Full Citation:

CHAPTER 9

Ecological Science and Landscape Design: A Necessary Relationship in Changing Landscapes

Joan Iverson Nassauer

Landscape design is cultural action about nature, and landscape design constructs ecosystems. Because design always affects ecological processes—even when designers are not attentive to these effects—design has a necessary relationship with ecological science. How design curricula and professional cultures embody this relationship is conceptually incomplete and subject to surprising contention. While no one would dispute that landscape architects need to know about nature, what they need to know and how they should learn it is much less clear. Typical approaches that design curricula have taken toward ecological science could be characterized as ambivalence, inspiration, and integration. Each of these is problematic. None adequately fulfills the expectations of students who come to landscape architecture inspired by the promise of learning to design with nature. None recognizes the depth and variety of ecological knowledge that can inform design. None realizes the potential for design to bring ecological health to changing landscapes. Design curricula may realize this potential if they clearly embrace a core definition of design as cultural action, while they also educate students to practice design in a continuous exchange with ecology.

Ecology and design are two very different ways of looking at and prescribing action in the landscape. Ecology is scientific study, and design is creative cultural action. While they are different, they share something fundamental to both: the landscape. This creates obvious grounds for mutual interest and collaboration, and, at the same time, it creates a basis for mis-
understanding and competition between different views of the same sub-
ject. Imagine Henry Cowles and Jens Jensen exploring the Indiana dunes

I. Cject. Imagine Henry Cowles and Jens Jensen exploring the Indiana dunes
together early in the past century and you have a picture of the collabora-
tion that ecology and design can have (Grese 1992). Now, imagine a land-
scape architecture student entering professional school infused with the
desire to support nature with design, but soon absorbing the tacit knowl-
gedge that some students excel in design while others pay attention to sci-
ence and planning, and you have a picture of a different relationship. The
picture of Cowles and Jensen shows a great ecologist and a great landscape
architect, each accomplished in his own discipline, each seeking its poten-
tial, and each undeterred by its conventional limits. The second picture sug-

218 PART III. EDUCATION FOR PRACTICE

As viewpoint and question that need ecological critique, development, or
accomplished in their own disciplines. Their experience in their own disci-
plines led them to viewpoints and questions for which they valued the
insights of the other. How might design pedagogy lead students to formulate
viewpoints and questions that need ecological critique, development, or
answers? How might curricula engage them in practice of this exchange?
Cowles and Jensen expanded the intellectual potential of their own disci-
plines and were undeterred by conventional disciplinary limits. Students
begin their professional education with a deep desire to search for their own
potential, and when they begin, they are free from nearly all conventions.

To explore how students could use the landscape foundation shared by
ecology and design, we might look again at Cowles and Jensen. They were
accomplished in their own disciplines. Their experience in their own disci-
plines led them to viewpoints and questions for which they valued the
insights of the other. How might design pedagogy lead students to formulate
viewpoints and questions that need ecological critique, development, or
answers? How might curricula engage them in practice of this exchange?

But often, professional design culture and curricula change that. Design educa-
tion often acculturates students as much as it gives them new knowledge. To
consider what students learn in professional programs, landscape architects
and planners should examine not only curricula but also the culture of design
and planners show not only curricula but also the culture of design
as it characterizes ecological science.

Past relationships between ecology and design in landscape architecture
curricula can be broadly characterized as (1) ambivalence about the necessity
of ecology for design, (2) ecology as a source of inspiration for design, and (3)
integration of the substance of ecology into design. These relationships exist
in curricula around the country, sometimes in the same discipline at the same
time. While the characterizations simplify reality, they are intended to point
to areas of contention and conceptual ambiguity in design curricula. Consid-
ering them may suggest more valid, complex, and intentional relationships
between ecology and design for future curricula.

II. Ambivalence

Today it would be difficult to find a prominent designer who does not pay
homage to the importance of ecology for design. Yet designers' behavior, in
the content of professional courses and curricula, in the priorities and
alliances of professional organizations, and in their own designs, sometimes
belie the words. Students' experience of curricula may lead them to conclude
that ecological science competes with the knowledge and methods particular
to design, potentially limiting the intuitive, place-based products of design
with analytical methods and universal generalizations valued by science, pos-
sibly replacing time for studio or graphics with science coursework. Scientific
knowledge may be seen as dully formulaic or exhaustively factual in compar-
son with the holistic, artistic revelations of design. When design and ecol-
ogy are even implicitly set in such a dichotomy, students perceive that they
must make a choice between landscape architecture based on ecology and
landscape architecture as design.

