(s)/montan-e(a)	area-(s)	energy
1971--1980	lizard-(s)	energy	island-(s)	desert-(s)	feeding
1981--1990	foraging	sex-(es,ual,ually)	patch-(y,es,iness)	disturbance-(s)	competiti-on(ve)
1991--2000	landscape-(s)	seedling-(s)	nitrogen	Feeding	larva-e(l)
2001-2010	invasi-on(ons,ve)	landscape-(s)	web-(s)	native-(s)	diversity
2010-2013	invasi-on(ons,ve)	ecosystem-(s)	diversity	climat-e(s,ic)	native-(s)

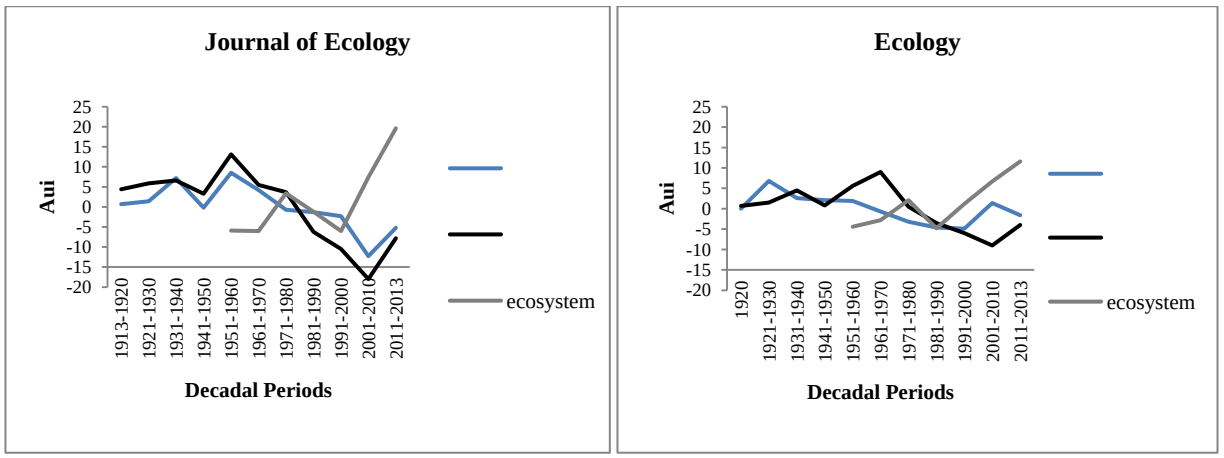

Fig.1: Temporal change of use of the terms *ecological, ecology* and *ecosystem* in article titles in both journals.

4. RESULTS

In this study, instead of terms and topics either selected or determined through surveys, the terms found in the titles of ecology publications were made subject of the study. In this way, a holistic approach has been demonstrated. Also, within the study carried out according to publication groups, the details have been presented.

The titles of the ecology publications enable long-term term studies. Thereby, the overall trends and changes in the works of the journals can be set forth.

Long-term analysis of the terms used in the titles of publications was performed. Said research results are in accordance with analyses (Nobis and Wohlgemuth, 2004) made from abstracts and titles on the scale of article. Both journals have published term and concept studies directly. While the terms which enter top hundred are the ones that directly express ecological research topics, the terms which are under the topic titles are also encountered.

Botany terms are further processed in both journals. None the less, botany topics are even more pronounced in the *Journal of Ecology*. On the other side, zoology terms have found more space in *Ecology*.

Use of the terms vary with time in both journals. Use of the terms that enter top hundred chance over time, notwithstanding that, it is understood that some of the terms are used throughout the publication life of the journals, and that some of them in the previous years and some of them in recently are further used. Article usage index (A_{ui}) of especially the terms that ranked after the top hundred are found to be higher in recent years.

The situation that some of the terms frequently take place in the paper titles of both journals may arise from the effect of the general trends of ecology, as well as the effect of the developments in other disciplines as it is in computer technologies.

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Appendix 1: Index values of *Journal of Ecology* publications and their ranks

	Articles		Others		Total	
Publication numbers	**4848**		**1715**		**6563**	
TERMS	***rank***	**JE_{ai}**	***rank***	**JE_{oi}**	***rank***	**JE_{ti}**
plant-(s)	**1**	201,5	**1**	163,3	**1**	191,5
forest-(s)	**2**	133,3	**5**	54,2	**2**	112,6
vegetation	**4**	106,4	**3**	82,8	**3**	100,3
species	**3**	119,2	**24**	18,1	**4**	92,8
soil-(s)	**7**	83,1	**4**	75,2	**5**	81,1
ecology	**12**	58,2	**2**	112,5	**6**	72,4
growth	**5**	86,6	**19**	21,0	**7**	69,5
communt-y(ies)	**6**	84,2	**23**	18,7	**8**	67,0
grass-(es,land,lands)	**8**	74,9	**25**	17,5	**9**	59,9
tree-(s)	**10**	66,0	**16**	21,6	**10**	54,4
population-(s)	**9**	67,9	**44**	10,5	**11**	52,9
seed-(s)	**11**	66,0	**50**	8,2	**12**	50,9
pattern-(s,ed,ing)	**13**	54,5	**75**	5,8	**13**	41,7
ecological	**18**	38,0	**6**	50,1	**14**	41,1
distribution-(s)	**14**	47,4	**21**	19,8	**15**	40,2
tropic-s(al)	**21**	36,5	**10**	29,7	**16**	34,7
response-(s)	**15**	41,9	**51**	8,2	**17**	33,1
competiti-on(ve)	**16**	40,6	**46**	9,3	**18**	32,5
water-(s)	**22**	35,1	**15**	22,2	**19**	31,7
variation-(s)	**19**	37,7	**62**	7,0	**20**	29,7
nutrient-(s)	**17**	39,2	112	2,3	**21**	29,6
structure	**23**	34,9	**43**	11,1	**22**	28,6
seedling-(s)	**20**	37,5	156	0,6	**23**	27,9
succession-(s,al)	**25**	32,0	**40**	12,2	**24**	26,8
natur-e(al, ally)	**43**	22,3	**9**	36,7	**25**	26,1
rain	**24**	32,8	**76**	5,8	**26**	25,8
flora-(l)	**66**	16,1	**7**	49,6	**27**	24,8
ecosystem-(s)	**37**	23,5	**12**	25,7	**28**	24,1
climate(s,ic)	**33**	24,1	**22**	19,2	**29**	22,9
spatial	**26**	28,3	**99**	3,5	**30**	21,8
lake-(s)	**31**	24,3	**34**	14,0	**31**	21,6
size	**27**	27,0	**100**	3,5	**32**	20,9
interaction-(s)	**28**	25,2	**47**	8,7	**33**	20,9
biology/biological	**84**	12,6	**8**	39,1	**34**	19,5
habitat-(s)	**34**	24,1	**77**	5,8	**35**	19,4
root-(s,ed)	**45**	22,1	**42**	11,7	**36**	19,4
island-(s)	**54**	18,6	**17**	21,6	**37**	19,4
dispersal	**36**	23,9	**78**	5,8	**38**	19,2
marsh-(es)	**38**	23,5	**63**	7,0	**39**	19,2
model-(s,ing)	**41**	22,5	**45**	9,9	**40**	19,2
demograph-y(ic)	**29**	25,0	113	2,3	**41**	19,0
reproducti-on(ve)	**30**	25,0	114	2,3	**42**	19,0
diversity	**32**	24,3	**95**	4,1	**43**	19,0
life	**59**	17,5	**14**	23,3	**44**	19,0
nitrogen	**42**	22,5	**52**	8,2	**45**	18,7
mountain-(s, ous)/montane	**51**	19,6	**28**	16,3	**46**	18,7
environmental	**52**	19,4	**29**	16,3	**47**	18,6
herbivor-y(e,es)	**35**	24,1	115	2,3	**48**	18,4
fire-(s)	**39**	22,7	**88**	4,7	**49**	18,0
alga-(e,l)	**62**	16,7	**20**	21,0	**50**	17,8
environment-(s)	**69**	15,1	**13**	25,7	**51**	17,8
production	**44**	22,3	101	3,5	**52**	17,4
annual-(s)	**40**	22,7	127	1,7	**53**	17,2
poll-en(inated,ination)	**46**	20,6	**57**	7,6	**54**	17,2
lea-f(ves)	**47**	20,6	**64**	7,0	**55**	17,1
woodland-(s)	**48**	20,2	**70**	6,4	**56**	16,6
africa-(n)	**74**	14,4	**18**	21,6	**57**	16,3
disturbance-(s)	**67**	15,9	165	0,4	**58**	16,3
salt-(s)	**57**	18,2	**65**	7,0	**59**	15,2
clone-(s,al)	**49**	20,0	138	1,2	**60**	15,1
invasi-on(ons,ve)	**55**	18,4	**79**	5,8	**61**	15,1
graz-ing(ed)	**50**	20,0	157	0,6	**62**	14,9
season-(s,al)	**53**	18,8	**97**	4,1	**63**	14,9
desert-(s)	**70**	14,9	**30**	15,2	**64**	14,9

