Editorial

(Text) Mining the LANDscape: Themes and trends over 40 years of *Landscape and Urban Planning*

HIGHLIGHTS

- Diverse research themes coalesce after two initial decades of publication.
- Stable clusters reflect three major knowledge domains: human dimensions, landscape planning and analysis, and urban ecology.
- Emerging themes and "hot topics" are identified along the edges and intersection of clusters.

GRAPHICAL ABSTRACT
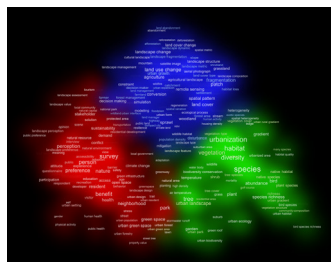
ARTICLE INFO

ABSTRACT

In commemoration of the journal's 40th anniversary, the co-editor explores themes and trends covered by *Landscape and Urban Planning* and its parent journals through a qualitative comparison of co-occurrence term maps generated from the text corpora of its abstracts across the four decadal periods of publication. Cluster maps generated from the VOSviewer program reveal a coalescence of concepts for the last two decades along three knowledge domains: human dimensions, landscape analysis and planning, and urban ecology. Citation impact "heat maps" offer additional clues about emerging and high-impact topics. The editor assesses these findings with respect to the journal's aims and scope and offers some thoughts on future directions for research.

Published by Elsevier B.V.

1. Introduction

This volume marks the 40th anniversary of *Landscape and Urban Planning* (LAND) and provides a fitting occasion to reflect upon where the journal has been and where the journal community might be heading. Visualization has always played an important role in understanding and planning for change in the physical landscape, and advances in text mining and bibliometric mapping tools are now providing easier and better ways to visualize the "intellectual landscape" of terms and concepts that define a field (Linton, 2011). When the good people in Elsevier's Research and Academic Relations department recently prepared for our editorial team a "term map" of concepts discussed in research papers and review

articles published in the journal during 2008–2012, the clarity and beauty of the visualizations piqued my curiosity as to how the maps were generated and how they might be used to understand the intellectual evolution of the journal and the fields it encompasses.

I was pointed to VOSviewer, "a freely available computer program for creating, visualizing, and exploring bibliometric maps of science" (http://www.vosviewer.com/). The program employs a text mining function to identify relevant noun phrases in combination with a unified mapping and clustering approach to examine network co-citation data and the co-occurrence of scientific terms (Van Eck & Waltman, 2011; Waltman, Van Eck, & Noyons, 2010). While many programs are available for analyzing text units and similarity matrices, the emphasis of VOSviewer is on visualization

(Van Eck & Waltman, 2010). The options and interactive functionality of the program provide an accessible and hands-on way to explore networks of bibliometric data such as citation counts and/or the co-occurrence relationships among key terms and concepts.

This editorial reports my exploration of the intellectual "inscape" of LAND and its progenitors through a qualitative comparison of VOSviewer co-occurrence term maps across 40 years of publication (1974–2014) and an associated co-occurrence citation impact "heat map" analysis for the past two decades (1996–2012). I begin with a brief history of the LAND and its parent journals to describe their aims and scope and publication runs. I then summarize the approach and findings of my analysis and conclude with some thoughts on future directions for research for the journal and the fields it covers. For those interested in an earlier exploration of the journal's intellectual "outer-scape" based on co-citation analysis of LAND and 50 related journals, see Gobster and Xiang (2012a).

2. Text corpus and thematic foundations

The core data for analysis come from a February 8, 2014 download of Scopus title-abstract-keyword (post-1994 only) fields of all research articles published in LAND and its parent journals. These articles span from volume 1 of LAND's principal parent journal, *Landscape Planning*, in 1974 until the online publication of volume 122 of LAND (February 2014), plus a few unassigned articles still in press at that time. My focus was on research and I defined valid articles as document types classified in Scopus as articles, review papers, and conference papers as long as they included abstracts, but deleted other material such as editorials, errata, and notes. Out of a potential pool of 3157 articles, 2938 were valid articles for analysis, 90% of which were research articles.

To better understand the term maps and their evolution over time, it is helpful to know a little about the history of the journals and their thematic foundations as described by their aims and scope statements, key editorials, and publisher's notes. *Landscape Planning* began publication by Elsevier in June 1974 as a quarterly "International Journal on Landscape Ecology, Reclamation and Conservation, Outdoor Recreation and Land-Use Management." Under the leadership of founding editor Arnold E. Weddle, the scope of the journal focused on "the use of land which is not urban," and its aim was to emphasize "a multi-disciplinary, ecological approach...to draw attention to the interrelated character of problems posed by nature, man's use of land, and the resulting changes in the landscape." Recognizing the need for landscape planning to deal with rapidly changing patterns of land use observed in Europe and North America, the journal was launched as an attempt to accelerate development of the nascent field and bridge the "two cultures" of research and practice through a "world-wide exchange of ideas" (Weddle, 1974).