Design programs need to explore this dichotomy so that they can dis-
pense with it. Certainly, H. W. S. Cleveland, Jens Jensen, or Frederick Law
Olmsted Sr. would not have seen design and ecology as mutually exclusive.
Their education was not formally limited to design topics; it was broadly
based on discussions with others in the humanities, arts, and sciences. More
recently, landscape architecture has again claimed ecology as a fulcrum for
the meaning of design (e.g., Olin 1988; Spiri 1988a, b; Riley 1988). Pushed
by public interest, landscape architects have returned "wild" nature to even
the most urban venues. Yet making ecology part of design curricula has
encountered surprising resistance. Why?

In part, design and planning have been blinded by their own stereotyping
of ecology, which has tended to limit ecological applications to the analysis
of regions. Thirty years ago, Ian McHarg set an indelible imprint on the pro-
fessions with his stunning statement, Design with Nature (1969). While his
philosophy pointed to the centrality of human perception of nature, young
landscape architects of the time gravitated toward the book's concrete meth-
ods and images, maps of suitability and vulnerability analyses. Analysis was
the part of McHarg's message that entered the professional mainstream. For
designers, ecology emerged firmly attached to regional analysis. With influ-
ential exceptions (Ferguson 1987, 1998; Hough 1984, 1995; Morrison 1979)
that led some landscape architects to a dawning awareness of the value of
native plants and surface stormwater management, the ecology of the site
typically was limited to rather superficial analysis. At the site scale, ecologi-
cal factors were described as constraints to development rather than systems
or processes with spatial characteristics.

This separation of site from region and design from analysis expressed
landscape architecture's ambivalence toward science. Geographic information systems (GIS), the international growth industry incubated by regional analysis, is the most obvious object lesson of this separation. When Howard Fisher collaborated with Carl Steinitz to begin applying computer mapping to landscape analysis at the Harvard University Graduate School of Design in 1965 (Steinitz 1993), landscape architecture graduates of Harvard and the University of Pennsylvania began to export its concepts and technology to many landscape architecture programs. But these new computer mapping courses played to mixed reviews by faculty and students. Some saw this powerful new technology opening doors to a broad future for the profession. Others wondered what entering code into a computer terminal could possibly have to do with design.

The GIS paradigm tsunami that eventually swept up geography, and much of planning, forestry, wildlife biology, and ecology had its contemporary beginnings in landscape architecture. McHarg's book popularized basic methodological possibilities for applying GIS and inspired many but not most designers of an era. For some, making maps describing the implications of ecology remained an alternative to design, not a part of it. Computer-aided mapping lived but languished in landscape architecture programs that were uncertain what it had to do with design. For those who thought about design as what a person can touch, the space a person can enter, and for those who approached design primarily with intuition, computer-aided mapping sometimes seemed a foreign language, and its ecological roots seemed equally alien. Regional scale analysis maintained a presence in design curricula, but it was not at their heart, and ecology was marginalized with it.

Meanwhile, computer-aided mapping mushroomed into GIS course series and graduate programs in geography. GIS has fundamentally changed the way agriculture, forestry, industry, governments, planning, and landscape architecture work. Numerous extremely successful types of GIS enterprises were initiated by landscape architects Jack Dangermond, Lawrie Jordan, and Bruce Rado (e.g., ESRI, ERDAS) (Steinitz 1993), but these enterprises are not viewed as landscape architecture—only related to it. In the 1990s many design programs had to rush to catch up with the GIS technology that had been initiated but not nurtured in landscape architecture. In the design professions today, the relationship between ecological analysis and ecological design, and the relationship between region and site is more apparent than a decade ago, but the essential ambivalence that kept landscape architecture from seizing the moment of intellectual, entrepreneurial, and design opportunity with GIS may continue to predispose design to a related kind of blindness to its relationship with ecology.

