

# Culture and changing landscape structure

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## Abstract

Culture changes landscapes and culture is embodied by landscapes. Both aspects of this dynamic are encompassed by landscape ecology, but neither has been examined sufficiently to produce cultural theory within the field. This paper describes four broad cultural principles for landscape ecology, under which more precise principles might be organized. A central underlying premise is that culture and landscape interact in a feedback loop in which culture structures landscapes and landscapes inculcate culture. The following broad principles are proposed:

1. *Human landscape perception, cognition, and values* directly affect the landscape and are affected by the landscape.

2. *Cultural conventions* powerfully influence landscape pattern in both inhabited and apparently natural landscapes.

3. *Cultural concepts of nature are different from scientific concepts of ecological function.*

4. *The appearance of landscapes* communicates cultural values.

Both the study of landscapes at a *human scale* and experimentation with *possible landscapes*, landscape patterns invented to accommodate ecological function, are recommended as means of achieving more precise cultural principles.

## Introduction

The fundamental premise for examining culture in landscape ecology is that *culture structures landscapes*. A corollary premise is that *landscapes inculcate culture*. Culture changes landscapes and culture is embodied by landscapes. Both aspects of this dynamic are encompassed by landscape ecology, but neither has been examined sufficiently to produce cultural principles.

When landscape ecology began to emerge in American science, the pervasive effect of human beings within and upon the landscape was integral

to the field (Risser et al. 1984). This presented a significant shift from ecological research that focussed on pristine ecosystems, and it followed from European landscape ecology, which had established human effects as definitional (Naveh 1982). A decade later, American landscape ecology has entered the cultural realm with its vocabulary and in environmental policy, but cultural effects on landscapes have been more assumed than examined. Research in landscape ecology has not focussed on culture despite its centrality to the field (Caldwell 1990, Naveh 1991).

However, landscape ecology as a science has

shown an extraordinary tendency to resonate beyond the bounds of research into policy and popular culture. Three distinctive characteristics help to account for its diffusion:

- It includes human behavior within ecological systems (Risser 1987).
- It includes human inhabited and cultivated land uses within ecological models (Forman and Godron 1986).
- It tends to study landscapes at a human scale (Wiens 1992).

While landscape ecology research frequently has examined the relationship of landscape structure to ecological function and considered alternative patterns of structure, it has not tended to investigate *why* one pattern or another would occur (Baker 1989). The focus has been on landscape structure, not on human behavior. A more functional perspective quickly demonstrates that humans not only construct and manage landscapes, they also look at them, and they make decisions based upon what they see (and know, and feel). This dynamic helps to explain landscape structure as both an effect of culture and as an artifact that changes culture. For example, the practice of stream channelization resulted from a particular cultural view of the function of streams, but when people experienced flooding, public perceptions of stream channelization began to change. Completing the feedback loop, changed public perceptions and cultural values may result in changed landscape structure in watersheds that contribute to flooding.

Random House (1987) defines culture as: “the sum total of ways of living built up by a group of human beings and transmitted from one generation to another”. Culture is not determined by climate, geomorphology, or vegetation (Hartshorne 1959). Rather a wide range of cultural variations could occur in any given place. We make landscapes according to the political system in which we operate, the economic use we see for land, our aesthetic preferences, our social conventions – all of these are summarized here under the label of culture. In a broad sense, as we plant or subdivide or harvest or build, we are the instruments of our culture working within the fundamental ecological framework of the land.

Culture not only helps to explain landscape structure, it helps to suggest the enormous array of possible human actions and constructions in the landscape, including landscapes that do not exist now but might be designed to promote ecological function. These possible variations have received little attention among landscape ecologists. Instead a highly simplified concept of natural effects compared with anthropogenic effects has continued to dominate research. Landscape ecology must include a cultural explanation for landscapes that exist or that might evolve from current trends. It also should include experiments with landscapes that could shift trends to accommodate ecological function. These possible landscapes are designs that propose how inhabited landscapes should be organized in response to biophysical function.

Broad cultural principles for landscape ecology are offered here as ground for achieving more precise principles and for designing possible landscapes. They are developed from a critical review of literature within landscape ecology and literature within design and environmental perception that has not yet been incorporated into landscape ecology. On one hand they suggest that principles developed in these disciplines are highly complementary. On the other they reflect the lack of powerful foundational theory in each of these areas of inquiry.

