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Of looks, laws and lawns: How human aesthetic preferences influence landscape management, public policies and urban ecosystems

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Introduction

Throughout history, humans have transformed and managed landscapes for many reasons including agriculture, natural resource extraction and inhabitation. The contemporary extent and impact of human landscape modification is now so great that the Earth may be described as "human-dominated" (Vitousek et al. 1997). Among ecologists, the increasing recognition that human activities have important environmental consequences has spurred interest in integrating humans into ecological theories and research. The central question of such interdisciplinary research is: How do human sociocultural systems interact with ecological systems to determine environmental patterns and processes (e.g., biodiversity, nutrient cycles) (Pickett et al. 2001)?

Sociocultural and ecological systems interact most strongly in urbanized landscapes where human activities are the dominant drivers of ecological patterns and processes. Although historically neglected as a subject of scientific inquiry, a growing number of ecologists have begun to study the ecology of urban ecosystems (Pickett et al. 2001). However, incorporating sociocultural variables into basic and applied ecological science remains a major challenge for ecologists because of, among other reasons, disciplinary divides in research and training. Such hurdles may be overcome in many ways but especially by developing new interdisciplinary frameworks about the influences of humans on ecological systems. In particular, the influence of aesthetic preferences on ecological patterns and processes has not been widely explored.

In urban ecosystems, humans affect ecological patterns and processes through the design, creation and management of unique habitats such as buildings, landfills and parking lots. However, the most familiar human-created habitat is the lawn, composed of closely mown grasses and herbaceous vegetation. Lawns comprise up to 60% of urban residential areas (Kaye et al. 2004) and cover upwards of 30 million acres across the United States (Bormann et al. 2001). Although ubiquitous, lawns have been the subject of precious few studies both from sociocultural and ecological perspectives.

Synthesizing existing knowledge on sociocultural and ecological aspects of lawns is the main objective of this paper with the hopes that it will provide a springboard for future discussion and research.

My central thesis is that aesthetic preferences influence urban landscape (especially, lawn) management, which in turn has ecological consequences. Although lawns may be managed in a variety of ways for many purposes, the focus of this paper is the idealized lawn found around homes and in institutional landscapes and parks. The idealized lawn is evenly mown, contains one grass species without weeds or diseases, and is green all year round. Discussion of my thesis is developed on a conceptual framework (Fig. 1) and will highlight linkages among 1) the sociocultural variables that have given rise to the idealized lawn aesthetic (Fig. 1a, b, c), 2) the influence of this aesthetic on public policies and lawn management (Fig. 1d, e) and 3) the ecological consequences of idealized lawn management (Fig. 1f). I will conclude by proposing that the dominant preference for the idealized lawn aesthetic could be modified by incorporating ecological knowledge into lawn management preferences and practices (Fig. 1g).

History of the lawn aesthetic

Lawns are a human construct in both concept and physical form. The nearest relatives of lawns are grazed grasslands or pastures. However, the idealized lawn differs from its non-human managed cousins in many respects. Its maintenance requires extensive inputs of money, time, water, pesticides and fertilizers. Where did the idealized lawn aesthetic come from? Why has it been so widely adopted? Why are people obsessed with maintaining a "perfect" lawn (Jenkins 1994, Schultz 1999)? Few straightforward answers exist for these questions. Rather a multitude of factors have synergistically given rise to the idealized lawn aesthetic. A brief summary of the sociocultural history of the lawn concept, the technology and industry that supports idealized lawn management and analysis of popular attitudes about lawns is necessary to understand the origins and perpetuation of the contemporary lawn aesthetic. (Most of the following historical

information is from Jenkins (1994) and Bormann et al. (2001). See these texts for details.)

The origins of the lawn as a landscape design concept can be traced to the 1600's in European gardens, especially in England and France. The angular, trimmed fields that surrounded aristocratic palaces (e.g., Versailles) reflected attitudes about the need for human control of nature through rigorously designed and maintained landscapes (Fig. 1b). Grassy fields were kept trim by hand with scythes or by grazing animals.

During the eighteenth century, colonists in North America adopted the principles of European landscape design and brought many typical lawn grasses with them from Europe. Exemplary colonial lawns were established on wealthy landowners' properties such as Thomas Jefferson's Monticello and George Washington's Mt. Vernon. For the majority of early settlers, however, lawn creation was unattainable due to lack of property and because environmental factors such as climate and soil did not permit lawn cultivation. Through the early history of America, lawns were not a predominant part of the typical human-inhabited landscape.