Inspiration
In another characterization, ecology may be welcomed into the professional curriculum and into the studio as an inspiration for design. This relationship recognizes that ecology affects sites as well as regions and that ecology can inspire form as well as delimit analysis. It replaces ambivalence with an interested conversation between acquaintances. Drawing on ecology for inspiration recognizes that ecology is not design, and design is not ecology. It assumes that there is something to be gained by bringing ecology to design while holding it at a distance: near enough to make selective impressions. Such a relationship may evoke wide enthusiasm; it offers much and risks little, but it leaves design teaching and curricula with the ambiguity of acquaintance. How much do designers need to know about what they find interesting in ecology before they can use it? In what ways should they be attentive and true to the source of their inspiration, ecological science, and in what ways are they free to interpret the source? Finally, do design curricula implicitly trivialize the content of ecology when they approach it as mere inspiration for design? Each of these questions confronts designers with the potential that what they say, their rhetoric, will not be true to its source, ecology.

At a time when ecological rhetoric sells everything from herbicide to vacation tours, designers will be sorely tempted to allow their rhetoric to exceed their knowledge. The dangers of this temptation are both ethical and ecological. The popular authority that landscape architects enjoy as designers of nature colors their pronouncements and their designs with ecological beneficence, almost regardless of their deeper knowledge or intentions for ecological health. How can professional curricula prepare designers and planners to use their power of expertise with integrity: describing what they know and do not know about the ecological function of their designs, designing for both ecological function and cultural perception while distinguishing between them?

Even if designers use ecological rhetoric with the greatest integrity, they must consider ecological risks. As proponents of sustainable development have concluded, anyone who changes the landscape must be extremely cautious when they intervene in any ecosystem because, even when experts think they understand, they may be wrong (Holdgate 1996). Cautious intervention does not mean doing nothing or making only small gestures. It means asking questions of people who have the greatest knowledge, weighing and judging multiple answers, and monitoring the effects of design. It also means being prepared to respond to unintended consequences (Gunderson, Holling, and Light 1995). Using the rhetoric of ecology comes with considerable responsibility. It implies a definition of design that extends far beyond the time of construction. Is the responsibility so great that professional curricula should...
Lessons from Ecology

Both the history and the tradition of ecology can teach designers something about how to create a discipline in the landscape design field. When ecology began as a discipline, it was focused on understanding and relating to the natural world, and its practitioners sought to understand the complex relationships between living organisms and their environment. Similarly, landscape architects also strive to understand the natural world and to create designs that integrate human activity with the natural environment.

Central to landscape architects' identity is their view of themselves as integrators of nature and culture. They seek to understand the biological and ecological processes that shape the natural world and to use this knowledge to inform their design decisions. In this sense, ecology serves as a kind of generalist's hubris, believing that they can do all things well-including design. However, the breadth of ecological knowledge that some design curricula may attempt to integrate into design curricula in a way that leaves students feeling that they need to know it all, it may prevent them from achieving any sense of mastery, as they ceaselessly tread the slope of preparation to act. If ecology is integrated into design curricula in a way that prepares students to act, they may become almost ecologists and not quite designers anymore.

The object lesson of GIS should also be applied to the discipline of landscape architecture. In the past, landscape architects have often sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

Within the past decade, the role of landscape architects has been to help clients understand and engage with their natural surroundings. In doing so, they have sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

The history and tradition of ecology can teach designers how to engage with their natural surroundings. They can learn how to observe and analyze the natural world, and how to communicate their observations to others. The history and tradition of landscape architecture can teach designers how to use this knowledge to inform their design decisions. In this sense, ecology serves as a kind of generalist's hubris, believing that they can do all things well-including design. However, the breadth of ecological knowledge that some design curricula may attempt to integrate into design curricula in a way that leaves students feeling that they need to know it all, it may prevent them from achieving any sense of mastery, as they ceaselessly tread the slope of preparation to act. If ecology is integrated into design curricula in a way that prepares students to act, they may become almost ecologists and not quite designers anymore.