	Articles		Others		Total	
Publication numbers	**4848**		**1715**		**6563**	
TERMS	***rank***	**JE_{ai}**	***rank***	**JE_{oi}**	***rank***	**JE_{ti}**
field-(s)	**60**	17,3	**66**	7,0	**65**	14,6
australia-(a)	**71**	14,9	**35**	14,0	**66**	14,6
region-(s,al)	**80**	13,4	**26**	17,5	**67**	14,5
dune-(s)	**61**	17,3	**83**	5,2	**68**	14,2
perennial-(s)	**58**	18,2	116	2,3	**69**	14,0
coast-(al)	**73**	14,6	**41**	12,2	**70**	14,0
densit-y(ies)	**56**	18,4	139	1,2	**71**	13,9
land-(s)	109	9,5	**11**	26,2	**72**	13,9
Light	**63**	16,7	117	2,3	**73**	13,0
bog-(s)	**64**	16,7	140	1,2	**74**	12,6
litter-(fall)	**65**	16,7	141	1,2	**75**	12,6
Arid	**88**	12,0	**32**	14,6	**76**	12,6
shrub-(s)	**68**	15,3	**89**	4,7	**77**	12,5
genetic-(s)	**76**	14,2	**71**	6,4	**78**	12,2
area-(s)	**78**	13,6	**53**	8,2	**79**	12,2
flower-(s,ing)	**90**	11,8	**38**	12,8	**80**	12,0
savanna-(s)	**72**	14,9	118	2,3	**81**	11,6
Biomass	**75**	14,4	119	2,3	**82**	11,3
Productivity	**79**	13,6	**96**	4,1	**83**	11,1
landscape-(s)	**85**	12,6	**67**	7,0	**84**	11,1
peat-(s)	**77**	13,8	128	1,7	**85**	10,7
native-(s)	**83**	12,8	**90**	4,7	**86**	10,7
Carbon	**94**	11,3	**68**	7,0	**87**	10,2
Germination	**81**	13,0	129	1,7	**88**	10,1
stand-(s)	**82**	13,0	130	1,7	**89**	10,1
arctic	**89**	12,0	**91**	4,7	**90**	10,1
fung-(i,al)	**93**	11,6	**84**	5,2	**91**	9,9
mineral-(s)	**95**	11,3	**85**	5,2	**92**	9,8
colon-y(ies,ed,ing,tion)	**86**	12,2	131	1,7	**93**	9,4
heterogene-ity(ous)	**87**	12,2	132	1,7	**94**	9,4
england	**91**	11,8	104	2,9	**95**	9,4
america-(n)	123	7,8	**36**	14,0	**96**	9,4
river-(s)	102	9,9	**58**	7,6	**97**	9,3
mycorrhiza-(l,as)	100	10,5	**86**	5,2	**98**	9,1
association-(s)	110	9,3	**48**	8,7	**99**	9,1
local	**92**	11,8	142	1,2	**100**	9,0
regeneration	**96**	11,3	143	1,2	101	8,7
temporal	**97**	11,3	166	0,0	103	8,4
temperate	**98**	10,9	144	1,2	104	8,4
canop-y(ies)	**99**	10,7	158	0,6	108	8,1
marin-a€	165	5,4	**27**	16,9	106	8,4
man	171	1,4	**31**	15,2	159	5,0
evolution-(ary)	147	6,2	**33**	14,6	105	8,4
animal-(s)	169	3,9	**37**	13,4	134	6,4
zealand	161	5,6	**39**	12,8	115	7,5
europe-(an)	139	6,6	**49**	8,7	121	7,2
lichen-(s)	148	6,2	**54**	8,2	128	6,7
formation-(s)	151	6,0	**55**	8,2	131	6,6
prairie-(s)	170	3,3	**56**	8,2	171	4,6
moist-(ure)	152	6,0	**59**	7,6	133	6,4
physiological	157	5,8	**60**	7,6	136	6,2
freshwater	168	4,3	**61**	7,6	157	5,2
britain	158	5,8	**69**	7,0	139	6,1
moss-(es)	115	8,9	**72**	6,4	107	8,2
alpine	153	6,0	**73**	6,4	138	6,1
sea-(s)	162	5,6	**74**	6,4	149	5,8
pine-(s)	124	7,8	**80**	5,8	117	7,3
wales	130	7,4	**81**	5,8	125	7,0
aquatic-(a)	134	6,8	**82**	5,8	130	6,6
insect-(s)	167	5,2	**87**	5,2	156	5,2
range-(s,land,lands)	103	9,9	**92**	4,7	102	8,5
cycle-(s)	142	6,4	**93**	4,7	143	5,9
adaptation-(s)	149	6,2	**94**	4,7	148	5,8
primary	112	9,1	**98**	4,1	112	7,8

Appendix 2: Index values of *Ecology* publications and their ranks.