A year later, Elsevier launched *Urban Ecology* as the city "sister" of the countryside-focused *Landscape Planning*. Founded and edited by Royce LaNier, the quarterly journal arose out of a United Nations initiative to support research on environmental issues dealing with human settlement in developed and developing nations and was sponsored by the International Association for Ecology (INTECOL). The journal's aims and scope voiced a concern for "ecological processes and interactions within urban areas and between human settlements and the surrounding natural systems which support them." The editor also reached out to a broad international and transdisciplinary audience of scientists and practitioners, and hoped to use the journal as a forum to build a continuing dialog between these groups (LaNier, 1975). Elsevier discontinued *Urban Ecology* as an independent journal in 1985 after publishing 9 volumes, and amalgamated it with *Landscape Planning* to form "a new
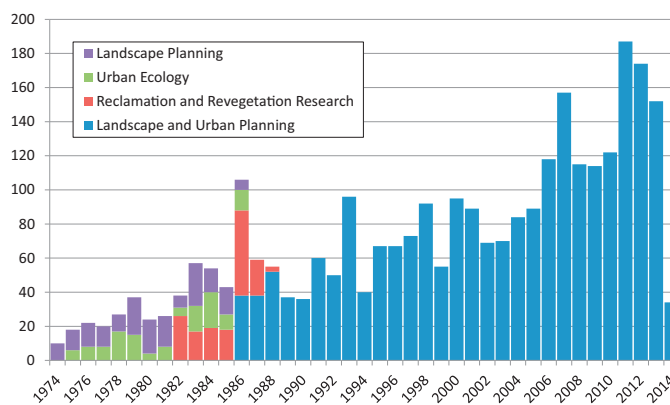

Fig. 1. Articles with abstracts used in the analysis, by journal and year of publication.

journal," *Landscape and Urban Planning*, which combined the key aims and scope language from the two journals quoted above into a single statement (Publisher, 1985; Weddle, 1986). Over its 11-year run, *Urban Ecology* published 160 articles across all types as listed in Scopus, 128 of which were articles with abstracts used in this analysis. *Landscape Planning* published 226 articles over 12 volumes and 13 years, of which 201 are listed in Scopus as articles and 186 of which included abstracts for analysis.

In 1988, the journal *Restoration and Reclamation Research* was also incorporated into *Landscape and Urban Planning*. The quarterly was launched by Elsevier in 1982 under the co-editorial leadership of Mohan K. Wali and Edward M. Watkin, who had edited the journal *Reclamation Review* from 1977 to 1982 until it was discontinued by Pergamon Press. *Restoration and Reclamation Research* (RRR) was described as "an international and interdisciplinary forum" concerned with the "reclamation and rehabilitation of drastically disturbed lands." Its dominant focus was on landscapes affected by coal and mineral surface mining activities, though its editors voiced a broader concern "to reconstruct these landscapes to aesthetically pleasing and biologically productive ecosystems with long term stability (Wali & Watkin, 1982). Elsevier ceased publication of RRR because it was not "economically feasible" and amalgamated it with the "economically much stronger" LAND, with which it was felt to have "a large degree of overlap in scope" (Publisher, 1988). Perhaps for this reason there was less of an effort to explicitly incorporate language from the RRR aims and scope into LAND as there was for *Urban Ecology*, although the titles of the two defunct journals were included under the LAND cover title subheading until 1990 and the journal did host a special issue on "Reclamation and Revegetation" in 1989. RRR published 154 articles over its 7-year run, all of which provided valid material for analysis.

Michael M. McCarthy and Jon E. Rodiek assumed editorial responsibilities for LAND in 1991, and Rodiek continued as sole editor from 1992 until September 2010 when I became editor, joined a year later by Wei-Ning Xiang as co-editor. During the span between 1988, when both parent journals had been incorporated into LAND, and now, the journal's annual output of published articles has quadrupled, and the number of issues has increased over time from quarterly publication to continuous, "article based publishing" online that is compiled into volumes released for printing on a monthly basis. Since the merger of *Landscape Planning* with *Urban Ecology* in 1986, 2716 articles have been published in LAND, 2470 of which provide title-abstract-keyword information for analysis. This healthy growth reflects the increased importance of the topics covered by the journal and the breadth of interests of scholars who seek LAND as a publication outlet (Fig. 1).

While it seems logical to use each of the parent journals as text corpora for comparative analysis, the cut points for dividing

Table 1
Text corpus characteristics and VOSviewer input/output parameters for each journal and time period in the analysis.

Text corpus	Period	Valid *N* articles	Counting method[a]	Min *N* of terms to include	*N* relevant terms selected	*N* terms edited for display	Cluster resolution
Landscape Planning	1974–1986	186	Binary	5	109	54	.5
Urban Ecology	1975–1986	128	Full	5	113	46	.6
Reclamation & Revegetation Research	1982–1988	154	Full	5	57	43	.8
Landscape and Urban Planning	1986–1995	514	Binary	6	280	126	.8
Landscape and Urban Planning	1996–2005	783	Binary	7	453	250	.9
Landscape and Urban Planning	2006–2014	1173	Binary	10	459	276	1.0
Landscape and Urban Planning	2006–2012	987	Binary	10	385	214	NA

[a] Full counting means that all occurrences of a term in a document (in this case, title-abstract for each article) are used to assess co-occurrence relationships among terms. Binary counting uses only the presence or the absence of a term in a document.