The object lesson of GIS should also be applied to the discipline of landscape architecture. In the past, landscape architects have often sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

Within the past decade, the role of landscape architects has been to help clients understand and engage with their natural surroundings. In doing so, they have sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

The object lesson of GIS should also be applied to the discipline of landscape architecture. In the past, landscape architects have often sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

The history and tradition of ecology can teach designers how to engage with their natural surroundings. They can learn how to observe and analyze the natural world, and how to communicate their observations to others. The history and tradition of landscape architecture can teach designers how to use this knowledge to inform their design decisions. In this sense, ecology serves as a kind of generalist's hubris, believing that they can do all things well-including design. However, the breadth of ecological knowledge that some design curricula may attempt to integrate into design curricula in a way that leaves students feeling that they need to know it all, it may prevent them from achieving any sense of mastery, as they ceaselessly tread the slope of preparation to act. If ecology is integrated into design curricula in a way that prepares students to act, they may become almost ecologists and not quite designers anymore.

The object lesson of GIS should also be applied to the discipline of landscape architecture. In the past, landscape architects have often sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

Within the past decade, the role of landscape architects has been to help clients understand and engage with their natural surroundings. In doing so, they have sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

The history and tradition of ecology can teach designers how to engage with their natural surroundings. They can learn how to observe and analyze the natural world, and how to communicate their observations to others. The history and tradition of landscape architecture can teach designers how to use this knowledge to inform their design decisions. In this sense, ecology serves as a kind of generalist's hubris, believing that they can do all things well-including design. However, the breadth of ecological knowledge that some design curricula may attempt to integrate into design curricula in a way that leaves students feeling that they need to know it all, it may prevent them from achieving any sense of mastery, as they ceaselessly tread the slope of preparation to act. If ecology is integrated into design curricula in a way that prepares students to act, they may become almost ecologists and not quite designers anymore.

The object lesson of GIS should also be applied to the discipline of landscape architecture. In the past, landscape architects have often sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.

Within the past decade, the role of landscape architects has been to help clients understand and engage with their natural surroundings. In doing so, they have sought to use GIS as a tool for analysis and planning. However, the use of GIS as a tool for design is more recent and less well understood. The success of using GIS in landscape architecture depends on the ability of designers to use it effectively in the design process.
without skepticism and debate, the ideas and their discussion have been brought into the normal business of ecology. Federal, state, and local land management and conservation policies have been reoriented around these ideas. Increasingly, the popular press and citizens use their vocabulary. Yet these influential approaches to changing landscapes remain optional for the design disciplines.

Concepts and ideas in conservation biology, ecosystem management, landscape ecology, and restoration ecology are or could be as much about cultural action as they are about ecological function. Ecologists, knowing the limitations of their knowledge, have frequently called for knowledge of culture that will support action. Ecologist Jane Lubchenco (1998), president of the American Association for the Advancement of Science, dubbed humans "a new force of nature" in her presidential address, "Entering the Century of the Environment: A New Social Contract for Science." Design programs should respond in kind. Operating from the strength of their traditional core, design as cultural action, they should recognize the necessity of ecological knowledge with a new ecological contract for design. Landscape architecture, like ecology, should behave differently as a discipline five years from now. Conservation biology, ecosystem management, landscape ecology, and restoration ecology should grow and be challenged within the design professions as well as within ecology.

**Interdisciplinary Discussion**

For landscape architecture to evolve and lead in new interdisciplinary approaches, consultative interdisciplinary discussion should become a regular, practiced part of design programs. A strength of studio pedagogy is that it includes repetition for students to develop practiced, discerning abilities. Consultative interdisciplinary discussion should become one of those practiced abilities. Just as students draw differently in their first year of studio, they might consult with ecologists differently before they have begun to hone their understanding of cultural perceptions or their ability to make form. Early on, they will hear and inquire of ecology differently, but they should know that the discussion is of the essence and practice it. Later, they will have better questions for ecology because they will know more about it, and they will have better answers for ecologists, who are themselves interested in cultural action. Just as students are taught the essential and somewhat amorphous knowledge of making landscape form, they should be taught the essential and somewhat amorphous knowledge of how to consult with others who have rigorous knowledge of ecology.

To teach designers to be leaders and expert participants in interdisciplinary work with ecologists, design curricula could include the following experiences for students.