	Articles		Reports		Others		Total	
Publication numbers	11820		1438		2451		15709	
TERMS	*	E_{ai}	*	E_{ri}	*	E_{oi}	*	E_{ti}
plant-(s)	**1**	101,4	**2**	52,9	**2**	82,0	**1**	94,0
population-(s)	**2**	82,8	**3**	52,9	**5**	37,9	**2**	73,1
forest-(s)	**4**	77,7	**5**	48,7	**3**	49,4	**3**	70,6
species	**3**	80,0	**8**	40,3	**11**	22,4	**4**	67,4
communt-y(ies)	**5**	74,4	**18**	22,3	**7**	33,9	**5**	63,3
predat-ion(or,ors,ory)	**6**	62,4	**92**	5,6	**13**	19,6	**6**	50,5
ecology	**24**	28,2	**6**	48,0	**1**	123,6	**7**	44,9
soil-(s)	**10**	38,7	**4**	50,8	**8**	30,2	**8**	38,4
growth	**7**	44,2	**14**	26,4	**25**	15,1	**9**	38,1
competiti-on(ve)	**8**	43,9	**74**	7,6	**32**	12,6	**10**	35,7
ecological	**15**	34,3	**9**	38,9	**6**	36,3	**11**	35,0
model-(s,ing)	**9**	40,0	**93**	5,6	**16**	18,4	**12**	33,5
habitat-(s)	**12**	37,5	**19**	22,3	**39**	11,4	**13**	32,0
response-(s)	**11**	38,4	**46**	11,8	**61**	7,3	**14**	31,1
size	**13**	36,7	**57**	9,7	**20**	16,7	**15**	31,1
distribution-(s)	**18**	33,6	**11**	32,7	**37**	11,8	**16**	30,1
tree-(s)	**19**	33,3	**20**	21,6	**22**	16,3	**17**	29,6
herbivor-y(e,es)	**14**	36,0	139	1,4	**46**	9,4	**18**	28,6
vegetation	**35**	24,5	**10**	34,1	**4**	43,7	**19**	28,4
food-(s)	**17**	33,8	**35**	14,6	**47**	9,4	**20**	28,2
variation-(s)	**16**	33,9	**29**	16,0	**64**	6,9	**21**	28,1
water-(s)	**34**	25,3	**1**	58,4	**12**	20,8	**22**	27,6
interaction-(s)	**20**	33,1	123	2,8	**26**	14,7	**23**	27,4
densit-y(ies)	**21**	30,8	**32**	15,3	**40**	10,6	**24**	26,2
field-(s)	**28**	27,6	**13**	27,8	**33**	12,6	**25**	25,3
ecosystem-(s)	**23**	28,6	109	3,5	**17**	17,5	**26**	24,6
pattern-(s,ed,ing)	**22**	29,2	**43**	12,5	**57**	7,8	**27**	24,3
seed-(s)	**26**	28,0	**21**	20,2	**62**	7,3	**28**	24,1
tropic-s(al)	**31**	27,0	**75**	7,6	**14**	19,2	**29**	24,0
diversity	**25**	28,1	**82**	7,0	**34**	12,6	**30**	23,7
fish-(es)	**30**	27,2	**22**	20,2	**48**	9,4	**31**	23,7
structure	**27**	28,0	110	3,5	**41**	10,6	**32**	23,0
reproducti-on(ve)	**29**	27,3	**50**	10,4	**49**	9,4	**33**	23,0
grass-(es,land,lands)	**32**	26,4	**28**	16,7	**45**	9,8	**34**	22,9
lake-(s)	**37**	24,1	**12**	29,2	**31**	13,1	**35**	22,9
select-ed(ion,ive,ivity)	**33**	26,1	**51**	10,4	**76**	5,7	**36**	21,5
life	**40**	22,8	**23**	19,5	**30**	13,5	**37**	21,1
insect-(s)	**42**	21,5	**44**	12,5	**18**	17,5	**38**	20,1
spatial	**36**	24,5	111	3,5	**81**	4,9	**39**	19,5
desert-(s)	**45**	20,7	**30**	16,0	**35**	12,6	**40**	19,0
prey	**38**	23,4	155	0,7	**53**	9,0	**41**	19,0
temperature-(s)	**48**	19,0	**7**	42,4	**82**	4,9	**42**	19,0
nutrient-(s)	**39**	23,1	140	1,4	**58**	7,8	**43**	18,7
environment-(s)	**46**	20,4	**76**	7,6	**21**	16,7	**44**	18,7
bird-(s)	**49**	19,0	**33**	15,3	**23**	15,9	**45**	18,1
dispersal	**41**	21,8	**68**	8,3	**90**	4,1	**46**	17,8
stream-(s)	**43**	21,2	**52**	10,4	**87**	4,5	**47**	17,6
nitrogen	**44**	21,0	112	3,5	**50**	9,4	**48**	17,6
natur-e(al, ally)	**58**	15,7	**15**	26,4	**15**	18,8	**49**	17,2
pine-(s)	**54**	17,4	**16**	25,7	**51**	9,4	**50**	16,9
production	**50**	18,9	**77**	7,6	**55**	8,6	**51**	16,2
succession-(s,al)	**51**	18,8	**53**	10,4	**69**	6,5	**52**	16,1
climat-e(s,ic)	**52**	17,7	106	4,2	**27**	14,7	**53**	16,0
foraging	**47**	19,2	113	3,5	**98**	3,7	**54**	15,3
ant-(s)	**55**	16,8	**36**	13,9	**71**	6,1	**55**	14,9
mountain-(s)/montan-e(a)	**57**	15,9	**24**	18,1	**56**	8,2	**56**	14,9
host	**53**	17,6	**94**	5,6	**77**	5,7	**57**	14,6
lea-f(ves)	**59**	15,3	**40**	13,2	**52**	9,4	**58**	14,2
marin-a €	**66**	14,1	**41**	13,2	**28**	14,3	**59**	14,1
season-(al)	**56**	16,1	**37**	13,9	**91**	4,1	**60**	14,0
environmental	**63**	14,5	**78**	7,6	**29**	13,9	**61**	13,8
range-(s,land,lands)	**64**	14,5	**31**	16,0	**65**	6,9	**62**	13,4
animal-(s)	**92**	10,0	**34**	15,3	**10**	25,3	**63**	12,9
poll-en(inated,ination)	**65**	14,3	**83**	7,0	**54**	9,0	**64**	12,8
abundance-(s)	**60**	15,0	**58**	9,7	110	3,3	**65**	12,7
california	**68**	13,4	**59**	9,7	**42**	10,6	**66**	12,6
fire-(s)	**67**	13,8	114	3,5	**43**	10,2	**67**	12,3
demograph-y(ic)	**62**	14,7	157	0,7	**78**	5,7	**68**	12,0
invasi-on(ons,ve)	**61**	15,0	156	0,7	**99**	3,7	**69**	11,9
prairie-(s)	**69**	13,2	**54**	10,4	**70**	6,5	**70**	11,9
evolution-(ary)	**74**	12,0	142	1,4	**19**	17,1	**71**	11,8