The American landscape began to change dramatically beginning in the mid-nineteenth century. At this time, residential developments expanded from urban centers into surrounding rural land due, in part, to expansion of rail lines. People could live in rural landscapes at greater distances from their places of work and build single-family homes (Fig. 1b). Synergistically, landscape architects began to develop a standard of aesthetics to guide what suburban housing developments should look like (e.g., Frederick Law Olmstead's Riverside, IL). Included in such guidelines were distances that houses should be located from the street. This "set back" distance provided space for lawns and helped create the illusion that houses were located within a continuous green field (Schroeder 1993). Such suburban designs were meant to foster a sense of community and gave the front lawn stature as the symbol of a landowner's contribution to keeping the community looking neat and orderly (Fig. 1c; Nassauer 1988).

Maintaining an idealized lawn is impossible without a suite of technological innovations that were developed in the latter half of the nineteenth and throughout the twentieth centuries. The evolution of lawnmower designs shows improvements to facilitate more efficient mowing (Schroeder 1993, Schultz 1999). Turfgrass breeders have continually developed

grass varieties that tolerate environmental stresses such as drought, heat, and disease and that provide aesthetic appeal such as fine texture and bright color. In addition, irrigation systems, fertilizers and pesticides (most originally developed for agriculture) have all been marketed as necessary lawn care materials. Indeed, the lawn care industry has heavily promoted the idealized lawn aesthetic through advertising to increase sales of their products (Fig. 1a; Robbins and Sharp 2003). The targets of such advertising were—and are—suburban homeowners who increased in number during and after the 1950's and concomitantly have increased the acreage of lawns in America (Jenkins 1994). Thus, it is apparent that many factors worked in concert to permit and promote the spread of the idealized lawn as a cultural norm.

Over a century in the making, the idealized lawn aesthetic persists today and influences lawn management across the United States (Fig. 1e). An estimated 383,000 acres are transformed into lawn every year in the U. S. with a large percentage of them receiving chemical applications (Robins and Birkenholtz 2003). Lawn care industries continue to promote the idealized lawn aesthetic through advertisements showing lawns as centers of family fun and community pride (Robbins and Sharp 2003, Byrne personal observation). Recent surveys indicate that a majority of people apply chemicals onto their lawns because they feel it important to have an idealized lawn (e.g., Pieklik 2003, Law et al. 2004). Such feelings are often brought about by social pressures to conform to community landscaping standards. Where do such pressures come from? Often, public policies encourage adoption of the idealized lawn aesthetic.

Weed laws and neighbors

Public policies, either written or understood, are in place in many local governments and neighborhoods that regulate lawn management. So called "weed laws" (Rappaport 1992) restrict the height of vegetation in lawns and implement fines on homeowners who do not follow them (Hanche 1994). Neighbors are often the enforcers of such legislation by calling the local authorities or leaving critical, and anonymous, notes at residences of untidy lawns. In some neighborhoods, especially wealthier ones, the lawn aesthetic is enforced by homeowner organizations that have regulations in place about landscape management to help maintain high property values (Fig. 1b; Pieklik 2003). Although few data exist on the number and consequences of public lawn policies across the country, it is clear that

they have a strong effect on the adoption of the lawn aesthetic by homeowners. Rather than face the wrath of neighbors and fines, homeowners generally conform to accepted lawn management practices. (Although there are dissenters, they are few and far between. See Bormann et al. (2001) for examples.)

The relationship between the idealized lawn aesthetic and public policies (both written and unwritten) resembles the chicken-and-egg question; which came first? It is unclear which has influenced the other to a greater degree. Has popular preference for idealized lawn management put pressure on policy makers to create weed laws? Or do policies help convince people that the idealized lawn is the only socially acceptable form of landscaping? I propose that the answer is yes to both of these questions and that the relationship between policy and aesthetic preference is best understood as a feedback loop (Fig. 1d). Lawmakers, facing pressure to appease popular opinion, created weed laws as a way to discourage those who would rather not mow from disrupting community peace. In turn, the presence of such policies reinforces the lawn aesthetic and feelings of social responsibility associated with the management of idealized lawns. Increasing concerns about the ecological effects of lawn management may ultimately drive policies in the other direction—toward stricter limitation of lawn management (Rappaport 1992, Bormann et al. 2001). To inform such policy changes, ecological science can be used to understand how lawn management affects ecosystems.

