

## The histories and goals of landscape ecology

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# The histories and goals of landscape ecology

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## A brief history of Landscape Ecology

The image of Landscape Ecology is to a high degree influenced by the way we understand its history. Our history tells us first of all that landscape ecology is considered a rather new phenomenon, with roots in central Europe mainly back to the second world war, spreading rapidly over the rest of the world from the middle of the 80ties, with the first textbook in English from 1984. First time the term landscape ecology turned up was in 1939 in an article on 'air photos and ecological soil science' written by the German biogeographer Ernst Troll. In this article he elaborated extended on the perspectives in air photo interpretation with a lot of examples from all over the world. In the end he put 'landscape ecology' into a concluding remark, almost by the way, saying: *Air photo research is to a great extent landscape ecology. The common goal is the understanding of the spatial ecology of the face of the earth.* (Troll, 1939). For Troll the goal was a broad marriage of geography and biology. This marriage has been the basis of our history of Landscape Ecology ever since, however in a much more narrow form than we tend to admit: Within physical geography a geo-ecological school developed in central Europe uniting the different subdisciplines into a landscape study with emphasis on integrated structural studies with the most important result being the distinction between the topological and the chorological dimension and the classification and hierarchical ordering of landscape types in the chorological dimension (Neef, 1963). A development within a spatially oriented vegetation science resulted in a very parallel bio-ecological tradition among botanically oriented biologists (Tüxen, 1968). Although still differences exist in terminology and focus for these studies, it is clear, that a geo-bio-ecological integration has been established and that landscape ecology as an interdisciplinary field has furthered this integration into what Zonneveld has called the ecology OF the landscape (Zonneveld, 1995). The zoologists however went quite another way. Starting their landscape ecological interest with the practical perspectives of conservation biology, their interest for the spatial aspect developed rapidly in the wake of the upcoming island-bio-geography in the late 60ties resulting in the development of dispersal ecology and metapopulation theory. Up to the last years, however, this development should honestly be seen rather as an internal specialisation within biology - as the invention of the spatial dimension in biology - than as a result of an interdisciplinary co-operation. Zonneveld has called this spatial biology for ecology IN the landscape, stressing the difference to the former geo-bio-ecologically oriented ecology of the landscape. But it is also clear that it has been his hope and dream to integrate especially these two traditions in the study of landscape functions that he consider to be the core of landscape ecology. Landscape ecology *sensu strictu*, he calls it. Around this core of landscape ecology *sensu strictu* a 'theoretical foundation' for landscape ecology has been formulated and the contribution of different disciplines and applied sciences to this theoretical foundation has been mentioned. Much emphasis has been put on the development of quantitative spatial landscape ecology dominating the rapidly developed US-landscape ecology, as well as the foundation and development of the international journal Landscape Ecology.

Parallel to this, and especially within the recent history, that is after the foundation of IALE in 1982, it has been stressed how new perspectives, e.g. within cultural aspects of landscape ecology (Svobodová 1990, Svobodová and Uhde 1993, Nassauer 1997) have widened the universe of landscape ecology, primarily through IALE-initiated activities, and what you could call an additional paradigm of a global cooperation among all types of disciplines with relevans to landscape studies has been formulated, by stating that landscape ecology is a science not just 'combining sciences (which is multi-disciplinarity), not 'in between' (which is interdisciplinary), but above a series of sciences

and integrating them: namely a transdisciplinary science (Naveh and Lieberman, 1984, Zonneveld 1995) for the study of the Total Human Environment.

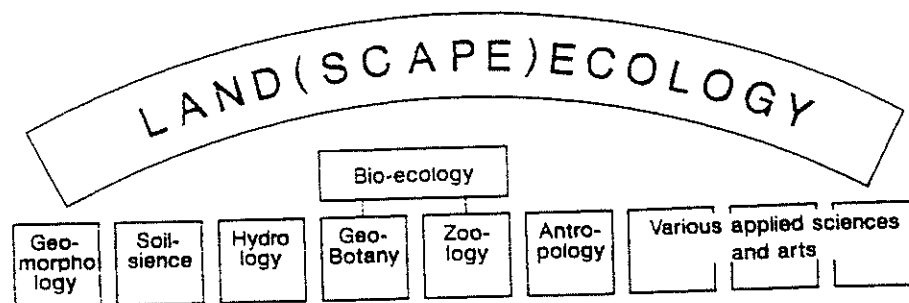


Fig. 1. Landscape ecology as a transdisciplinary science.

Especially Zonneveld and Naveh have put much effort into the formulation of a metatheory for this transdisciplinary science based on general system theory, biocybernetics, information theory, fuzzy set theory, hierarchy theory etc.