	Articles		Reports		Others		Total	
Publication numbers	11820		1438		2451		15709	
TERMS	*	E_{ai}	*	E_{ri}	*	E_{oi}	*	E_{ti}
biology/biological	101	9,1	**95**	5,6	**9**	28,6	**72**	11,8
seedling-(s)	**70**	13,0	**45**	12,5	141	2,0	**73**	11,3
carbon	**73**	12,1	**55**	10,4	**83**	4,9	**74**	10,8
area-(s)	**82**	11,1	**25**	18,1	**84**	4,9	**75**	10,8
america-(n)	**96**	9,5	**56**	10,4	**24**	15,5	**76**	10,5
island-(s)	**85**	11,0	103	4,9	**44**	10,2	**77**	10,3
disturbance-(s)	**71**	12,8	141	1,4	111	3,3	**78**	10,2
landscape-(s)	**75**	12,0	170	0,0	**59**	7,8	**79**	10,2
productivity	**78**	11,7	107	4,2	**66**	6,9	**80**	10,2
web-(s)	**72**	12,4	169	0,0	**80**	5,3	**81**	10,2
lizard-(s)	**79**	11,6	**61**	9,0	112	3,3	**82**	10,1
annual-(s)	**77**	11,8	**89**	6,3	113	3,3	**83**	10,0
litter-(fall)	**80**	11,4	**69**	8,3	114	3,3	**84**	9,9
energy	**83**	11,1	101	4,9	**72**	6,1	**85**	9,7
region-(s,al)	**89**	10,6	**90**	6,3	**67**	6,9	**86**	9,6
patch-(y,es,iness)	**76**	12,0	171	0,0	134	2,4	**87**	9,4
native-(s)	**84**	11,1	102	4,9	**92**	4,1	**88**	9,4
sex-(es,ual,ually)	**86**	11,0	144	1,4	**79**	5,7	**89**	9,3
root-(s,ed)	100	9,2	**42**	13,2	**63**	7,3	**90**	9,3
feeding	**88**	10,7	**62**	9,0	135	2,4	**91**	9,2
trophic	**87**	10,7	145	1,4	**73**	6,1	**92**	9,2
mortality	**90**	10,5	**60**	9,7	136	2,4	**93**	9,2
light	105	8,6	**17**	22,9	115	3,3	**94**	9,1
alga-(e,l)	**99**	9,4	**26**	18,1	154	1,6	**95**	9,0
local	**81**	11,3	143	1,4	142	2,0	**96**	8,9
aquatic-(s)	106	8,5	**38**	13,9	**88**	4,5	**97**	8,4
breeding	**93**	10,0	104	4,9	137	2,4	**98**	8,3
coast-(al)	104	8,7	**47**	11,8	100	3,7	**99**	8,2
reef-(s)	**91**	10,3	158	0,7	143	2,0	**100**	8,1
heterogene-ity(ous)	**94**	9,8	159	0,7	101	3,7	102	8,0
larva-e(l)	**95**	9,8	132	2,1	126	2,9	101	8,0
coral-(s)	**97**	9,5	146	1,4	144	2,0	105	7,6
coexist-ence(ing)	**98**	9,5	172	0,0	145	2,0	108	7,4
sampl-(e,s,ing)	126	6,6	**27**	18,1	103	3,7	112	7,2
germination	168	4,5	**39**	13,9	139	2,4	150	5,0
mammal-(s)	120	7,6	**48**	11,1	**68**	6,9	103	7,8
stand-(s)	158	5,2	**49**	11,1	130	2,9	138	5,4
shrub-(s)	107	8,4	**63**	9,0	116	3,3	104	7,6
photosynthe-(sis,tic)	122	7,0	**64**	9,0	127	2,9	122	6,6
river-(s)	123	7,0	**65**	9,0	128	2,9	123	6,6
bog-(s)	160	5,2	**66**	9,0	123	3,3	143	5,2
florida	172	3,8	**67**	9,0	153	2,0	168	4,0
cycle-(s)	124	6,9	**70**	8,3	129	2,9	124	6,4
oak-(s)	129	6,5	**71**	8,3	146	2,0	129	6,0
alaska-(n)	144	5,8	**72**	8,3	106	3,7	132	5,7
arctic	150	5,5	**73**	8,3	107	3,7	136	5,5
sea	141	5,8	**79**	7,6	120	3,3	133	5,6
colorado	151	5,5	**80**	7,6	158	1,6	148	5,1
land-(s)	171	3,8	**81**	7,6	**38**	11,8	137	5,4
salt	130	6,5	**84**	7,0	156	1,6	131	5,8
alpine	154	5,4	**85**	7,0	132	2,9	147	5,2
moist-(ure)	165	4,8	**86**	7,0	161	1,6	161	4,5
fir	173	3,7	**87**	7,0	125	3,3	170	3,9
spruce	174	3,7	**88**	7,0	168	1,2	173	3,6
wisconsin	148	5,6	**91**	6,3	131	2,9	142	5,2
site-(s)	108	8,4	**96**	5,6	**94**	4,1	109	7,4
beetle-(s)	111	8,3	**97**	5,6	**89**	4,5	110	7,4
graz-ing(ed)	113	8,1	**98**	5,6	138	2,4	115	7,0
phytoplankton	138	6,0	**99**	5,6	165	1,2	141	5,2
minnesota	152	5,5	**100**	5,6	171	0,4	156	4,7
physiolog-y(ical)	137	6,0	130	2,8	**36**	12,6	120	6,7
genetic-(s)	128	6,5	128	2,8	**60**	7,8	125	6,4
body	116	8,0	125	2,8	**74**	6,1	111	7,3
fitness	127	6,6	162	0,7	**75**	6,1	128	6,0
neotropical	134	6,2	163	0,7	**85**	4,9	135	5,5
terrestrial	145	5,7	120	3,5	**86**	4,9	139	5,3
niche-(s)	103	8,8	115	3,5	**93**	4,1	107	7,6
rain	109	8,4	147	1,4	**95**	4,1	113	7,1
decomposition	119	7,7	126	2,8	**96**	4,1	121	6,7
avian	156	5,3	131	2,8	**97**	4,1	153	4,9

) rank

Appendix 3: Time-dependent use of the terms which entered the top 100 among the article tittles of *Journal of Ecology*.