LAND are not so clear. It is tempting to examine work produced under each editorship, though the length of tenure between each (1986–1990, 1991–2010, 2010–now) is rather uneven. The best choice seems to be a simple decadal comparison from the time of journal mergers (1986–1995, 1996–2005, 2006–present), and there is good reason for doing an analysis over a continuous time span because there have been no radical changes in the philosophy of running the journal. While the journal subtitle has changed and the statement of aims and scope has been adjusted for the times by Rodiek (1992, 1995, 2010), as they were again in 2012 under the present editorship (Gobster & Xiang, 2012b), the core principles originally expressed by Weddle remain constant. These include: (1) a focus on landscape change, particularly with respect to problems encountered by land use changes and their interactions with natural systems; (2) a reliance on ecology as the foundation for landscape planning and design; (3) the need to involve multiple disciplines in solving complex problems; and (4) the importance of linking research to practice to effect positive change (Gobster & Xiang, 2012b). Under this relative editorial stability, we can have some degree of confidence that any changes observed across the decades of LAND publication derive from external forces relating to the advance of science, response to changes in the physical and social environment, and/or changes in publication options and niches among journal outlets with overlapping content. It is under these factors that such an analysis gets interesting, so let's move on to the data!

3. Approach to analysis

To prepare the text data for input into VOSviewer, the title-author-keyword information for each valid article was merged into a single paragraph, then combined into a single text corpus (.txt file) for each journal/time period. To allow for an adequate number of terms to be included in each term map, the counting method and number of terms were adjusted in VOSviewer for the earlier periods of publication where there were fewer articles comprising the text corpora (Table 1). Relevant terms selected by the program's natural language processing algorithm were edited to delete terms I did not consider germane to my analysis goals; these included specific place names, general statistical terms or measures reflecting such things as time, quantity, and rate; and other general or ambiguous terms with low relevance scores (e.g., "proximity," "movement," "concern").

Once the basic map of relationships is generated, VOSviewer provides three main viewing options for exploring and printing output results: "label view," "density view," and "cluster density view," each of which highlights different aspects of the data. I did my original interpretation in cluster density view (see the graphical abstract for this editorial in ScienceDirect for an example), which highlights the cluster patterns that were my chief interest in comparing the trend maps. I then used the program's output parameters to adjust the resolution of the clustering to facilitate interpretation

of the term maps, and rotated and recolored the clusters that shared commonality across journals/time periods to facilitate map comparisons. For presentation, I chose to portray the figures in label view, which provides a clearer and more readable look at individual terms and their relationships when viewed in printed form.

For the citation impact, "heat map" analysis of LAND terms, I created a matching scores file of citation count data for the last two decades of LAND publication, lopping off 2013–2014 articles for the latest period because of insufficient data, and normalizing the counts by year to facilitate comparison as suggested by Van Weijen (2013). For this analysis, label view is the only option.

4. Findings

Figs. 2–7 show the co-occurrence term maps for each of the journal/time periods in VOSviewer label view.[1] Each term or concept is represented by a circle, where the diameter of the circle and size of its label represent the frequency of the term, its proximity to another term indicates the degree of relatedness of the two concepts, and its color represents the cluster to which it conceptually belongs. Rotating the solution can sometimes help to understand and compare the maps, but because the concepts are spatially interrelated in multidimensional space and the program is limited to two dimensional representation, some relationships may not be readily apparent.

In examining the earliest maps from *Landscape Planning*, *Urban Ecology*, and *Reclamation and Revegetation Research*, I was initially struck by the paucity of information compared to the later LAND maps, and perhaps an analysis of the full text versions of the articles would further flesh out the skeletons we see here (though Elsevier presently does not provide full text electronic access to RRR). Nevertheless, some interesting patterns emerge, especially in comparing the maps from *Landscape Planning* (Fig. 2) and *Urban Ecology* (Fig. 3). Both maps contain a human dimensions cluster (red, lower left) reflected by terms such as "perception," "public," and "environmental quality," with associated terms such as "park "and "natural environment" that may connote settings for use. *Landscape Planning*'s lexicon is more fully developed across all clusters than is *Urban Ecology*'s, but with respect to the human dimensions

---

[1] Note that in preparing the figures for publication, I adjusted the size of each figure for maximum readability. This makes the circles on the maps for the earlier periods of publication (Figs. 2–5) look larger than those on the later maps, even though the later ones may have terms with higher frequencies of co-occurrence. So while the size of the circles and labels between maps cannot be directly compared, their relative size within each map accurately reflects term frequency. Another printing issue relates to the visibility of the labels for terms. In both label and cluster density views, when the labels for terms come close to one another, the smaller term displays as a shadow. These terms are clearly visible in VOSviewer but tend to disappear when printed as a figure, and because several of the terms were important to my analysis and discussion, in preparing Figs. 2–9 and the graphical abstract/cover image, I carefully darkened in these labels where possible by overwriting them in PowerPoint with text in the correct size and position.