**Principle 1. Human landscape perception, cognition, and values affect the landscape and are affected by the landscape**

Perception, cognition, and evaluation are highly interrelated processes (Kaplan 1987). Both perception, the immediate apprehension of the environment, and cognition, the way information is organized, stored, and recalled, exhibit the effects of culture (Murphy 1966, Goodenough 1970, Golledge and Stimson 1987). Values, enduring beliefs about what is socially or personally preferable, affect both perception and cognition (Golledge and Stimson 1987). Human preference for landscapes, a measure of landscape aesthetic quality, clearly draws upon all of these processes. Kaplan (1987, p. 26)

compares landscape preference with habitat selection among vertebrates, and concludes that:

“Aesthetic reactions reflect neither a casual nor a trivial aspect of the human makeup. Aesthetics is not the reflection of a whim that people exercise when they are not otherwise occupied. Rather, such reactions appear to constitute a guide to human behavior that has far-reaching consequences... Aesthetics could thus be seen as a set of inclinations, however intuitive or unconscious, which might influence the direction people choose not only in the physical environment but also in other domains.”

Several analyses of the preference literature have defined culture somewhat narrowly, using culture to refer to learned or historical explanations for landscape preference as compared with biological (innate or evolved) explanations (Zube et al. 1982, Daniels and Vining 1982, Bourassa 1990, 1991). Others have argued that distinguishing between these types of explanations may not reflect the processes at work when people interact with the landscape. They suggest that these processes are mutual transactions between people and landscapes in which innate and learned responses are not readily distinguishable (Ittelson 1973, Altman and Rogoff 1987, Hartig 1993). Kaplan and Kaplan (1982) have used an information processing model, in which biological explanations suggest only one perspective on the processes. Golledge and Stimson (1987) have explored a larger behavioral process model, emphasizing the effect of landscape preference on human behavior, and the reciprocal way in which behavior changes the landscape.

Each of these theoretical perspectives addresses a large body of empirical research that demonstrates enormous consistency in human preferences for landscapes. While statistically significant differences have been observed between the preferences of people who work in or with the landscape compared with other people, and between young children and others, or among people who live in different places, the most remarkable result of surveys and experiments has been the consistency of human preference for natural looking landscapes

that include canopy trees or water features, and that allow views out across the landscape. While this simple image does not begin to describe the range of preferred landscapes, it does describe a frequently replicated empirical result.

*Biological theories* are helpful in accounting for this widely shared landscape preference for savanna-like landscapes. Appleton (1975) stressed the evolutionary advantages of landscape views that simultaneously afford prospect (wide, open views from which approaching predators could be seen) and refuge (protected settings that prevent the viewer from being seen or that protect the viewer's back). He analyzed the enduring cultural value of prospect and refuge views as portrayed in Western landscape painting since the 18th century. Balling and Falk (1982) inferred an innate preference for landscapes that exhibit the structural characteristics of the African savanna from their investigation of preferences for different global biomes. While young children in the forested northeastern United States preferred savanna over forested landscapes, adults preferred the more familiar forest environment. Bourassa (1990, 1991) interprets these and numerous other empirical studies that show high preference for canopied landscapes with an open floor as evidence of lawlike biological constraints upon preference for natural landscapes.

*Information-processing theories* acknowledge that a biological or evolutionary explanation provides insight into preference but do not limit their inferences to savanna-like settings or natural landscapes. Information-processing models suggest that the way human beings have evolved to perceive landscapes has implications for all of environmental perception. From this perspective, the savanna is only one notable type that exhibits characteristics of landscapes people prefer and seek to make.

J.J. Gibson (1979, p. 140) first proposed the theory that people seek landscapes that afford them desirable experiences.

“The perceiving of an affordance is not a process of perceiving a value-free physical object to which meaning is somehow added...; it is a process of perceiving a value-rich ecological object. Any substance, any surface, any

layout has some affordance for benefit or injury to someone. Physics may be value-free, but ecology is not”.

Gibson defines an affordance as not dependent upon the perception of an observer; an affordance exists because of the value or meaning it intrinsically possesses, its potential. He stresses that the potential for movement through an environment, or locomotion, is critical to human exploration of what an environment affords. Consistent with Appleton’s prospect and refuge theory, Gibson discusses the human experience of landscape in terms of habitat, and notes that hiding places are valued within human habitat.