TERMS	1913–1920	1921–1930	1931–1940	1941-1950	1951–1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank	TERMS	1913–1920	1921–1930	1931–1940	1941-1950	1951–1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank
plant-(s)	-0,8	-1,5	-1,3	-1,0	-3,3	-2,9	-2,9	-3,3	-1,2	11,1	7,0	1	**herbivor-y(e,es)**							-10,7	-5,8	15,1	15,2	15,4	26
forest-(s)	-1,2	-1,4	-2,8	-1,7	-2,7	-1,4	-3,5	-1,6	6,8	7,6	2,0	2	**dispersal**		-2,1	-3,9		-5,9	-7,8	-8,9	-5,7	-0,1	27,6	11,3	27
species		-2,3	-3,9	-2,0	-4,1	-5,2	-3,2	-1,9	3,4	14,0	7,4	3	**ecosystem-(s)**			-3,9		-5,9	-6,0	3,4	-1,2	-6,0	7,4	19,6	28
vegetation	3,4	2,4	5,5	2,9	4,1	7,2	2,4	-3,1	-5,3	-12,2	-7,3	4	**marsh-(es)**	2,4	1,4	3,1	-0,6	-4,1	0,1	-0,1	0,6	1,9	0,4	-5,0	29
grass-(es,land,lands)	-1,4	-1,9	-0,9	-1,3	-2,1	-1,6	-1,3	4,7	2,8	2,7	0,3	5	**woodland-(s)**	-1,0	-0,9	1,3	-1,3	7,5	0,8	4,8	4,0	5,6	-13,3	-7,5	30
population-(s)	-1,7	-2,7	-3,6	-1,8	-4,3	-4,7	0,9	10,3	8,6	2,2	-3,3	6	**graz-ing(ed)**			0,4	-0,3	-2,6	-5,3	-0,2	7,3	1,7	2,2	1,8	31
ecology	4,4	5,9	6,6	3,3	13,1	5,5	3,7	-6,2	-10,5	-18,0	-7,8	7	**clone-(s,al)**							-8,4	10,4	29,5	1,2	-3,3	32
pattern-(s,ed,ing)				-1,6	-3,3	-2,1	-0,5	6,1	4,1	5,0	2,1	8	**mountain-(s, ous)/montane**	0,1	0,2	0,5	-0,3	-2,5	2,2	-1,0	6,7	6,3	-11,0	-1,1	33
competiti-on(ve)	-1,0	-2,5	-4,3		-5,2	-2,8	-4,4	-0,1	6,5	15,0	1,1	9	**environmental**	-0,9	-1,9	-2,7		-5,7	-8,3	-3,0	1,6	5,4	14,7	3,2	34
ecological	0,7	1,4	7,2	-0,2	8,5	4,2	-0,7	-1,3	-2,3	-12,3	-5,2	10	**season-(s,al)**		-1,9	-1,5	-1,3	-0,1	10,4	15,9	4,3	-1,6	-18,2	-4,1	35
variation-(s)			-4,2	-1,8	-5,6	-5,5	-5,5	4,8	13,6	9,6	-0,3	11	**invasi-on(ons,ve)**				-1,2	-5,6	-8,2		-12,1	-11,4	50,4	9,5	36
seedling-(s)			-4,2	-1,8	-2,3	-4,9	-4,4	0,5	13,2	10,4	-1,4	12	**densit-y(ies)**			-2,5		-5,6	-9,3	-2,5	5,9	4,3	10,0	7,2	37
tropic-s(al)	-0,9		-2,5	0,5	-4,5	-5,3	-1,9	2,6	2,2	9,0	3,9	13	**perennial-(s)**	-0,8					-9,3	-2,4	10,7	13,6	8,0	-2,8	38
structure	-1,4	-0,6	-1,2	-1,8	-2,0	-2,1	3,9	-1,9	4,1	1,6	1,6	14	**salt-(s)**	1,4	2,7	3,2	-0,1	-1,1	-1,3	3,2	-0,7	2,3	-3,3	-6,2	39
rain	-1,4	-2,4	-1,0		-1,1	-0,4	-5,2	0,1	6,6	8,7	-1,6	15	**life**		-1,8	4,6	0,0	-2,0	-8,1	-6,8	2,1	0,5	15,0	-1,4	40
succession-(s,al)	-0,7	2,2	-0,3	-1,7	-0,3	-4,6	-2,5	8,2	8,4	-4,7	-4,0	16	**dune-(s)**	0,4	-0,6		-1,2	9,9	-2,1	26,6	1,1	-6,5	-16,7	-6,1	41
spatial					-6,0	-8,2	-6,4	0,2	12,2	13,5	6,8	17	**field-(s)**	-0,8		-3,6	-1,2	-0,8	1,5	3,9	1,1	7,8	-0,1	-4,9	42
size			-2,5		-5,2	-8,9	-7,7	4,7	16,5	15,9	-5,4	18	**alga-(e,l)**	-0,7	0,7	11,3	8,7	13,0	3,2	14,4	-9,4	-13,6	-19,0		43
interaction-(s)					-5,9	-8,8	-5,0	-6,2	5,7	15,4	16,9	19	**bog-(s)**	-0,7	-0,5	-2,3	3,8	6,8	8,1	0,8	0,5	-3,7	-6,7	-6,0	44
demograph-y(ic)							-4,1	18,7	12,5	2,5	-0,2	20	**light**		-0,5	-3,5		-0,6	8,1	-7,8	4,2	5,0	-1,8	1,4	45
reproducti-on(ve)					-5,9	-8,0	0,0	8,8	8,4	9,9	-1,1	21	**litter-(fall)**		-1,8			-3,0	0,7	-0,4	15,3	-6,1	4,4	0,1	46
diversity				-1,5		-8,7	-9,0	-8,4	-2,1	26,8	19,5	22	**flora-(l)**	0,6	3,4	10,6	1,5	3,5	-4,0	-9,0	-6,7	-2,0	5,4	-3,4	47
lake-(s)	-0,3	-1,3	-0,5	-0,7	6,8	-0,3	24,9	4,3	-7,2	-17,3		23	**disturbance-(s)**						-9,1		-5,3	8,6	27,8	8,4	48
climate(s,ic)		-2,1	-1,4	1,0	-5,0	-3,6	-9,0	-7,5	-1,1	15,2	15,4	24	**shrub-(s)**						-6,4	-2,1	4,6	16,3	6,9	-0,4	49
habitat-(s)	0,6	-2,1	-3,1		1,0	-2,7	-6,4	-2,4	3,2	16,1	-1,7	25	**environment-(s)**		1,1	-3,4	-1,0	1,5	-3,6	2,2	-6,1	9,9	5,9	-4,4	50

continued of Appendix 3.