Fig. 2. Term map for *Landscape Planning*, 1974–1986.

cluster some noticeable differences between the two journals are a greater emphasis for *Landscape Planning* on landscape and recreational terms such as "outdoor recreation," "national park," and "landscape management," and on human responses such as "preference" and "scenic quality," while for *Urban Ecology* terms such as "culture," "migration," "behavior," and "stress" suggest that the journal dealt with more basic sociological and psychological concerns. Both journals also exhibit an ecology cluster (green, lower right) sharing common terms such as "tree," "vegetation," and "forest," but while *Landscape Planning*'s ecological orientation is more rural and regional in nature, terms in *Urban Ecology* such as "green space," "neighborhood," and "urban forest" reflect its urban focus. The remaining clusters share little in common between the two journals, yet further clarify their respective themes dealing

Fig. 3. Term map for *Urban Ecology*, 1975–1986.

Fig. 4. Term map for Reclamation and Revegetation Research, 1982–1988.

with the social-ecology of human settlement in the case of *Urban Ecology* (e.g., "energy use," "human ecology," "lifestyle" (blue, top)) and landscape planning (e.g., "land use planning," "preservation," (blue, top)) and professional practice (e.g., "landscape architecture," "profession") (yellow, center)) across urban and rural settings for *Landscape Planning*.

RRR's term map (Fig. 4) bears little resemblance in structure or concepts with either *Landscape Planning* or *Urban Ecology*. Indeed, only the two general terms "tree" and "land" are shared between the maps. Instead, the loosely grouped clusters seem to deal more with types of disturbances or impacts ("spoil," "salt," "mine," "tailing") and their associated treatment and revegetation responses

Fig. 5. Term map for *Landscape and Urban Planning*, 1986–1995.

Fig. 6. Term map for *Landscape and Urban Planning*, 1996–2005.

("fertilizer," "sewage sludge," "seedling," "plant growth"). Concepts of "rehabilitation" and "reclaimed site" do, however, bear some relationship to the term "restoration" near the center of clusters in the *Landscape Planning* map, and along with the differentiated terms for soil in RRR ("mine soil," "top soil," "native soil"), the terms "soil" and "restoration" in the *Landscape Planning* map may provide the conceptual thread that ties the two journals together.

The fact that these terms persist and expand in number in the 1986–1995 LAND term map (Fig. 5) provides some evidence of a conceptual carryover of RRR following its amalgamation with LAND. The four cluster solution retains a similar structure as the earlier *Landscape Planning* map, yet the ecology cluster (green, right) now includes terms such as "reclamation," "revegetation," "disturbance," and "seedling" that would seem to indicate an absorption of conceptual material from RRR. At the same time, the upper part of this cluster now looks more like the ecology cluster in the *Urban Ecology* map than its counterpart in the *Landscape Planning* map. While the urban-related terms stay within the same blue cluster (bottom center) in the 1986–1995 LAND map ("urban," "town," "urbanization") as they did in the earlier *Landscape Planning* map ("city," "urban development"), the ecology cluster of the 1986–1995 map is now missing the rural, regional orientation of its 1974–1986 *Landscape Planning* predecessor.

The two center clusters were rather weakly defined in the *Landscape Planning* term map, but in the 1986–1995 LAND map they now more clearly seem to group together terms associated with landscape and ecological planning (bottom center, blue) and landscape analysis (top center, yellow). Of chief interest are the emergence of terms associated with greenway planning ("greenway," "corridor," "connectivity"), landscape ecology ("landscape structure," "landscape level," "landscape change"), and the tools of landscape analysis ("GIS," "remote sensing," "visualization"). The actual term "landscape ecology" is located just off the edge of these center

clusters in what I had called the human dimensions cluster (red, left) on earlier term maps. While a part of this cluster does deal with human dimensions topics such as "preference," "visual quality," and "meaning" at top and "tourism," "participation," and "conflict" near the bottom, the cluster also incorporates a number of terms dealing with professional practice in landscape planning and design such as "planning process," "design process," and "expert." As opposed to the other clusters in this map, there appears to be little in the way of new terms that were not also present on the 1974–1985 *Landscape Planning* map. Thus one might speculate from looking at the changes in the term maps between these two periods that while some significant advances were made in urban ecology and landscape planning and analysis, this was a time of relative stability in the human dimensions area, at least it was reported in LAND.