Lawn ecology

The earliest ecological investigation of lawns was by Falk in 1976. From his analysis, he concluded that lawns are highly productive ecosystems but their management requires as much energy as for a corn field without the production of edible biomass. In addition he found many more organisms inhabiting the lawn than just a few grass species. Although insightful, Falk's work has not sparked widespread interest among ecologists to study lawn ecology. Most research has come from turfgrass scientists who focus on pest control and health of the grass. However, from the limited studies available, it is clear that landscape management practices affect the ecological patterns and processes in lawns (Fig. 1f).

The impact of pesticides and fertilizers on non-target organisms is one of the best studied aspects of lawn ecology. Generally, insecticides have been found to reduce abundances of beneficial predatory arthropods (e.g., spiders, beetles) in lawns immediately after

application (Potter 1993). Although some effects may be transient with rebounding of populations, chemical lawn applications may lead to increased pest outbreaks due to disruption of food web structure (Potter 1993). Earthworms are another beneficial organism in lawns due to their effects on litter decomposition; abundant applications of pesticides can also reduce their abundances and lead to undesirable increases in thatch (Potter 1993). Other decomposer organisms such as soil microarthropods can be negatively affected by idealized lawn care and thus reduce the overall biodiversity of lawns (Byrne and Bruns 2005). Little is known about the effects of lawn management on other organisms such as soil microbes and vertebrates. Clearly, more research is needed on lawn biota to better understand how lawn management affects urban biodiversity.

Carbon (C) and nitrogen (N) cycling are important ecological processes in lawns because they regulate soil nutrient availability for plants. In addition, certain C and N molecules have negative environmental consequences such as the effects of carbon dioxide (CO₂) and nitrous oxide (N₂O) on climate change and nitrate (NO₃⁻) on water pollution. Because these molecules are associated with lawn dynamics, they will be the focus of this brief discussion.

Lawns are highly productive ecosystems meaning that they fix large amounts of CO₂ from the atmosphere into plant biomass through photosynthesis (Falk 1976). However, the decomposition rate of grass clippings may be high which releases CO₂ back into the air (Byrne unpublished data). In addition, CO₂ is produced from the burning of fossil fuels in lawn mowers. Unfortunately, few data exist on the contribution of CO₂ from lawn mowers to air pollution and its overall relationship to C cycling in lawns. Further research is needed to examine if lawns are net sinks of CO₂ due to their high productivity or net sources due to CO₂ production from lawn mowers (Bormann et al. 2001).

N cycling in lawns can be altered in several ways. Excess fertilizer applied to lawns increases the possibility of ground and surface water pollution through NO₃⁻ leaching and run-off (Guillard and Kopp 2004). The production of atmospheric nitrogen (NO_x) from fuel burning in lawn mowers can contribute significantly to ground ozone and smog especially on weekends (Diem and Comrie 2001).

Changes to the soil biota can also affect N transformations in lawns. For example, Kaye et al. (2004) found that microbes in lawn soils produced significantly more amounts of N₂O than in nearby native grasslands. Although such research is sparse, interest in the effects of lawn management on both N and C cycles is growing. Future studies will provide useful insight into the effects of urbanization on the biosphere.

Ecological aesthetics

Increased environmental awareness over the past three decades has caused some to question the idealized lawn aesthetic: is it healthy for humans and other organisms (Bormann et al. 2001, Robbins and Birkenholtz 2003)? Although lawn alternatives are becoming more common as people seek less management-intensive, more diverse, and possibly more healthful urban landscapes (Bormann et al. 2001), it is clear that a large proportion of homeowners still prefer the idealized lawn aesthetic over alternatives (Schultz 1999, Piekielek 2003, Law et al. 2004). Is it possible that this preference could change? What might encourage people to dispense with lawn chemicals?