TERMS	1913--1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank	TERMS	1913--1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank
australia-(a)		-0,2	-3,4		-1,2	4,8	6,5	5,1	3,3	-4,8	-5,7	51	**region-(s,al)**		0,7	2,6	-0,5	0,7	2,5	10,7	-10,6	1,9	-1,1	-4,8	76
desert-(s)	-0,6	-0,2	-3,4		4,4	2,1	13,5	6,5	-2,3	-9,0		52	**temperate**			-1,0					-10,6	11,6	25,7	10,4	77
savanna-(s)					-4,0	4,8	-7,4	-1,9	-2,3	7,7	15,1	53	**canop-y(ies)**					-4,8	-6,6	-7,7	-0,9	12,1	20,8	-0,8	78
coast-(al)	0,8	-0,2	-2,0	-1,0	13,0	-2,0	-0,3	-1,7	-2,1	2,4	-7,1	54	**herb**							-5,6	-2,6	22,5	13,8	1,3	79
genetic-(s)					-5,3			0,1	12,7	17,6	8,9	55	**mycorrhiza-(l,as)**		0,9	1,1		-4,8	-8,5	-9,6	-8,5	10,7	17,7	5,2	80
peat-(s)	-0,5	0,0	-0,3	2,1	-0,8	14,9	10,9	2,1	-5,8	-14,0		56	**mediterranean**					-4,7	-8,3	3,1	0,2	10,2	11,8	-0,2	81
area-(s)	1,1	3,1	2,8	-0,9	0,8	4,7	-2,4	-3,7	-1,2	-1,8	-2,4	57	**phenolog-y(ies,ical)**						-8,3	3,1	12,7	4,0	-2,8	10,3	82
productivity					-5,2	-2,9	5,1	-8,3	-2,7	16,4	9,7	58	**mortality**					-2,6	-8,3	-3,2	6,5	-0,2	16,0	4,0	83
germination			-1,6		4,4	7,0	2,8	7,9	1,1	-8,8	-5,3	59	**range-(s,land,lands)**			-2,7	-0,3	-2,6		-3,2		4,0	22,2	12,3	84
stand-(s)					-3,6	-4,1	7,5	1,5	4,3	7,1	-0,6	60	**river-(s)**		7,4	7,7	3,9	1,6	6,2	-5,3	0,2	-4,4	-9,0	-6,4	85
native-(s)						-7,2	-8,3	-11,1	-10,0	36,6	18,9	61	**scotland**			3,6	-0,3	1,6	2,1	19,7	12,7	-4,4			86
biology/biological	-0,3	10,1	0,1	2,5	-0,2	-0,6	3,2	10,2	-9,9	-10,0	-5,2	62	**communt-y(ies)**	-1,5	0,0	0,4	-0,7	-0,1	3,8	-2,9	-6,5	-5,9	8,2	5,3	87
landscape-(s)							-9,9	-11,1	-1,7	35,9	16,1	63	**abundance-(s)**			-2,7			-8,3	-7,3	2,7	6,5	18,9	4,3	88
colon-y(ies,ed,ing,tion)	-0,3		-1,4	-0,7	0,0	-7,0	-1,4	6,0	2,2	3,9	1,7	64	**land-(s)**	2,4	5,7	6,1		-0,2	-6,1	-0,7	-5,7	-3,9	6,8	-2,0	89
heterogene-ity(ous)								-4,2	19,1	12,4	6,8	65	**association-(s)**	4,7		-0,3		-0,1	9,6	-0,4	-1,0	-1,5	-6,0	0,4	90
arctic		-1,3	2,1	-0,6	1,9		-8,1	-9,2	14,5	16,4	-3,3	66	**stress**							1,8	-7,7	-5,9	22,9	18,2	91
arid						-1,8	14,3	-7,5	-4,4	11,2	7,0	67	**fen**		-0,7	13,4	-0,1	22,8	-8,2	6,7	3,8	-10,2	-17,0		92
england	-0,2				-3,2	17,6	7,8	4,9	4,5	-12,7		68	**lowland-(s)**					-4,5	-1,3	2,1	10,7	3,4	8,0	-6,2	93
flower-(s,ing)			-3,0			-6,9	0,8	10,2	2,8	1,3	9,0	69	**primary**	0,3		-2,5		-4,5	-3,6	18,0	-3,0	5,7	-5,6	0,6	94
local				-0,6	-5,0	-8,7	-8,0	-2,1	2,8	22,3	9,0	70	**soil-(s)**	-1,0	-0,5	1,9	-0,4	1,0	7,2	-1,4	-3,4	-4,1	-1,2	1,9	95
fung-(i,al)					0,4	-6,9	-6,2	-12,6	1,3	26,7	9,4	71	**chalk**		15,6	6,8	11,6	2,6	1,2	-4,6	6,6	-10,1	-19,2		96
carbon			-3,0	-0,6	-1,3	-6,8	-6,1	3,8	-0,2	18,5	0,6	72	**moss-(es)**		4,0	-0,1	0,0	2,6	3,5	7,1	-2,7	1,5	-9,9	-3,8	97
mineral-(s)				1,3	9,6	7,8	26,7	7,5		-19,7		73	**growth**		-2,5	-3,8	-0,9	-1,7	0,3	1,6	7,6	3,5	0,6	-2,5	98
regeneration	-0,2	4,3	-1,1	-0,6	-3,1	-1,3	-4,3	3,8	7,0	0,3	-4,9	74	**age-(s)**		-0,6			-4,4	-8,0	-4,4	19,0	4,3	-0,1	3,4	99
temporal						-6,8	-6,1	-1,6	16,1	11,2	6,0	75	**bryophyte-(s)**	5,3	4,3	7,4	0,1	5,5		0,7	7,6	-9,9	-14,2	3,7	100

Appendix 4: Time-dependent use of the terms which entered the top 100 among the article tittles of *Ecology*.