Locomotion is also essential to Kevin Lynch’s (1960) theory of legibility. Without making reference to an evolutionary explanation, Lynch simply observed that people in cities preferred landscapes that assisted wayfinding. These are landscapes that have clear landmarks, corridors, and nodes, which are used to create cognitive maps of the city. Cognitive maps (Tolman 1948, Downs 1981, Garling et al. 1984, Golledge and Stimson 1987) are particular to the individual, but many individuals’ cognitive maps are likely to share certain features of a landscape. For example, Lynch drew data drawn from inhabitants of Boston, Newark, and Los Angeles, and he found that in Boston in the 1960’s, the John Hancock Tower was a landmark common to many individual cognitive maps. Lynch also observed that people who are familiar with a landscape develop cognitive maps that include smaller scale elements than those in cognitive maps of people who are new to a landscape.

Kaplan and Kaplan (1982) critically integrated many of the theories outlined above and developed the theory of information processing. This theory contributes to explaining human abilities to cope with stress in the environment and human landscape preferences. It summarizes preferred landscapes as offering exploration: both complex (rich, intricate) and mysterious (with something yet to be discovered); and being understandable: both coherent (orderly) and legible (accessible to finding one’s way).

*Transactional theories* complement information-processing theories. Both emphasize the way in which people construct their perceptions of the landscape in cognitive maps. However, transactional theories emphasize that people do not stand apart from the landscape, but rather are participants in the landscape in a situation of “mutual influence”. Ittelson’s (1973) transactional framework for the study of environmental perception is summarized in the following list of considerations excerpted from Sell et al. (1984, p. 71-72):

1. Landscapes surround. They permit movement and exploration... and force the observer to become a participant.
2. Landscapes are multimodal. They provide information that is received through multiple senses and that is processed simultaneously.
3. Landscapes provide peripheral.. information. Information is received from behind the participant as well as from in front, from outside the focus of attention as well as within.
4. Landscapes provide more information than can be used...
5. Landscape perception always involves action. Landscapes..provide opportunities for action, control and manipulation.
6. Landscapes call forth actions. They provide symbolic meanings and motivational messages that can call forth purposeful actions.
7. Landscapes always have ambiance. They are almost always encountered as part of a social activity, they have a definite aesthetic quality, and they have a systemic quality.

These considerations clarify that human beings act in and on landscapes, as well as landscapes providing information and experiences to people.

*Behavioral theories* emphasize the role of people as actors making landscapes. The behavioral process described by Golledge and Stimson (1987 p. 13) focuses on the interface between environmental structure and human spatial behavior.

“The behavioral interface is the black-box within which humans form the image of their world.. . The key psychological variables intervening between environment and human behavior within (the behavioral interface) are a

mixture of cognitive and affective attitudes, emotions or affective responses, perception and cognition, and learning (which are linked.”

Importantly, the behavioral interface functions not only as a filter between the environment and behavior, it also precipitates change – when people change the environment and when people’s minds are changed by their experiences of the environment. Golledge and Stimson describe experience of the environment as derived from:

1. Inherent sensitivity to some stimuli in the environment.
2. Learning and experience of the environment.
3. Secondary information, not necessarily direct experience.

Taken together these theories are most helpful in the degree to which they concur that human landscape perception, cognition, and values are closely related processes, all of which act in human aesthetic experience. The theories all help to explain human preference for savanna-like landscapes, and several of the theories suggest explanations for preference for other landscape types as well. Both transactional and behavioral models also point to the degree to which human behavior and landscape change is functionally linked to preference.

These theories also shed new light on the biophysical typology of landscape ecology. First they suggest why the typology of patch, corridor, and matrix has such immediate appeal to human beings. This typology not only describes landscape at a scale experienced by humans, it describes landscape at the grain of human experience, as elements that correspond to elements identified in several leading perceptual theories. For example, the elements of a landscape that would have afforded an early human being survival or prospect and refuge, or legibility, or coherence, or complexity also could be validly described in terms of a patch-corridor-matrix structure. The same typology of landscape that is relevant for scientific analysis is relevant for human aesthetic analysis.

## **Principle 2. Cultural conventions powerfully influence landscape pattern in both inhabited and apparently natural landscapes**

*“People in any country see their terrain through preferred and accustomed spectacles, and tend to make it over as they see it.”*

Lowenthal and Prince, 1965, p. 186

Cultural conventions and customs directly affect what people notice, find interesting, and prefer about the landscape. Conventions and customs also direct human action to make landscapes, particularly vernacular landscapes, which are “identified with local custom, pragmatic adaptation to circumstances, and unpredictable mobility” (Jackson 1984, p. xii). Vernacular landscapes are made by land developers, homeowners, farmers, foresters, and others who make landscapes with standard practices in mind rather than with design intentions that are particular to a place.