### Why study the history of landscape ecology?

Already at the historical first international congress on Landscape Ecology in Veldhoven in 1981, much attention was paid to its history, by asking the old geographer Ernst Neef from Dresden to give a main speech on "Stages in the development of landscape ecology" (Neef, 1982).

In the first edition of Naveh and Liebermann's textbook from 1984 the first chapter was devoted to the evolution of landscape ecology. In the 2nd edition a supplement on recent development in Landscape Ecology gave a detailed description of the rapid spread from Europe to the rest of the world since the mid 80's. These texts have been indicated as the basis for this lecture.

Other main contributions have been published by I. Zonneveld (Zonneveld, 1990, 1995), K.-F. Schreiber (Schreiber, 1990), and R. T. T. Forman (Forman, 1990). and a list of relevant papers have been distributed in the course material.

In the IALE-Bulletin many national reports on the development of landscape ecology in different countries has been published, showing a variety of entrances and different degrees and types of interdisciplinary integration between regions.

But Landscape Ecology is a young science. Why already pay so much attention to its history?

Is it just to give an introduction of our roots for newcomers?

Is it to present central references to be studied, if one will move more deeply into the heart of landscape ecology?

Or is it to facilitate the communication between different disciplines, working on a common project under the title 'landscape ecology' by showing how it already has proved possible?

Certainly we can postulate such practical reasons: But it would not be the whole truth: As the first president of IALE, Isi Zonneveld has often stated, to be recognised as a certain field of science distinct from others a science needs a network of researchers and a paradigm (Zonneveld, 1990, 1995): We could add, that it's also a part of the recognition to produce a history of both the network and the paradigm and to get this history recognised especially in the scientific community. I emphasise: to produce it: History is not just facts about the past: It is an interpretation related to the situation and interests of certain groups at the present time. So when the situation and the interests change, the history will and should change accordingly!

We have to be aware, that producing the history of Landscape Ecology, we interpret the past in a way suitable for our goals, using it to confirm a dominating or wished paradigm, and to confirm a certain interpretation of the existence of a strong and relevant network.

The wished recognition is at least threefold:

It is a question of an internal matter among the network: Do we have a common paradigm, and if not, which one shall dominate, and how does this domination relate to the network..

It is also a question of our external scientific relations: How to convince the existing scientific community, including the existing scientific division of labour within it, that we have a unique role to play. Finally it is a question of our relation to the surrounding society: What is, and should be the function of the science in the society and what is the relation between this function and the role in the division of labour among the sciences? Formulating a history of landscape ecology is also to give arguments for certain types of wished recognition within these different levels.

### **The motives of individual scientists to join landscape ecology**

For the individual scientist, coming from a recognised discipline or field of interest, and considering joining the interdisciplinary field of landscape ecology, this history might be very important. He or she should after all like to be not just a part of the science, but also of its history.

When scientists are labelled, and especially when we are labelling ourselves, we tend to consider it a process, reflecting the most inner core of the logic's of our educational and scientific knowledge. At least we tend to argue, as if it was the case. But at the same time we also experience, that such a discussion very often bring our emotions to the boil, because it very deeply also is a matter of our personal identity, as well as our social status. We have used the most sensitive part of our adult life to get socialised into a certain discipline, and we are inclined to defend this identity and social status by all means, at least until we think we have something better. I say this to stress that every organisation of science to a high degree is a social matter of crucial importance for the individual scientist.

Let me give you two examples to explain my point:

Last summer I was invited to a meeting in Jutland in NERI - the Danish National Environmental Research Institute - to talk about landscape ecology for a newly established department of landscape ecology in the organisation. Most of the scientists moved to the new department were biologists, engaged in different aspects of dispersal ecology. None of them had been active in the Danish Society for Landscape Ecology (DLF), and there had been a general resistance toward the formation among the staff, because they considered the activities of the society as a broad amorf discussion forum dominated by geographers and landscape planners that would have only very little to offer for the development of their scientific interests. And they were partly right. Although we have many biologists as members in DLF also dealing with dispersal ecology, the activities have been much broader with emphasis on interdisciplinarity and application. On the other hand, the reason behind the decision was obviously inspired by a good connection to a European network of conservation ecologists interested in dispersal ecology of whom many were active within landscape ecology, e.g. Paul Opdam and Gary Fry. Within this network they had no problems of identity, because if such activities in an international context was considered landscape ecology, it was actually what they were doing.

So, now they are active in our society, the head of the department, Jesper Fredshavn, is co-organiser of our next seminar at the agricultural university in two weeks.

There is however another side of the picture, which the next example will show.