TERMS	1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank	TERMS	1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank
plant-(s)	0,3	0,1	-0,9	-1,1	-2,2	-3,4	-4,8	-2,2	3,0	6,9	4,1	1	**seed-(s)**		-3,0	-2,7	-2,5	-3,1	-2,7	3,3	5,3	4,3	1,6	-0,4	26
population-(s)		-3,2	-1,3	0,4	3,0	3,0	3,1	-1,8	-0,1	-2,4	-0,5	2	**structure**		-1,8	-2,4	-2,2	-4,3	-1,8	2,1	8,7	-0,2	1,3	0,8	27
species		-2,6	-2,1	-1,1	-0,6	-3,2	1,0	-1,8	-1,8	9,0	3,5	3	**reproducti-on(ve)**		-2,4	-2,4	-1,9	-2,8	-2,3	1,8	7,4	6,7	-3,2	-0,9	28
forest-(s)	0,1	0,1	2,5	-0,3	0,8	-0,2	-0,5	-0,7	-0,1	0,1	-1,8	4	**fish-(es)**	0,1	0,5	2,0	-1,3	-0,3	-2,6	-4,1	-0,6	0,0	6,3	-0,2	29
communt-y(ies)		-2,0	-0,7	-1,5	-1,7	-2,4	-1,3	1,2	-1,6	4,4	5,8	5	**tropic-s(al)**		-1,4	-3,0	-2,2	-4,0	-4,7	0,0	5,7	1,3	3,6	4,8	30
predat-ion(or,ors,ory)			-3,1		-4,6	-5,0	-1,9	4,4	5,0	10,1	1,4	6	**grass-(es,land,lands)**		-1,7	0,9	3,6	1,2	4,0	-2,2	-9,4	-2,3	5,0	1,3	31
growth		-1,9	0,2	2,2	1,1	2,0	0,4	-0,3	3,4	-6,3	-0,4	7	**select-ed(ion,ive,ivity)**		-3,0	-3,0		-3,6	-4,0	6,0	6,2	3,3	3,0	-1,9	32
competiti-on(ve)			-3,1	-2,0	-4,1	-2,0	2,8	11,0	4,9	-1,9	-2,1	8	**water-(s)**	0,1	7,1	2,7	3,5	-0,2	2,7	3,5	5,2	-6,3	-14,7	-3,7	33
model-(s,ing)		-3,1			-4,8	-3,9	0,2	-4,4	1,6	14,5	6,1	9	**vegetation**		5,3	5,0	2,7	6,8	9,6	2,3	-5,9	-7,3	-12,6	-5,7	34
soil-(s)	0,5	4,4	1,8	-0,2	1,1	3,9	-2,4	-8,2	0,8	-2,9	1,3	10	**spatial**					-4,6	-4,2	-7,0	-2,4	2,3	19,8	5,7	35
response-(s)		-2,8	-2,8	-1,9	-3,0	-2,0	-3,7	1,3	6,2	5,4	3,6	11	**lake-(s)**		2,3	2,3	4,2	10,5	3,6	0,1	-3,3	-4,3	-12,4	-2,9	36
habitat-(s)		-1,7	-1,9	-1,9	-3,7	-4,1	-2,4	2,0	0,3	11,4	2,3	12	**prey**					-4,5	-5,2	0,8	4,7	8,1	4,0	1,6	37
size		-2,8	-2,8	-1,0	-3,6	-3,6	0,6	8,5	4,8	0,2	-0,1	13	**nutrient-(s)**					-4,5	-3,0	4,3	2,0	8,3	1,8	0,6	38
herbivor-y(e,es)							-9,0	1,0	8,3	15,6	5,5	14	**life**	0,2	0,8	-1,1	-1,3	-3,0	-3,3	-1,1	0,0	3,8	5,5	-0,5	39
ecological	0,0	6,8	2,6	2,1	1,9	-0,7	-3,2	-4,6	-4,9	1,4	-1,6	15	**dispersal**				-2,4	-4,1	-3,5	-3,7	-1,2	5,2	14,7	1,8	40
variation-(s)		-2,3	-2,5	-1,8	-2,7	-2,1	-3,9	2,8	8,2	5,4	-0,8	16	**insect-(s)**		5,4	-0,9	-1,2	-0,1	-3,5	-1,6	2,9	2,4	-3,5	0,3	41
food-(s)		-1,3	-2,0	-1,8	-1,5	-1,9	-0,8	-0,9	6,8	5,3	-1,7	17	**stream-(s)**		-0,5	-2,1	-1,6	-2,8	-1,0	2,1	6,3	3,1	-2,1	-1,2	42
distribution-(s)	0,6	3,5	1,8	1,5	2,6	4,2	1,3	-1,3	-4,9	-8,9	-0,2	18	**nitrogen**		-2,9	-2,9		-4,0	-5,0	-5,0	4,6	11,4	5,1	1,7	43
tree-(s)	0,1	-1,0	-1,5	-1,0	-0,9	-0,8	-6,0	-0,2	5,3	2,7	3,4	19	**desert-(s)**		1,6	0,8	0,4	0,1	1,1	9,4	7,2	-2,9	-12,5	-5,1	44
interaction-(s)						-5,1	-5,2	5,0	7,5	10,3	2,2	20	**foraging**						-4,4	3,6	16,5	8,0	-5,2	-3,7	45
densit-y(ies)			-2,7	-1,7	-2,8	-0,9	-0,6	2,1	4,2	4,8	0,9	21	**temperature-(s)**	0,7	6,5	4,3	3,8	6,3	5,8	4,2	-4,5	-9,6	-15,2	-2,3	46
pattern-(s,ed,ing)				-2,5	-3,8	-0,5	1,2	8,9	0,2	0,2	3,1	22	**bird-(s)**		-1,9	-1,9	1,6	-1,7	-1,3	-0,7	3,6	1,6	1,8	-0,9	47
ecosystem-(s)					-4,4	-2,8	2,1	-4,8	1,2	6,7	11,6	23	**production**		-2,8	-2,4	-1,5	-1,7	0,6	6,5	8,6	-1,9	-6,6	1,3	48
ecology	0,7	1,5	4,5	0,8	5,6	9,0	0,5	-3,5	-6,0	-9,0	-4,0	24	**succession-(s,al)**		2,2	2,7	1,3	1,2	2,1	3,7	4,4	-1,6	-13,1	-2,6	49
diversity						-4,2	2,3	-8,6	-8,7	22,6	11,3	25	**field-(s)**	0,3	-0,1	-0,5	-1,5	1,6	0,2	3,2	7,2	4,8	-13,1	-2,2	50

continued of Appendix 4.