Because they embody unexamined conventions and customs, landscapes are resistant cultural artifacts. Typically, people believe that a yard, a park, a field, a forest, or a city *should look a certain way* without questioning the necessity of that appearance (Rapoport 1982, Nassauer 1988a, 1995). If personal preferences for an unconventional landscape structure exist, they tend to be subsumed by the power of convention. People make landscapes according to what they believe their neighbors will think or cautious assessments of market expectations. Innovation in the design or management of the landscape occurs within the realm of convention.

Conventions about landscape resist change in part because culture imbues landscape appearance with easily read connotations about the person who cares for the land (Nassauer, 1988b, 1993, 1995). The landscape of any American’s home is immediately interpreted for what it says about the householder. Talking about Minnesota farms and suburban homes, research participants have described the owners as good or bad neighbors, hard workers or lazy, good or poor stewards, based entirely upon the appearance of the landscapes they care for

(Nassauer 1988b, 1993). Changing the way people design and manage landscapes will require change in the way people read social characteristics into landscapes.

The resistance of convention does not prevent cultural values from changing. For example, the popular value of wilderness changed in the United States in the 19th century largely because of the portrayal of wilderness in literature and art, the emergence of tourism, and the political advocacy that followed (Nash 1967). Consequently, landscapes began to be preserved as state and national parks.

### **Principle 3. Cultural concepts of nature are different from scientific concept of ecological function**

While people who value nature tend to assume that natural landscapes embody ecological quality, cultural concepts of nature and scientific concepts of ecological function have no necessary relationship (Nassauer 1992). What looks like beautiful nature may be a polluted former landfill, and what looks like a neglected abandoned lot may be a rich ecosystem. Nature as Western culture interprets it is as much a convention (Crandell 1993) as is the tidy, mown lawn. While the recent rejuvenation of a popular ecological consciousness has begun to challenge the rectitude of the conventional mown lawn (Bormann et al. 1993, Stein 1993), preconceptions of what healthy ecosystems look like may be more resistant to change because cultural perceptions of naturalness are so deeply identified with cultural perceptions of ecological health.

However, the distinction between ecological function and cultural perceptions of nature is unmistakable. For example, while Minnesota suburban residents value songbirds in the suburban environment, they are unlikely to value the woody habitat the birds require (Martin 1993). A woody understory may have a useful habitat function but it may not look like the cultural ideal of picturesque nature. Similarly, indigenous oak woodland ecosystems, which tend to match the picturesque cultural image of naturalness, are likely to be maintained with relative integrity by their Minnesota property owners. However, indigenous prairie

ecosystems, which do not match that image, are likely to be planted with coniferous trees by their Minnesota property owners, who think they are improving the natural landscape by planting trees (Buss 1994). A controversial example of a picturesque cultural concept of nature applied in national policy is the USDA Forest Service Visual Management (VMS). The VMS guided the clearcutting of forest lands to meet visitor expectations for a natural appearing forest by specifying that clearcutting should occur where it would not be seen from major roads travelled by tourists (USDA Forest Service 1974, McGuire 1979). Observers who were interested in the ecological health of forest lands saw this policy as organized deceit (Wood 1988, Nassauer 1992).

The cultural perception of nature is not wrong, it simply is. Rather what is mistaken and insidious in its effect is the confusion of cultural perception with ecological function. This mistake tends to lull people into a complacency about ecological quality where landscapes look natural, and to provoke people into objecting to ecological landscape protection or innovation where the resulting landscapes do not look natural. To improve the ecological function of landscapes, landscape ecologists need to know that the cultural perception of nature is independent from ecological function, and that landscape appearance communicates in a cultural language of form.

### **Principle 4. The appearance of landscapes communicates cultural values**

Culture filters landscape perception. In the 19th century the portrayal of landscape in literature and art created new cultural filters. The landscape can portray itself and cause people to see it in a different way. Landscapes are concrete, public statements of cultural values (Rapoport 1982; Nassauer 1992). They are “enormous communication device(s)” (Lynch 1971).

If an overarching goal of landscape ecology is to improve ecological function by changing the structure of landscapes, landscape ecologists need to know how values and conventions change. Values

embodied by landscapes are frequently contradictory. In the United States today, ecological quality is valued, but *so* are wealth (Bourassa 1992), neatness (Nassauer 1988), and safety (Schroeder and Anderson 1984, Nasar 1993), for example. While law, politics, new customs and even fads are pervasive evidence of the cultural value of ecological quality, this value constantly must contend with the social value of wealth, when it resists restrictions upon the use of land, air, or water: neatness, which tends to create homogeneous landscape structure and simple ecosystems: and safety, which has led to the removal of vegetation that might hide attackers. These contradictions underscore the need to establish new conventions by creating new forms of inhabited landscapes that portray ecological function at the same time that that portray multiple cultural values.