For me, the most interesting term maps are those from the two most recent periods of LAND publication, 1996–2005 (Fig. 6) and 2006–present (Fig. 7). The high number of terms on each makes them difficult to describe in any detail, but on a larger structural level the maps seem simpler and more conceptually coherent than earlier periods. On each map there are three clearly formed clusters dealing with human dimensions (red, lower left), landscape planning and analysis (top, blue), and urban ecology (green, lower right), each defined by some dominant terms. In the human dimensions cluster these include key process terms such as "perception," "preference," and "benefit"; stakeholder groups ("resident," "developer") and variables and tools for their measurement ("education," "survey"); and key settings and issues such as "nature," "sustainability," and "green space." The landscape planning and analysis cluster is defined by major process-oriented terms such as "landscape change," "land use change," and "sprawl"; analysis concepts and measurement tools such as "patch," "landscape metric," and "land cover"; and topics and settings such as
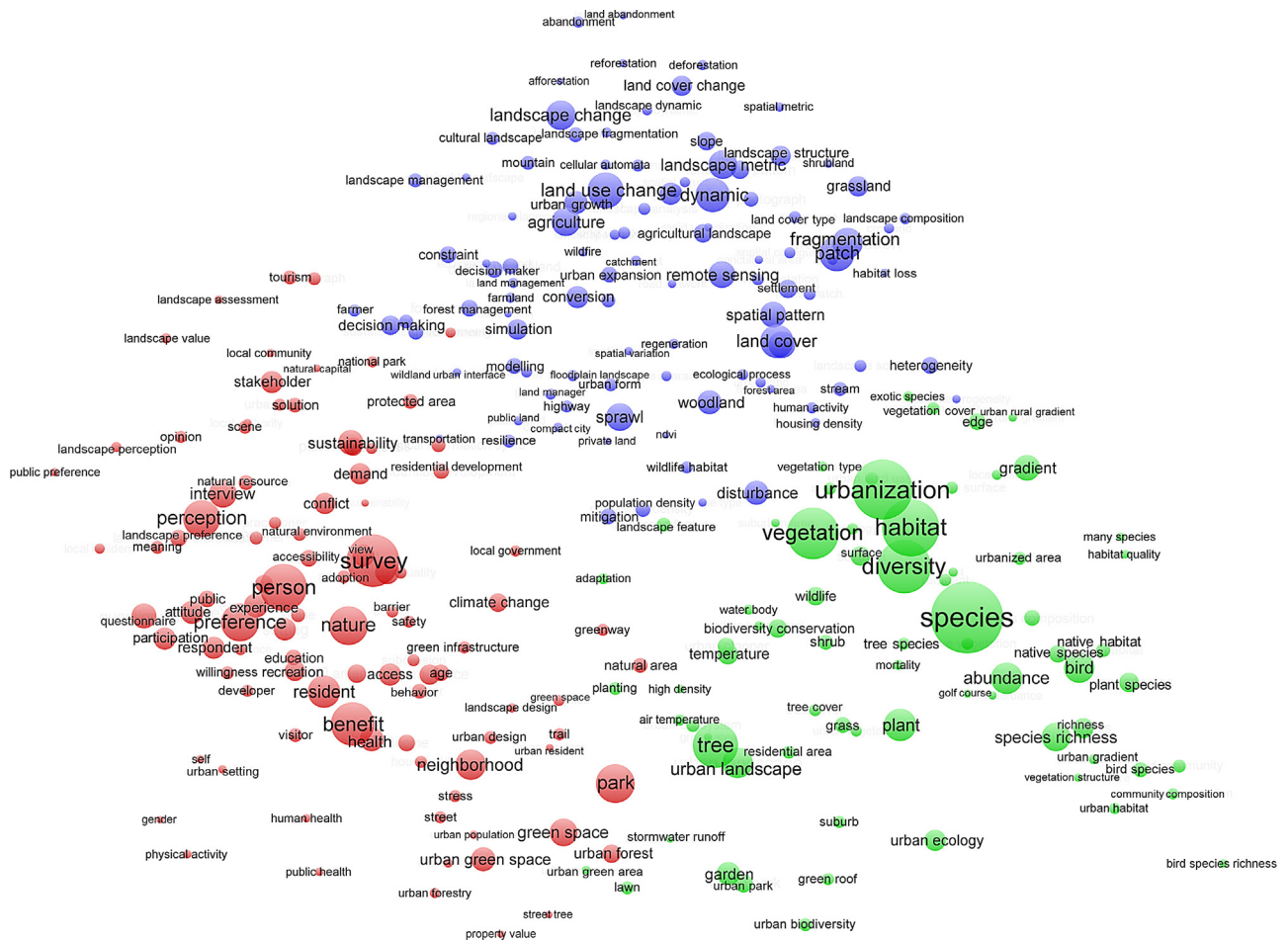
Fig. 7. Term map for *Landscape and Urban Planning*, 2006–2014.

"grassland," "stream," and "conservation planning." And the urban ecology cluster is dominantly focused on "habitat," "species," and "vegetation" and concern for their "diversity," "composition," and "abundance" across a variety of types ("tree," "bird") and urban settings ("urban forest," "garden").

The stability of these clusters across the last two decades suggests that human dimensions, landscape planning and analysis, and urban ecology are the principal paradigms or knowledge domains for understanding landscapes in urban and non-urban settings, at least within the boundaries of this journal's aims and scope. But while the core terms and concepts have not changed much, there is evidence in the evolution of research topics within the domains. For example, in the human dimensions area references to "scenic beauty" and related terms apparent in 1996–2005 are absent from the 2006 to 2014 map, while the latest map has added a number of terms related to "physical activity" and "human health." Also, it is interesting to see the evolution of work related to climate change. The term "climate" appears on the left side of the urban ecology cluster in 1996–2005, seemingly unrelated to the terms around it. By 2006–2014, however, a suite of related concepts appear next to it at the intersection of the three clusters, including "climate change," "adaptation," "urban heat island," and "temperature." While this grouping of terms might warrant its separate cluster, its location at this juncture suggests the social–ecological nature of how the topic is emerging within the context of this journal.