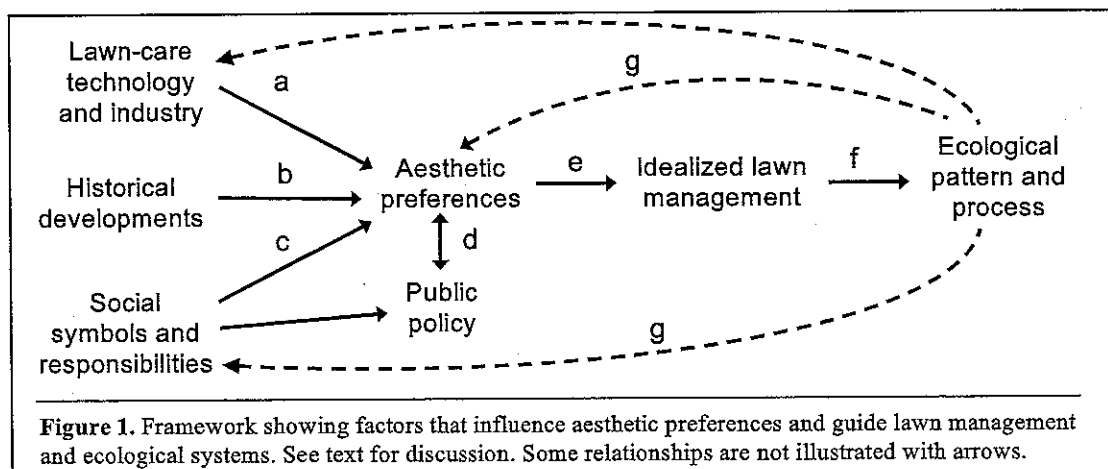
As described above, many factors have worked in concert to promote and facilitate the adoption of the idealized lawn as the best looking landscape, indeed as the only socially acceptable one (Fig. 1a,b,c,d; Jenkins 1994). However, aesthetic preferences about what looks "good" can be based on many ideas. Ecological knowledge about the effects of lawn management on organisms and ecosystem pollution (Fig. 1f) suggests that the look of the idealized lawn may hide some of its underlying negative consequences. Incorporation of such knowledge into aesthetics has led to new philosophies about what

landscapes are preferable.

Ecological aesthetics is the perception that what looks good is that which does not have negative ecological consequences. It explicitly incorporates ecological knowledge into its foundation. Thus, landscapes managed to conserve biodiversity, reduce air and water pollution and reduce energy inputs are viewed as good-looking no matter what their outward appearance (Koh 1999). Idealized lawns can therefore be viewed as "ugly" because they can result in unwanted environmental outcomes. Although the structure of the idealized lawn itself does not change, when it is viewed through a different lens—that of ecological understanding—our perception of it changes. Although subtle, the widespread shift from a preference for the idealized lawn aesthetic to a preference for ecological aesthetics could revolutionize the predominant management style of America's urbanized landscapes. The proponents of ecological aesthetics who wish to reduce the American obsession with perfect lawns face the challenge of undoing a century's worth of popular acculturation to the concept of the idealized lawn. This challenge may be overcome, in part, through educational programs that seek to infuse ecological science into public policies, the public's aesthetic sensibilities and the development of new technologies by the lawn care industry (Fig. 1g).

Conclusion

The lawn provides a perfect example of how human sociocultural systems influence ecological systems. As Figure 1 illustrates, a multitude of sociocultural factors have created the idealized lawn aesthetic that guides urban landscape management. The aesthetic has been heavily promoted by industry, adopted widely by the public and is now an unquestioned cultural symbol that reflects wealth and pride in the



neat and orderly appearance of one's property (Nassauer 1988, Jenkins 1994, Piekielek 2003, Bormann et al. 2001). The effects of lawn management on ecological patterns and processes are increasingly gaining scientific attention (e.g., Kaye et al. 2004). With greater knowledge of the potential negative consequences of lawn management, more people are searching for alternatives to the idealized lawn. However, alternatives often face opposition due to public policies that discourage management that goes against the predominant lawn aesthetic. Adoption of a preference for ecological aesthetics may provide the perspective needed to appreciate the appearance of more biodiversity (i.e., weeds) in lawns and reduce rates of chemical applications (Robbins and Birkenholtz 2003). No matter what aesthetic preference is adopted, it is clear from this analysis of the sociocultural and ecological dynamics of lawn management that aesthetic preferences impact ecological patterns and processes, especially in urban ecosystems. Thus, aesthetics should be considered as a key component of future studies about the relationships between sociocultural and ecological systems (Pickett et al. 2001).

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