A year ago we started to plan the conference last week on 'Transformation of agricultural landscapes' within our research group on 'value, landscape and biodiversity', dealing especially with the future of our agricultural landscapes. This group representing biology, geography, landscape architecture and planning, philosophy, economy, legal science and environmental management is very engaged in landscape problems and have enthusiastically went into a research program, empirically founded in studies of the dynamics of small biotopes of agricultural landscapes, studies that has developed into a classical type of research within landscape ecology. This group should certainly be potential members of IALE, and in any case you should expect them to wellcome an international conference organised within a landscape ecological context, with all the experience on interdisciplinary landscape research represented in this tradition.

The biologists and the geographers did certainly welcome it. But the others didn't. They persistently opposed to make it an official landscape ecological conference. Not that they were against the participation of landscape ecologists and that we in fact invited the total Executive committee of IALE plus the editor of the journal Landscape Ecology. They accepted fully this effort to strength the international organisation of landscape ecology, and found the participation very useful for our project. But they resisted to be drawn into a club of landscape ecologists! Or rather to have our common landscape research project put under the umbrella landscape ecology. First of all because these colleagues cannot find their own identity within the tradition of landscape ecology.

## Widening the goals of Landscape Ecology

We would like them to join us. We need them. We can observe a change during the later years in the ambitions of landscape ecology towards a still broader transdisciplinary amalgam of many disciplines linked together not by common theories and methods concerning the ecology of landscapes, but by common problems and goals related to the planning and management of our future landscapes. In a concluding lecture at the last world congress for landscape ecology on The Future of our Landscapes held in Toulouse in August 1995, Richard Hobbs expressed it very clear by saying: "Although it must be acknowledged that landscape ecology is still a developing science, this does not allow us to develop it in an academic vacuum. How much landscape ecology currently finds its way into land-use planning decisions? Or into landscape design?...I suggest, that in its present condition, landscape ecology has surprisingly little to offer those wishing to plan and manage the landscapes of the futures". To solve the problem Hobbs recommended a more goal-oriented participation in the process of shaping future landscapes: "...the Earth and its landscapes are under unprecedented threat from human activities, and there is an urgent need for rapid action to deal with these threats in a rigorous and effective way". He criticised our limited ability to use and develop our interdisciplinary network of landscape ecology: "Landscape ecology brings together an impressive variety of disciplines and outlooks. So far, we have failed to capitalise on this variety, and indeed often fail to see the value of different perspectives. Landscape ecology should be able to take the lead in integrating the many biological, geographical and sociological perspectives and the practical and theoretical approaches needed to tackle today's environmental problems" (Hobbs, 1997).

However at the same time he presented the following model as a status for present landscape ecology showing the relation between function, structure and change of the landscape, adding a list of what he considers important components.

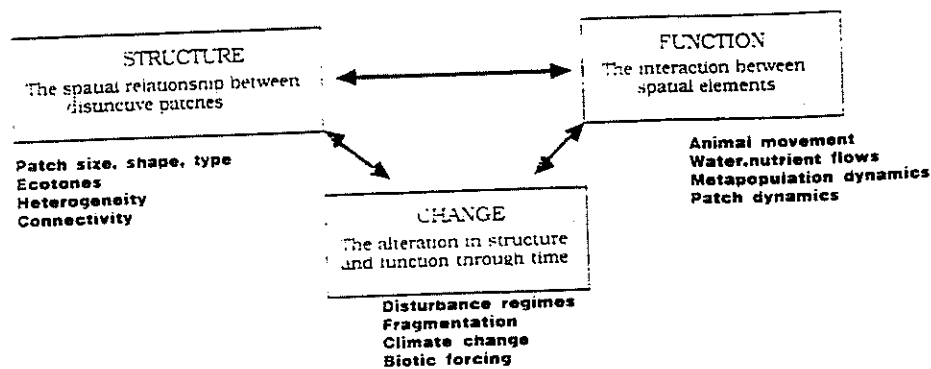


Fig. 2. "Landscape ecology can be considered as the study of landscape structure, function and change. Some of the important components of each of these are listed." (Hobbs, 1997)

I think he very nicely illustrate the problem of interdisciplinarity in landscape ecology: Here we get a good deal of biology, some geography - but not the economic and cultural part of it - , and no sociology. What about all the human activities that are not only represent threats to the landscapes but also have to deliver the solutions to the problems? What about the main force regulating these human activities, namely economy? What about the concepts of landscapes in the human minds that are materialised in the ownership pattern and the artefacts of the existing real cultural landscapes that partly gives rise to serious landscape ecological problems, but also represent some of our highest valued landscapes that we want to save?

They are missing totally. And with such a picture of landscape ecology I understand, why many scientist within social science and humanities are sceptical to receive the invitation. Especially when they are told that landscape ecology will form the basis for the planning and management of our future landscapes. It reminds me on a Danish philosopher (Tage Bild), that 25 years ago defined the term Ecologism as the combination of high competence within the natural sciences and illiteracy within social sciences, thus indicating that many ecological studies of the human environment are in practise very naive in there imagination of the possibilities of implementing natural science directly into planning and management.

This comment is of course not quite fair, since landscape ecologists have constantly invited all types of disciplines to join the association, recognising the principle need for all types of disciplines and specialists to serve a common goal. But it might indicate that we have some problems by handling and guiding the process of transdisciplinarity that we have initiated.

It is true, that many different types of scientists have joined landscape ecology during the forgoing years. But I am afraid that we tend to exaggerate it. The fact is that the vast majority of landscape ecologists still comes from biology and some from physical geography and their technical extensions into GIS and remote sensing. The only promising exception is a little minority of stable landscape architects, primarily in the USA. Of course there are also a growing mass of planners, but they have usually their background in these disciplines, too.

### **The history of a transdisciplinary science**

We have to improve this state of affairs, and one of the ways will be to go much more into what we could call a reconstruction of our history.

If we agree that landscape ecology is a transdisciplinary science with the aim of supporting the planning and management of the Total Human Ecosystem we should put more emphasis on trying to systematically to find the landscape ecological roots in all the ingoing disciplines and applied sciences. Not only those related to Landscape Ecology in sensu strictu, and not only related to the time period where the use of the word landscape ecology can be proved. And we should not put that much emphasis to the landscape ecology sensu strictu because we have to acknowledge that what is landscape ecological relevant shifts with the problem from time to time and from place to place. And that is probably the most important argument for a transdisciplinary landscape ecology.

Let me give you a few examples to show light on these perspectives:

Landscape Architecture has a long relevant history within landscape ecology. E.g. already in the beginning of this century landscape architecture was engaged in the planning of corridors in the USA (Langevelde, F.V., 1994).

Ebenezer Howard's garden cities that has influenced urban development in Britain and many other places, is another similar old example of landscape architectural and urban planning tradition extremely relevant for a reinterpretation relating it to modern techno-ecosystem way-of-thinking. Especially from the 60ties landscape architects begin to give especial attention to ecological principles within their tradition, most clearly presented by the publication of McHarg's: *Design with nature* (McHarg, 1969), a classical publication, that has inspired the last generations of landscape architects into a landscape ecological tradition. Richard Forman in fact got his landscape ecological professorship at the School of design at Harvard University based on this tradition, and it is obvious that it plays an important role in the USA and in the work of the US-section of IALE. But it is not a part of our European-centred historical image, quite the opposite. Why don't we make it an explicit part of our history, that could help attracting and keeping more outstanding landscape architects into the family.

Forest research could be another relevant tradition that has much to offer landscape ecology: Distinct geo-bio-ecological traditions have developed within this tradition closely related to the problems of location-adapted selection of tree species. Their recent trends within forest planning and management putting emphasis to multipurpose land-use within their traditionally economical far-sighted perspective should place them in the frontline of a practical-oriented landscape ecology.

Landscape ecology is not the only transdisciplinary science, and we should make explicit use of other experiences within the field. The classical example is medical science, with hundreds of years experience dealing with an integrated approach to the inner human nature, parallel to our endeavour to deal with an integrated approach to the nature outside the body. The possibilities for an interpretation of this history into the eco-system-health-concept has been systematically developed within Canadian landscape ecology, by Moss (Moss, 1994). Geography, not just physical geography, but geography as the study of the interrelation between society and environment is another example of what could be called a transdisciplinary science, where even very different types of landscape studies have been central. Especially the difficulties of overcoming the classical division between physical and economic geography represent a history of extremely relevance for landscape ecology: You could e.g. argue, that the basic reason why classical geographers engage in landscape ecology is, that they have given up the hope of integrating the different subdisciplines within geography into an integrated transdisciplinary landscape science (Brandt, 1996).

## Conclusion

We should realise, that there are many histories of landscape ecology, and that we have to be very careful, when we produce them. Probably it would be useful to ask the many outsiders to write their version- those, who have a specific niche in Landscape Ecology, but are not feeling a part of the big project.

I think we would be suprised to find a lot of relevant research that however by accident never found the way to landscape ecology, and also many areas, where we could stimulate scientists to develop new perspectives for their own disciplin, and at the same time add to the field of landscape ecology. Such a disciplin-oriented history of landscape ecology could be an important tool for to all scientists within the transdisciplinary umbrella of landscape ecology.

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