One might suspect that emerging topics would also be "hot topics" in terms of citation rates, and to some extent the heat maps show this to be the case. Figs. 8 and 9 are essentially the same term maps as those shown in Figs. 6 and 7, except that article abstracts

from 2013 to 2014 were deleted from Fig. 9 because of insufficient citation data. In Figs. 8 and 9, however, the terms are now represented by circles colored to reflect the average citation impact for the term rather than by cluster. The "heat" or citation impact ranges from blue (cool) to red (hot) corresponding to normalized scores from 0 to 2, with a score of 1 (green) being average impact. Human health and well-being is an emerging topic in the 2006–2012 LAND map, shown by the terms "health" and "stress" are in the orange warm area, and the climate change terms "climate" in 1996–2005 and "climate change," "temperature," and "air temperature" in 2006–2012 maintain an above-average, orange-to-yellow range. Some more general terms such as "perception," "habitat," "species," and "landscape change" appear to cool between 1996–2005 and 2006–2012, though there are no drastic declines and it is difficult to tell from this qualitative comparison whether the changes are statistically significant and/or a function of differences in sample sizes.

A more confident approach to using the maps to identify hot topics would be to look the warmest terms for each period. This can be done by a visual inspection of the maps and by their classification as shown in Table 2. One initial observation is that the hottest terms tend to be small and specific in nature. This is not surprising as more general terms such as "species" and "perception" can be used in many different ways. A second observation is that there tends to be more warm terms in the landscape planning and analysis cluster of each map than in urban ecology and human dimensions, particularly with respect to landscape change and landscape ecological terms. This could be the function of the subject area of research, which tends to have a higher level of activity outside the journal
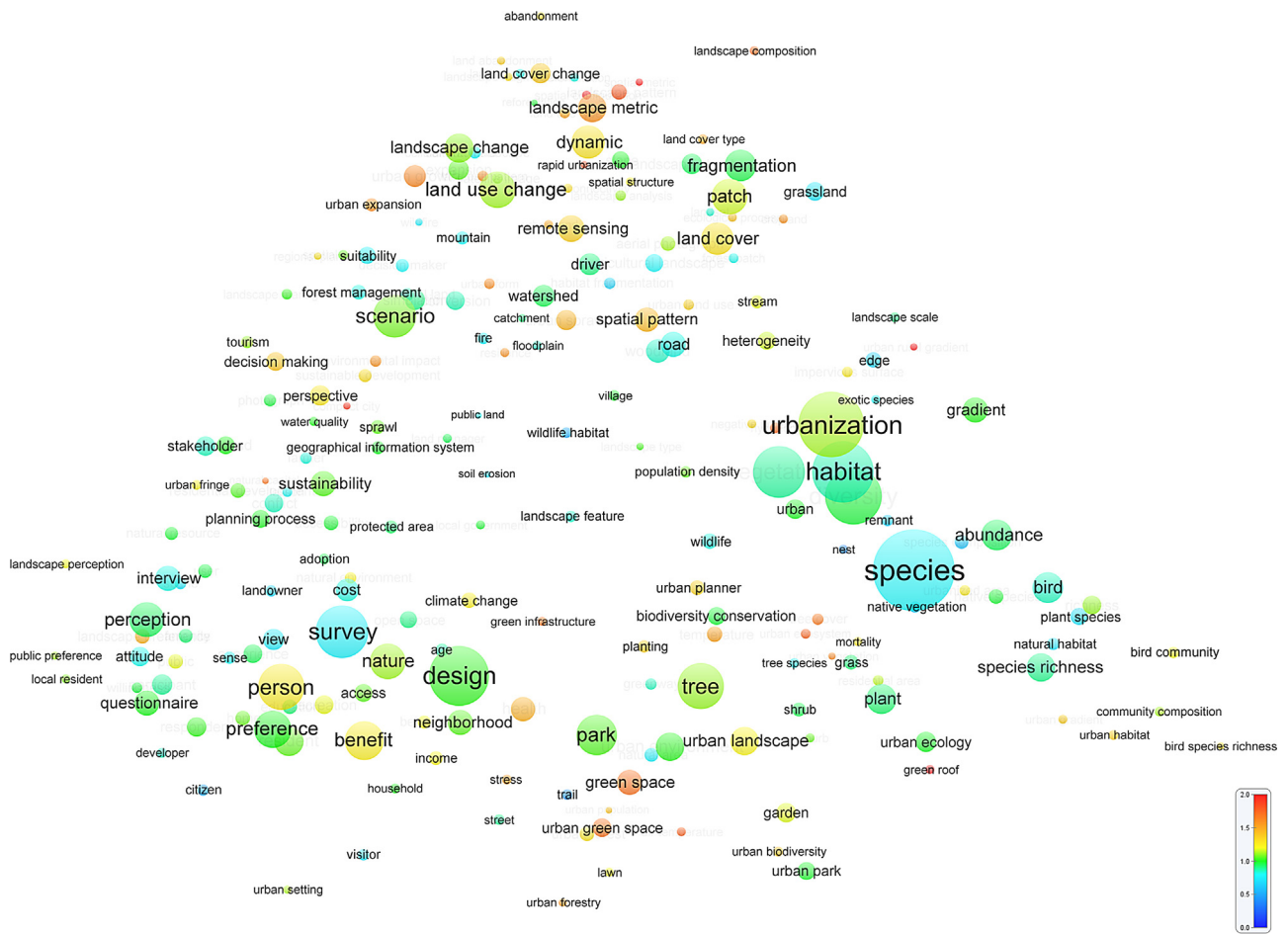
Fig. 8. Term citation impact "heat map" for *Landscape and Urban Planning*, 1996–2005.