**Discuss places.**

Students can learn how to do this in interdisciplinary discussions about the places they are designing. By discussing both real places and the imaginative speculations of students’ design ideas, ecologists can see new implications of their science and new questions for research. Thinking together about changing landscapes challenges both ecologists and designers by requiring them to take a normative stance, considering what should happen to a real place. By observing a real landscape, ecology and design rather naturally find questions for each other. For example, landscape architects should know how to look at an ecosystem, scanning for plants and animals that belong there. Knowing what should be there allows them to ask questions about anything that looks unfamiliar. For landscape architects to notice ecological patterns with sufficient acuity to formulate good questions for ecologists, they need to learn how to describe the natural world, drawing on morphological taxonomies much as the eighteenth-century naturalists did. Landscape architecture students will not become taxonomists, but engaging taxonomists in discussions of places can help students learn how to form the right questions about what they are observing.

**Discuss pattern and form.**

Ecological processes form landscapes, and design affects ecological function. Design students should use discussions with ecologists to match design intentions with their ecological effects, and to mesh cultural traditions and preferences with their ecological implications. Landscape ecology established and continues to open new ground for discussions of pattern and form because its makes pattern, or landscape structure, a fundamental ecological concept (e.g., Forman and Godron 1985; Dramstad, Olson, and Forman 1996). It enriches designers’ ways of pattern-finding and pattern-making in landscapes at all scales, and it demonstrates the ecological wisdom of the old landscape architecture tradition of working across scales.

**Discuss from the position of culture.**

If curricula teach students to know that their primary responsibility is to be experts about human experience and the cultural construct of nature, and to propose imaginative possible landscapes, designers will have better questions for ecologists, and they will have more to offer in the discussion. Being cultural experts does not mean that designers should not learn about ecology. It means that they should learn the vocabulary of ecological concepts, how to
recognize what belongs in a landscape, how to have a discussion with ecologists, and what they should expect to learn and produce from such a discussion. It also means that design and planning programs should draw deeply from the humanities and social sciences as well as from the design disciplines to give students truly expert understanding of the human experience of landscapes. Design and cultural perceptions of landscape have been integral to landscape ecology for the past twenty years (Nassauer 1995a). Conservation biology and ecosystem management have explicitly incorporated the perceptions of indigenous people (Grumbine 1992) and organizational behavior (Westley 1995) as key aspects of their interdisciplinary knowledge base. Ecological restoration is coming to grips with the necessity of linking the plant ecology of restoration with larger cultural meaning (Jordan 1994). Designers must be prepared to speak with broad knowledge and authority about human experience of landscape.

Respect knowledge and learn skepticism.

Students will be more powerful participants in interdisciplinary discussion if they learn how to respect and borrow from rigor as defined in science. Landscape architecture's drive to invent frequently overwhelms its need to know. Design students should bring more rigorous cultural knowledge to design. Design pedagogy also should clearly articulate an iterative design process that includes intervals for consulting experts in the biophysical sciences (Lyle 1983). Building an interdisciplinary discussion with ecology will require designers to learn to pause long enough to probe, skeptically judge, and learn from ecologists. This pause should allow designers to be equally skeptical of their own assertions about design and culture. To enable designers to compare the answers they receive from ecologists as well as to consider their own knowledge of culture, the working vocabulary of design must be expanded to include such fundamental scientific standards as validity and reliability. Learning from science and from the humanities, landscape architects and planners can adopt a more critical stance from which to judge the ecological and cultural effects of their work.

Exercise caution and humility.

Recently, many ecologists (Holdgate 1995; Holling 1995; Gorham 1997) and even some economists (Hannon 1992) have called for humility and caution not only when people change the landscape, but also when scientists describe it or make predictions about it. There is a growing consensus that a key reason to protect indigenous species and ecosystems is that humans do not know enough about them to calculate the implications of their change or loss. On this point as well as others, designers can learn directly from ecology to be cautious in disturbing ecosystems that are working. Design might also ensue.

lace ecology and learn to be cautious in disturbing settled places and local cultures that are working. Perhaps the burden should be on those who conceive landscape change to know what is not working or may not work in the future before they disturb a system that has sustained itself. Designers and planners can learn from restoration ecology's strategy of emulating indigenous ecosystems; borrowing from the landscape language of local people, using their familiar landscape symbols and aesthetic types, can help designers innovate to achieve larger ecological values in design (Nassauer 1997). Designers should be cautious with culture. Rather than perpetuating professional design culture's congenital infatuation with novelty, design curricula also might teach students the value of respectful observation and a more subtle ingenuity.