Culture can change when *people begin to recognize different landscape patterns as material evidence of long held values*. For example, farmers in the East and Midwest have valued progressive farming since the 19th century, but in 1910 a farm that included varied enterprises of fruit, livestock, and grain crops would have looked progressive. In 1960 a farm that specialized in a single enterprise at a larger scale would have looked progressive. Two decades later a farmer would have been likely to be perceived as progressive if he skillfully used residue management (Nassauer and Westmacott 1987). The value of progressive farming remained unchanged, but the landscape structure that displayed the value changed with new knowledge and innovation. This raises the question of how to create new landscape forms that accommodate ecological function in a way that is consistent with public values and cultural expectations.

### Study landscapes at a human scale

When the German geographer Carl Troll first coined the phrase, landscape ecology, in response to the patterns apparent in aerial photographs, he was observing patterns created by human settlement (Schreiber 1989). Landscape structure that is perceivable to humans as analysts, particularly at

the scale of standard maps and remote sensing data, is frequently the subject of landscape ecology research. While this scale of analysis may create a bias toward a human scale (Wiens and Milne 1989, Wiens 1992), it also presents ecological function at a scale that is apparent to human beings in everyday experience.

The same types of data bases that are used for biophysical analysis and modelling were used for some of the earliest empirical landscape perception research (Zube, Pitt, and Anderson 1974), and the typologies (e.g., woodland, cultivated field, pasture) used in biophysical research are very similar to typologies that predict human preference for landscape views. Within the scale and typology of landscape ecology, the shapes and forms of ecological cognition intersect the cultural perception nature. The woodland patch that delights the eye could be delineated in the same way to represent a woodland patch that provides habitat.

Human scale analysis of landscape structure places ecological function within the framework of human experience. It makes ecological function understandable to people. Where the research objective is to understand the behavior and habitat needs of other species, Wiens' criticism of a human scale landscape typology is well-founded. Where the objective is to understand ecological function at the scale at which landscape is constructed and managed, human-scale analysis is extremely useful.

### Experiment with possible landscapes designed to enhance ecological function

Possible landscapes are landscapes designed in the context of cultural expectations and ecological knowledge. Innovative designs for possible landscapes lay out a vision that is beyond the realm of models that rely on existing patterns. Measuring the ecological function of only existing landscapes or landscapes that are products of acultural models limits the normative power of biophysical knowledge, fails to address the values conflicts between ecological values and other cultural values, and omits the constructive vision of innovation. Ecological knowledge is used to determine how land

should be managed. If landscape ecology does not propose normative models for managing landscapes, it leaves the translation of scientific concepts to the idiosyncrasies of political circumstance. If normative landscape models are proposed without being grounded in the full range of cultural values, they will be overwhelmed by the momentum of custom. Working with possible landscapes would allow all the disciplines that contribute to landscape ecology to collaborate in determining the role of human behavior in ecological systems.

### Science, culture, and design

Research that includes the relationship between biophysical and cultural phenomena remains more of an aspiration than an accomplishment of landscape ecology (Naveh 1991, Farina 1993). While scholars, scientists, and designers, and particularly resource managers and planners in the field, have felt the necessity of binding social and cultural insights to ecological knowledge, action has been impeded by disparate disciplinary cultures. Different disciplinary conventions for research create obstacles to sharing knowledge. Cultural knowledge, scientific knowledge and design innovation are all needed to accomplish cultural principles for landscape ecology. If the disciplines that contribute to landscape ecology can breach the obstacles of research conventions, they can approach a level of mutual accountability in landscape ecology. A biophysical critique of existing and possible landscapes and of cultural expectations for landscape is needed. Cultural criticism and design experiments with biophysical research assumptions about landscape structure would accelerate development of landscape ecology theory.

### Conclusion

Among landscape ecologists a consensus is growing about the need to develop cultural principles for landscape ecology. The intrinsic reciprocal relationship between culture and landscape structure has been described here, and four general principles

have been introduced. The enormous opportunity to experiment with possible landscapes has been emphasized, and the usefulness of studying landscapes at a human scale has been described. Building more specific cultural principles in landscape ecology requires thoughtful development of methods that reside in the traditions of no single discipline but grow from the purpose of the work.

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