than does work in the other two clusters. There is a reasonable distribution of hot topics across each of the clusters, however, and the table shows a representative sample of these for each term map.

5. Discussion

This qualitative analysis of term maps of LAND and its parent journals over the past 40 years reveals the assembly, organization, explication, and evolution of concepts germane to the fields that concern the journal and its community of publishers,

editors, authors, reviewers, and readers. With a central concern for landscape and its varied manifestations across urban, rural, and wildland settings, the maps reflect three of the four core principles expressed in the journal's aims and scope mentioned earlier: a focus on the dynamics of landscape change, a reliance on ecology as the foundation for landscape planning and design, and the involvement of multiple disciplines. The fourth principle of linking research to practice is less evident, and as the journal has grown and matured in the last 20 years to become more scientific in nature, as is the purpose of international research journals, terms

Table 2
Selected examples and characteristics of "hot topics" terms from citation impact "heat map" analyses.

Term	Period	Color	Relevance	Occurrences	Size	Cluster
Landscape dynamic	1996–2005	Red	.98	16	Small	Planning and analysis
Heterogeneity	1996–2005	Red	.63	11	Small	Planning and analysis
Urban ecosystem	1996–2005	Red	.83	14	Small	Urban ecology
Habitat structure	1996–2005	Red	1.86	9	Small	Urban ecology
Meaning	1996–2005	Red	1.03	19	Small	Human dimensions
Green space	1996–2005	Red	.87	11	Small	Human dimensions
Landscape change	1996–2005	Orange	.46	57	Big	Planning and analysis
Decision making	1996–2005	Orange	1.10	34	Medium	Human dimensions
Species richness	1996–2005	Orange	1.48	37	Medium	Urban ecology
Composition	1996–2005	Orange	.91	32	Medium	Urban ecology
Spatial metric	2006–2012	Red	1.82	11	Small	Planning and analysis
Rapid urbanization	2006–2012	Red	1.66	11	Small	Planning and analysis
Compact city	2006–2012	Red	1.05	11	Small	Planning and analysis
Green roof	2006–2012	Red	1.25	13	Small	Urban ecology
Urban rural gradient	2006–2012	Red	1.43	11	Small	Urban ecology
Temperature	2006–2012	Orange	.72	27	Small	Urban ecology
Urban ecosystem	2006–2012	Orange	.81	15	Small	Urban ecology
Green space	2006–2012	Orange	.63	49	Medium	Human dimensions
Landscape preference	2006–2012	Orange	2.23	25	Medium	Human dimensions
Stress	2006–2012	Orange	.94	15	Small	Human dimensions

Fig. 9. Term citation impact "heat map" for *Landscape and Urban Planning*, 2006–2012.

relating to professional practice such as "landscape design," "planning process," and "landscape architecture" have faded from view. While such a linkage does not necessarily have to express itself in terms that can be identified within the text of articles, it remains a challenge of LAND to better connect our efforts to practitioners in landscape design, planning, and management while at the same time helping to advance novel and significant research in landscape science.

The VOSviewer's cluster density maps show a clear coalescence of journal terms and concepts over time into three knowledge domains dealing with human dimensions, landscape planning and analysis, and urban ecology. These results were particularly interesting to me as they parallel my own intuitive classification of new submissions that I established when I started as editor, and are the main divisions we use to assign papers to handling editors for peer review. As paradigms for work in landscape science, the more recent maps have cluster structures that show both stability over time and the elaboration and refinement of concepts within them. As LAND enters its 5th decade of publication, does this signal that our journal community has settled into a mature phase of Normal Science as discussed by Kuhn (2012), and that we are now mainly concerned with "mopping up" the details within each of these knowledge domains? As editors, we must be concerned about the novelty and significance of what we publish, and while I believe that there are still plenty of puzzles to be solved in understanding landscapes as social–ecological systems and developing knowledge to promote sustainable solutions for landscape change, at the same time we must be on the lookout for and help facilitate new discoveries and theories.

One must be cautious to not over-interpret mapping and clustering patterns, but for me some of the most interesting and novel terms appear to emerge along the edges of the clusters. In looking at the most recent term map (Fig. 7), terms relating to human health and physical activity (human dimensions cluster), landscape abandonment (landscape planning and analysis cluster), and urban biodiversity associated with gardens and green roofs (urban ecology cluster) each are located at the outer fringe of their respective clusters. While none of this work would qualify as paradigm-shifting discoveries in the Kuhnian sense, most would agree that these terms reflect important recent contributions to their respective knowledge domains. Perhaps even more interesting is that the terms relating to climate change group near the center confluence of the clusters, spanning the three knowledge domains. Complex landscape issues such as climate change require larger scale, transdisciplinary research efforts that recognize the integral relationships between humans and ecosystems. And as national and international policies and research funding initiatives increasingly recognize landscape as a logical unit around which to characterize these coupled social–ecological systems, it would be important to keep an eye on terms that emerge from this confluence.

Finally, while the cluster density mapping capabilities of VOSviewer were reaffirming and in some cases revelatory to me, I was less impressed with the information produced by the heat map analysis, and for the purposes of my trend analysis I found it difficult to understand changes in impact over time. Compared with the sophisticated work featured in this journal describing and modeling land use and land cover change, my heat map comparisons seemed more primitive than they needed to be given

the quantitative nature of the data. Perhaps with some expansion of program capabilities or use in conjunction with other tools and techniques (e.g., Muñoz-Leiva, Viedma-del-Jesús, Sánchez-Fernández, & López-Herrera, 2011; Neff & Corley, 2009), this feature could be improved for use in a trend analysis. This is a minor criticism, however, and directed toward a purpose for which it was not intended. For the most part I found the program both accessible and insightful in understanding the conceptual nature and structure of work published in the journal. Its interactive nature is particularly helpful for exploring one's data, and by varying different program parameters one can better understand the relatedness between concepts. One can imagine many possibilities for using the program on other data sets for this journal and others, and I would encourage those interested to explore and share their results.

6. Conclusion

The bibliometric methods presented here are certainly not the only way to learn about a journal's intellectual roots, and as an inquisitive editor I have also begun assembling archival material and conducting interviews with those involved with the journal's early days to help document the historical foundations of LAND and better understand the fields it covers. In fact while the electronic records of text and citation will endure, I am concerned that many of the personal recollections and ephemera associated with the journal and its editors that provide essential context to the published work are disappearing. As fields like landscape planning, urban ecology, and environmental psychology enter maturity, the time is right to step up efforts for their historical study, efforts which will require collaborative cooperation among journal publishers and editors, academic institutions, and professional associations.

References

Gobster, P. H., & Xiang, W.-N. (2012a). Mapping the intellectual landscape of *Landscape and Urban Planning*. *Landscape and Urban Planning, 106*(1), 1–5.

Gobster, P. H., & Xiang, W.-N. (2012b). A revised aims and scope for *Landscape and Urban Planning:* An International Journal of Landscape Science, Planning and Design. *Landscape and Urban Planning, 106*, 289–292.

Kuhn, T. S. (2012). *The structure of scientific revolutions* (50th Anniversary ed.). Chicago: University of Chicago Press.

LaNier, R. (1975). Developing an ecological framework for the planning of human settlements. *Urban Ecology, 1*, 1–4.

Linton, J. (2011). What does journal fit and focus look like: A visual representation. *Technovation, 31*, 613–614.

Muñoz-Leiva, F., Viedma-del-Jesús, M. I., Sánchez-Fernández, J., & López-Herrera, A. G. (2011). An application of co-word analysis and bibliometric maps for detecting the most highlighting themes in the consumer behaviour research from a longitudinal perspective. *Quality and Quantity, 46*(4), 1077–1095.

Neff, M. W., & Corley, E. A. (2009). 35 years and 160,000 articles: A bibliometric exploration of the evolution of ecology. *Scientometrics, 80*(3), 657–682.

Publisher. (1985). Publisher's note. *Urban Ecology, 9*, 97.

Publisher. (1988). Publisher's note. *Reclamation and Revegetation Research, 6*, 255.

Rodiek, J. E. (1992). Changing landscapes. *Landscape and Urban Planning, 23*, 5–6.

Rodiek, J. E. (1995). *Landscape and Urban Planning*: The Journal's role in communicating progress in the evolution of future urban environments. *Landscape and Urban Planning, 32*, 3–5.

Rodiek, J. (2010). The human-land use dilemma. *Landscape and Urban Planning, 96*, 135–137.

Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523–538.

Van Eck, N. J., & Waltman, L. (2011). Text mining and visualization using VOSviewer. *ISSI Newsletter, 7*(3), 50–54.

Van Weijen, D. (2013). Trends in pediatrics: Overview of research trends from 2007 to 2011. *Research Trends, 34*, 23–25.

Wali, M. K., & Watkin, E. M. (1982). Editorial. *Reclamation and Revegetation Research, 1*, 1.

Waltman, L., Van Eck, N. J., & Noyons, E. C. M. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics, 4*(4), 629–635.

Weddle, A. E. (1974). *Landscape Planning* – Aims and scope of a new journal. *Landscape Planning, 1*, 1–5.

Weddle, A. E. (1986). *Landscape and Urban Planning. Landscape and Urban Planning, 13*, 165–167.

Paul H. Gobster[*]
USDA Forest Service, Northern Research Station,
1033 University Place, Suite 360, Evanston, IL
60201-3172, USA

[*] Tel.: +1 8478669311.
E-mail address: pgobster@gmail.com

Available online 31 March 2014