TERMS	1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank	TERMS	1920	1921--1930	1931--1940	1941-1950	1951--1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013	Rank
environment-(s)		1,5	2,4	-1,9	-0,5	-0,9	-1,4	0,4	-1,4	4,5	-2,5	51	**evolution-(ary)**		-1,2	-2,6		-4,5	-3,8	-1,3	-2,5	1,0	14,1	3,8	76
climat-e(s,ic)	0,3	2,0	-1,4	-2,3	-0,9	-2,8	-7,1	-12,3	-7,5	21,6	10,5	52	**patch-(y,es,iness)**		-2,6				-5,2	-6,2	13,0	4,5	9,2	-1,1	77
host		-2,8		-0,4	-2,8	-5,2	-6,6	10,3	3,6	7,9	-0,5	53	**annual-(s)**	0,5		-1,9	-0,7	1,2	0,5	4,6	5,5	4,1	-10,3	-0,3	78
pine-(s)		1,1	8,4	4,5	5,0	5,5	1,3	-1,6	-4,9	-14,6	-4,3	54	**productivity**					-3,1	5,0	1,9	-6,5	3,0	6,6	2,7	79
ant-(s)	0,3	-2,3	-2,3	-0,3	-1,7	-4,1	-0,3	5,9	-0,4	8,4	-3,2	55	**lizard-(s)**				-0,6	-2,3	5,8	16,6	5,2	-3,4	-9,2	-5,3	80
larva-e(l)		-2,3	0,8	-0,3	-2,7	-0,5	-2,7	7,2	9,5	-5,3	-3,7	56	**litter-(fall)**		-1,8	-2,5	-2,1	-1,5	-0,7	4,5	2,6	-1,0	-2,3	5,1	81
season-(al)	0,3	3,6	-1,2	1,9	0,0	1,8	5,0	3,7	-1,7	-9,9	-3,6	57	**local**		-2,5		-1,3	-4,5	-1,4	-9,6	-0,2	0,0	19,1	3,8	82
mountain-(s)/montan-e(a)		5,2	2,0	3,0	3,8	8,3	-0,1	1,3	-4,2	-16,7	-2,5	58	**area-(s)**		1,3	5,1	2,5	3,9	7,9	-2,7	-5,3	-6,6	-5,4	-0,6	83
natur-e(al, ally)		1,6	-0,1	5,8	7,7	3,6	1,6	-3,9	-6,7	-5,3	-4,1	59	**energy**		-1,0	-2,5	-2,1	-3,7	7,9	16,4	2,4	-5,8	-8,4	-2,9	84
leaf		-2,2	-2,7	-1,7	-3,6	-1,1	3,1	9,7	4,1	-5,2	-0,1	60	**native-(s)**			1,3	0,2	-1,4	-2,0	-8,8	-9,1	-9,6	22,9	10,0	85
abundance-(s)		-1,6	-2,2	-1,7	0,4	-1,5	-5,6	-1,1	-2,8	11,1	5,1	61	**island-(s)**		7,5	2,1	-1,3	2,5	1,8	11,2	-0,6	-5,7	-15,2	-2,1	86
invasi-on(ons,ve)		-2,7	-2,7	-2,3		-6,1	-10,1	-11,8	-4,5	29,7	15,8	62	**sex-(es,ual,ually)**		-1,7		-2,1	-2,9	-4,3	-5,7	13,3	4,3	3,2	-0,6	87
demograph-y(ic)					-4,7	-5,5	-0,9	2,6	5,0	11,2	1,9	63	**trophic**				-2,0	-4,5	-1,9	-5,5	-7,3	4,8	17,3	5,8	88
range-(s,land,lands)		1,4	2,0	8,3	1,8	2,7	-6,6	-4,1	-6,9	-0,4	2,0	64	**feeding**		-1,7	-2,5	0,4	-3,7	-1,1	8,8	5,4	11,3	-14,1	-2,8	89
environmental	0,4	0,2	-0,9	-1,1	1,2	-1,4	1,0	-1,7	-4,0	1,3	4,9	65	**region-(s,al)**		3,9	7,9	3,6	5,2	-1,0	-9,4	-9,6	-4,4	2,8	1,3	90
poll-en(inated,ination)			0,9	0,7	0,1	1,1	-3,0	2,6	7,4	-2,5	-3,8	66	**mortality**		-2,5	-1,7	-0,4	-2,0	0,6	-1,4	1,7	-3,5	9,5	-0,3	91
marin-a €		3,9		0,8	-4,0	-2,4	-2,9	-5,6	-7,9	17,6	4,0	67	**reef-(s)**					-3,6	-2,5	-2,0	0,4	-4,9	19,1	3,1	92
fire-(s)		-2,1	-1,4	-1,6	-0,9	1,4	-0,8	-0,5	-2,1	6,4	1,8	68	**breeding**			-2,4	-0,3	0,7	-2,4	-0,8	-1,6	8,2	1,2	0,9	93
california		3,0	1,8	4,1	8,1	7,3	5,2	-1,9	-4,1	-21,1	-2,3	69	**animal-(s)**	2,3	4,3	5,2	-0,3	3,2	-0,7	-4,2	-8,4	-7,0	4,6	0,9	94
prairie-(s)	0,4	3,8	7,0	7,4	6,3	1,1	-1,6	-1,1	-5,2	-12,7	-5,5	70	**heterogene-ity(ous)**			-2,4			-5,8	-7,5	-3,1	8,7	20,7	1,0	95
seedling-(s)		-0,7	0,6	0,4	0,0	1,2	-3,4	-0,9	12,5	-6,6	-2,9	71	**america-(n)**		3,9	6,5	2,5	1,0	-2,2	-2,0	0,9	-3,7	-4,4	-2,3	96
disturbance-(s)						-6,0	-7,2	12,6	1,2	15,6	-1,5	72	**coexist-ence(ing)**						-4,8	4,2	2,7	-2,9	12,5	3,1	97
web-(s)							-8,4	-3,6	9,2	22,9	1,4	73	**coral-(s)**					-4,3	-5,7	0,7	2,7	-4,6	14,3	6,6	98
carbon		3,0		-2,1		-1,0	-5,5	3,0	5,0	5,4	0,9	74	**alga-(e,l)**		0,3	-1,5	1,7	0,2	-1,2	6,2	2,8	-3,6	-3,3	-1,3	99
landscape-(s)							-11,1	-13,8	15,1	24,6	6,6	75	**root-(s,ed)**		3,1	9,6	0,8	0,3	2,6	1,0	-7,9	-1,5	-4,7	-3,1	100