Conclusion: Interdisciplinary Practice in Design Education

Design education can articulate a necessary relationship between ecology and design by making consultative interdisciplinary discussions a regular experience for students. Practicing interdisciplinary consultation builds on the core traditions of design and planning without marginalizing ecological knowledge. It makes ecology more than an inspiring acquaintance for design. While it acknowledges the necessity for ecological knowledge of landscapes, consultative discussion recognizes that expert knowledge in design and ecology can rarely be integrated in a single person.

Landscape architecture should change as students regularly practice discussion with ecologists, just as conservation biology, ecosystem management, landscape ecology, and restoration ecology are changing ecology. A curriculum that articulates a necessary relationship with ecology might place ecology students and landscape architecture students in consultation in studio together. It would place landscape architecture students in science courses from which they could learn a morphological vocabulary of landscapes that would enable them to recognize what belongs in urban and indigenous ecosystems and to formulate questions for ecologists about what they notice. It would give landscape architects the knowledge to use rhetoric about nature thoughtfully and ethically, and to respect what they do not know as much as the power of their imaginations.

Finally, a landscape architecture curriculum that builds a clearer relationship with ecology should sharpen not blur students' understanding of design as cultural action. It would require studio pedagogy as well as curricula to underscore designers' obligation to understand the culture that gives landscape meaning and enriches human experience. Designers who can offer more well-founded insights into human experience of the landscape will be
more credible partners in discussion with ecologists, as well as collaborators with other disciplines. A curriculum that advances a necessary relationship between design and ecology might also critically examine the culture of the professions. If designers distinguish the habitual from the essential in their professional cultures, they may be more likely to recognize and create opportunities for growth and change in the professions. Building consultation with ecologists into the design process is such an opportunity.

At a time when people have begun to care that the countryside is shrinking, species are rapidly vanishing, and global climate is changing, the design professions are increasingly recognized for their ability to protect nature in the course of landscape change. Landscape architecture nearly always has claimed to do this and intended to do this. Yet designers have achieved widely varying degrees of success. Often, cultural necessity, described as economic pressures or client desires or the dominance of cars or the limits of codes and ordinances, has been offered as a rationale for ecological compromise. If design curricula recognize the necessary relationship between design and ecology, such compromise often may be replaced by invention of landscapes that meld ecological processes into valued places for human experience. By knowing how to learn about the ecological processes that function in a place, designers will have a stronger basis for invention. By being more firmly rooted in ecological knowledge, designed landscapes can deepen public understanding of nature rather than confuse it with unfounded rhetoric.

By knowing their own responsibility for cultural understanding and landscape innovation, designers will more convincingly prove their own necessity in determining the future of changing landscapes. Landscape change could be the product of discussion that enables both design and ecology to influence the future with more powerful and meaningful effect.

Citations


This chapter presents the framework within which I have organized the teaching of ecological principles to designers, and which I have used for many years to integrate lectures, studios, and research. For more than thirty years, I have been teaching in the Department of Landscape Architecture of the Harvard Graduate School of Design. During this time, I have visited almost all of the landscape programs in North America and Europe, and many in the rest of the world. I certainly comprehend the great variety of institutional settings from which the subject of this book is derived and in which its findings will have influence. I am sure that there is no single and appropriate set of conclusions, and I am absolutely certain that my experiences at Harvard have limits to their transferability. Nonetheless, I hope that my contribution will be of interest, use, and perhaps of influence.

This contribution must be seen in the context of my personal experience. I entered this field from its edge, bringing some ideas, but without substantial prior education or experience in either landscape architecture or ecology. In retrospect, I was fortunate, curious, energetic, somewhat iconoclastic, seriously interested in teaching and a broad range of major environmental issues, and at an institution that valued and supported my personal and academic "research and development." I always had very good students and collaborating faculty. And I learned much of what I now think I know in large part from these other people. In short, I am a consumer of ecology, not a producer.

I appreciate Herbert Simon's (1969) definition of design, and especially when the word "design" is seen as an active verb: