

The Critical Role of Higher Education in Creating a Sustainable Future

Higher education can serve as a model of sustainability by fully integrating all aspects of campus life.

by Anthony D. Cortese

Need for a New Human Perspective

For the first time in history, humans are pervasive and dominant forces in the health and well-being of the earth and its inhabitants. We are the first generation capable of determining the habitability of the planet for humans and other species. The limiting factors for future economic growth are not labor and technology (Hawken 1997). They are, instead, natural capital (the size of the fish stock, not the number and size of the fishing boats) and social capital (the ability to make market corrections and to govern society to achieve health, peace, security, social equity, and stability).

Envisioning a Sustainable Future

Imagine a society in which all present and future humans are healthy and have their basic needs met. What if everyone had fair and equitable access to the Earth's resources, a decent quality of life, and celebrated cultural diversity? Imagine future scientists, engineers, and business people designing technology and economic activities that sustain rather than degrade the natural environment and enhance human health and well-being. Imagine a future where we design our technology inspired by biological models operating on renewable energy. Imagine a future where the concept of waste is eliminated because every waste product is a

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raw material or nutrient for another species or activity or returned into the cycles of nature. Imagine that we are managing human activities in a way that restores and increases the biological diversity and complexity of the ecosystems on which we all depend. By doing so, humans could live off nature's interest, not its capital, for generations to come.

Imagine that all professionals understand their connections to the natural world and to other humans. What if people truly know where products and services come from, know where wastes go, and know the consequences to humans and other living species and how to minimize this ecological footprint (our impact on the Earth)?

The average American does not know that we consume our body weight in solid materials daily. For every 100 pounds of product produced in the United States, we actually move a staggering 3,200 pounds of material and energy, over 94 percent of which goes to waste before we ever see the product or the service (Hawken 1997). Our ecological footprint is largely invisible to most of us. We must make it visible to understand our impact.

Imagine a future in which we have stabilized the population at a level that is within the carrying capacity of Earth's ecosystems because we have increased the education, as well as the social and economic status, of women worldwide. Imagine that we have timely and accurate economic and ecological signals: microeconomic signals for price that reflect the true social and environmental cost to society, macroeconomic indicators that reflect the true well-being of society and the Earth, and ecological signals that we receive in time to prevent or remedy damage to humans or the environment. Current signals are either incomplete, highly inaccurate, lead us to a false sense of security, or are too late to prevent damage.

Now, imagine that all current and future generations are able to pursue meaningful work and have the opportunity to realize their full human potential both personally and socially. Imagine that through our dreaming and doing we have dramatically reduced resource consumption, pollution, and waste. Imagine we have done this in the developed world so that there is opportunity in the developing world and poorer communities within the United States to be healthy and have a decent quality of life. Imagine that communities are strong and vibrant because they celebrate cultural diversity, are designed to encourage collaboration and participation in governance, and emphasize the quality of life over the consumption of stuff. Think of what it could

be like if globalization is humanized to support democracy, human rights, and economic opportunity for everyone.

The vast majority of people would agree with these ideals. So how do we rapidly accelerate these ideas and create this future? We need a fundamental, transformative shift in thinking, values, and action by all of society's leaders and professionals, as well as the general population. To quote Albert Einstein, "The significant problems we face cannot be solved at the same level of thinking we used when we created them" (Calaprice 2000, p. 317).

Higher Education's Role

The change in mind-set necessary to achieve this vision is a sustained, long-term effort to transform education at all levels. Despite the efforts of many individuals and groups within the formal educational system, education for a just and sustainable world is not a high priority. (McIntosh et al. 2001). Indeed, it is the people coming out of the world's best colleges and universities that are leading us down the current unhealthy, inequitable, and unsustainable path. Only a few architecture schools have made sustainable design a foundation of education and practice (Glyphis 2001). The same is true in the education of virtually every intellectual discipline and profession. The greatest evidence of the need to transform education is the state of the world and the tremendous effort being made by thousands of nongovernmental organizations (NGOs) and schools in environmental and sustainability education to "fix" the traditional educational system.

Why is this the case? Several structural aspects of the current system contribute to the problem. Interactions between population, human activities, and the environment and strategies, technologies, and policies for a secure, just, and an environmentally sustainable future are among the most complex and interdependent issues with which society must deal. These issues cross over disciplinary boundaries. Higher education is generally organized into highly specialized areas of knowledge and traditional disciplines. Designing a sustainable human future requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation. Much of higher education stresses individual learning and competition, resulting in professionals who are ill prepared for cooperative efforts. Learning is fragmented, and faculty, responding to long-established incentives (e.g., tenure, research) and professional practices, are often discouraged from extending their work into other disciplines or inviting interdisciplinary collaboration.

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As a result, much higher education curricula tends not to ask students to challenge the following common assumptions:

- Humans are the dominant species and separate from the rest of nature.
- Resources are free and inexhaustible.
- Earth's ecosystems can assimilate all human impacts.
- Technology will solve most of society's problems.
- All human needs and wants can be met through material means.
- Individual success is independent of the health and well-being of communities, cultures, and the life support system.

The kind of education we need begins with the recognition that the crisis of global ecology is first and foremost a crisis of values, ideas, perspectives, and knowledge, which makes it a crisis *of* education, not one *in* education. (Orr 1994, p. 5)

Higher education institutions bear a profound, moral responsibility to increase the awareness, knowledge, skills, and values needed to create a just and sustainable future. Higher education plays a critical but often overlooked role in making this vision a reality. It prepares most of the professionals who develop, lead, manage, teach, work in, and influence society's institutions, including the most basic foundation of K–12 education. Besides training future teachers, higher education strongly influences the learning framework of K–12 education, which is largely geared toward subsequent higher education.

Higher education has unique academic freedom and the critical mass and diversity of skills to develop new ideas, to comment on society and its challenges, and to engage in bold experimentation in sustainable living. Why, then, is it so averse to risk and difficult to change? Because the change sought is a deep cultural shift—the most difficult to achieve—but one of the most important leverage points for institutional transformation (Meadows 1997). Leo Tolstoy provides some insights into the difficulty of relinquishing the inner realities required for such a change:

I know most (people), including those at ease with problems of the greatest complexity, can seldom accept even the simplest and most obvious truth if it would be such as would oblige them to admit the falsity of conclusions which they have delighted in explaining to colleagues, which they have proudly taught others, and which they have woven, thread by thread, into the fabric of their lives. (Bridges 2001, p. 17)

Education for the 21st Century

What if higher education were to take a leadership role, as it did in the space race and the war on cancer, in preparing students and providing the information and knowledge to achieve a just and sustainable society? What would higher education look like? The education of all professionals would reflect a new approach to learning and practice. A college or university would operate as a fully integrated community that models social and biological sustainability itself and in its interdependence with the local, regional, and global communities. In many cases, we think of teaching, research, operations, and relations with local communities as separate activities; they are not (see figure 1).

Because students learn from everything around them, these activities form a complex web of experience and learning (see figure 2).

All parts of the university system are critical to achieving a transformative change that can only occur by connecting

Figure 1 **General Practice of Higher Education**

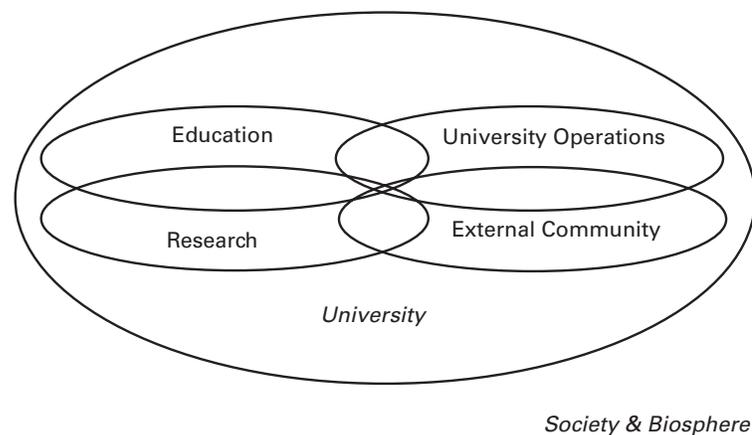
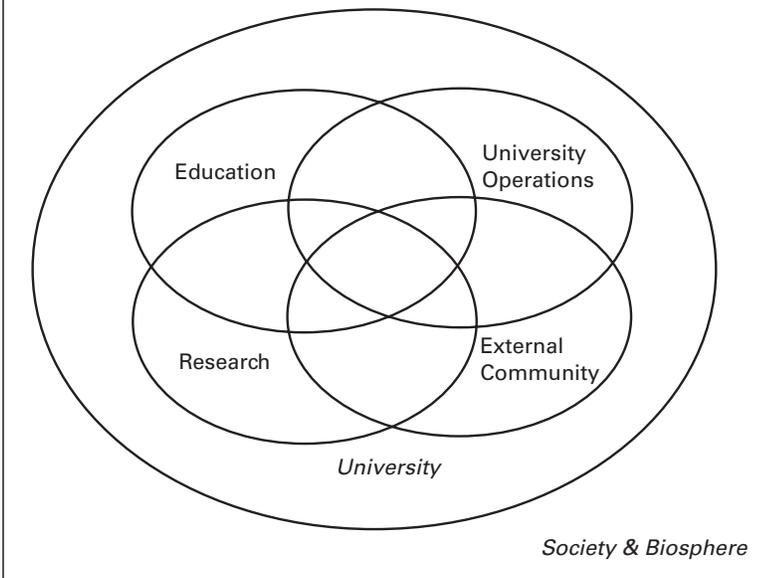


Figure 2 **Higher Education Modeling Sustainability As a Fully Integrated System**



head, heart, and hand. "However well-intentioned, formal education cannot compete with the larger educational effects of highways, shopping malls, supermarkets, urban sprawl, factory farms, agribusiness, huge utilities, multinational corporations, television and non-stop advertising that teaches dominance, speed, accumulation and self-indulgent individualism" (Orr 2002, p. 31). To graduate students who can overcome this larger, pervasive form of learning, the educational experience of graduates must reflect an intimate connection among curriculum and (1) research; (2) understanding and reducing any negative ecological and social footprint of the institution; and (3) working to improve local and regional communities so that they are healthier, more socially vibrant and stable, economically secure, and environmentally sustainable.

Just imagine if, in the 21st century, the educational experience of all students is aligned with the principles of sustainability. To achieve this, the *content of learning* will require interdisciplinary systems thinking, dynamics, and analysis for all majors, disciplines, and professional degrees.

This kind of thinking is critical to addressing environmentally sustainable action on local, regional, and global scales over short, medium, and intergenerational time periods. Education would have the same "lateral rigor" across, as the "vertical rigor" within, the disciplines. Compartmentalized knowledge without connection to larger system interactions results in viewing many interdependent challenges as separate, hierarchical, and

competitive. The net results are often unintended narrow, ineffective solutions, or worse, more harmful to people and the environment in another place or another time. For example, a Toyota Prius is a gasoline-electric hybrid vehicle that uses one-quarter of the gasoline and emits one-eighth of smog-producing emissions of sports utility vehicles and light trucks. Without larger systems thinking, driving a Prius would seem like a good environmental solution. However, it would not reduce traffic. Nationally, vehicle miles of travel have risen 70 percent from 1980 and some recent studies in 68 cities demonstrate that 90 percent of the increased capacity of urban highways is used up within five years (Texas Transportation Institute 2001). Driving a Prius does not reduce noise or safety problems, reduce paving over of green space or sprawl, or help with the social justice problems of poor people without access to jobs in the suburbs and exurbs (areas beyond urban suburbs that are subject to rapid development) that are not served well by public transportation. Indeed, if everyone drove a Prius, many of these problems could be made worse because people would feel they were doing a good thing driving this environmentally friendly car. The larger issue is to think upstream about how to solve all these problems in a systemic way and reduce the need for driving. A better solution provides people access to jobs and activities while minimizing the adverse health, ecological, and social footprint.

Understanding how the natural world works and learning how to have human technology and activity mimic and live within the limits of natural systems are crucial to education for citizenship in the 21st century. Imagine if all students knew how to operate on renewable energy and eliminate the concept of waste by making every waste product a raw material or nutrient for another species or activity or return it into the cycles of nature (McDonough and Braungart 2002). This is part of the concept of *industrial ecology*. In her book *Biomimicry*, Janine Benyus (1997) argues for using nature as mentor, model, and measure, "because animals, plants and microbes are the consummate engineers. They have found out what works, what fits in and what lasts here on Earth. After 3.8 billion years of R&D, failures are fossils, and what surrounds us is the secret to survival" (p. 3).

The content of education will include ways to preserve and restore cultural and biological diversity, both of which are critical to a sustainable future. This will mean learning how

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to live off nature's interest, not its capital (e.g., practicing sustainable agriculture, fishing, forestry).

The *context of learning* will change to make human/environment interdependence, values, and ethics a seamless and central part of teaching of all the disciplines, rather than isolated as a special course or module in programs for specialists. All students will understand that we are an integral part of nature. They will understand the ecological services that are critical for human existence and how to make the ecological and social footprint of human activity visible and as benign as possible (Chambers, Simmons, and Wackernagel 2000; Ryan and Durning 1997). Environmental specialists are necessary but not sufficient. Understanding how to create a just and sustainable society must be a fundamental principle in all education.

The *process of education* will emphasize active, experiential, inquiry-based learning and real-world problem solving on the campus and in the larger community. It is widely known that for long-term retention of knowledge, skills, and values, we retain 80 percent of what we do and only 10 to 20 percent of what we hear or read. For example, as part of the curriculum, the learning experience for students would include working on actual, real-world problems facing their campus, community, government, and industry. The process would also increase group work and learning so graduates will be able to collaborate effectively on complex problems as future managers and leaders.

Higher education would practice sustainability (see figure 2). A campus would practice what it preaches and make sustainability an integral part of operations, planning, facility design, purchasing, and investments and tie these efforts to the formal curriculum. The university is a microcosm of the larger community. Therefore, the manner in which it carries out its daily activities is an important demonstration of ways to achieve environmentally responsible living and to reinforce desired values and behaviors in the whole community. These activities provide unparalleled opportunities for teaching, research, and learning. By focusing on itself, the university can engage students in understanding the "institutional metabolism" of materials, goods, services, and transportation and the ecological and social footprint of all these activities. Students can be made aware of their "ecological address," and they can and would be actively engaged in the practice of environmentally sustainable living. Moreover, this is one of the most effective strategies to build a strong sense of collaboration and community throughout the institution—a long-standing

central goal for college and university administrators and trustees.

Finally, the learning and benefit to society of higher education forming *partnerships with local and regional communities* to help make them socially vibrant, economically secure, and environmentally sustainable will be a crucial part of successful higher education. Colleges and universities have an obligation to support local and regional communities, making every action lead to community improvement. Higher education institutions are anchor institutions for economic development in most of their communities, especially now that the private sector moves facilities, capital, and jobs frequently as mergers, acquisitions, and globalization become the norm for corporations. The 4,100 higher-education institutions in the United States are, themselves, large economic engines with annual operational budgets totaling \$200 billion in 2000, according to *The Chronicle of Higher Education* (2000, p. 7). This is greater than the gross domestic product of all but 25 countries in the world. Higher education's endowment was more than \$200 billion in 2000. Imagine the economic leverage if universities were modeling sustainability by purchasing sustainably preferable products and services and how much greater the benefit could be if they were doing joint purchasing with local communities. Utilizing faculty and students to conduct the research as an integral part of the learning experience would greatly enhance their education and promote a strong sense of connection to and caring for the local communities and to the ecosystems of which they are a part. Moreover, there is a strong movement among college and university presidents, deans, and faculty to promote civic engagement and democratic ideals through active faculty and student involvement (Campus Compact 1999).

Can Higher Education Meet This Challenge?

The issue is not the ability of higher education to take on this challenge; it is the will and the time frame for doing so. Most of the world's major international governmental, scientific, and nongovernmental institutions, as well as many business organizations, agree that the changes needed in individual and collective values and action must occur within the next one to two decades. After all, a child in kindergarten today will graduate from college in 2020. If higher education does not lead the sustainability effort in society, who will?

Fortunately, there are hundreds of examples of changes in all four areas (see figure 2) of higher education activities that shape the total student experience. Many of them are discussed in other articles in this journal. Information about the following examples is available through a number of organizations, including Second Nature (www.secondnature.org), the National Wildlife Federation's Campus Ecology Program (www.nwf.org/campus/ecology), and University Leaders for a Sustainable Future (www.ulsf.org) (Cortese and Benner 2001a, 2001b). The most successful changes are those in which the formal curriculum is an integral part of the other three functions of higher education. Most are driven by faculty and student pressure, but (fortunately) an increasing number are driven by high-level academic administrators and operations executives.

Environmental and sustainability literacy. A faculty coalition at Northern Arizona University has developed a concerted effort to strengthen the sustainability effort on the campus, with the goal of reaching the greatest number of students possible. A five-year faculty development program, called the Ponderosa Project, resulted in 80 faculty members revising 120 courses in most disciplines to make sustainability the context for, or content of, learning. The faculty then made sustainability a key thrust of the liberal studies requirement for all majors. This program is very similar to the faculty development program of the Tufts Environmental Literacy Institute initiated in 1990.

At a workshop for faculty from a consortium of 17 historically black colleges and universities and institutions serving other minorities, representatives from the Chlorine Chemical Council and Greenpeace debated the use of

chlorine compounds in society. After a brief question and answer period, participants were given sufficient time to individually brainstorm how they could incorporate the chlorine controversy into classes that they were currently teaching. They then went back to their campuses and made significant course revisions. Figure 3 identifies some of the courses and areas of the college in which this issue could be successfully engaged.

Curriculum incorporating environmentally sustainable design on campuses. Through the Green Design Initiative, Carnegie Mellon University intends to reach students at many levels: high school through graduate and lifelong learning. The university has developed the Environment Across the Curriculum Program that offers all Carnegie Mellon students a basic introduction to environmental issues. Undergraduate and graduate students at Carnegie Mellon are offered elective courses that provide a deeper understanding of scientific, engineering, economic, social, and policy issues relating to the environment. Furthermore, special opportunities exist for talented undergraduates to work with faculty and graduate students on Green Design research projects.

Under the direction of David Orr, Oberlin College has designed the Adam Joseph Lewis Center for Environmental Studies, one of the most environmentally sustainable buildings at any university. This building

- utilizes natural light extensively,
- did not use any known toxic building materials in its construction,
- is completely solar-powered and will eventually provide excess energy for the campus,

Figure 3 **Historically Black Colleges and Universities/Minority Institutions Consortium Curricula**

- | | | |
|--|---|---|
| • Personnel Administration
<i>Tuskegee University</i> | • International Relations
<i>Clark Atlanta University</i> | • Chemical Engineering
<i>Hampton University</i> |
| • Critical Reading and Writing
<i>Northern Arizona University</i> | • Environmental Economics
<i>Tuskegee University</i> | • Chemical Engineering Seminar
<i>Hampton University</i> |
| • Introduction to Linguistics
<i>Northern Arizona University</i> | • Materials Science
<i>Florida International University</i> | • Environmental Analytical Chemistry
<i>Hampton University</i> |
| • Introduction to Sociology
<i>Xavier University</i> | • Enviro-toxicology I and II
<i>Florida A&M University</i> | • Clinical Chemistry
<i>Xavier University</i> |
| • American Government
<i>Clark Atlanta University</i> | • General Chemistry
<i>Tuskegee University</i> | • Ecology
<i>Howard University</i> |

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- causes no air pollution,
- has effluent water that meets U.S. Environmental Protection Agency standards for drinking water quality,
- has grounds that were landscaped in a manner that would utilize native species of plants and promote biological diversity.

For more than five years, 250 students were involved in every aspect of the planning and design of the building and interacted with dozens of different design professionals and vendors in the Oberlin town community. This was done through a class specifically developed for this purpose.

Curriculum involving improvement in local communities. Unity College, a small, private, liberal arts college in Unity, Maine, has developed an entire curriculum around the study of one beloved place: Lake Winnecook. The Unity community was concerned about the water quality of the lake. The college's community service office took the lead in creating a cross-disciplinary program that involves courses and students from all areas of the college as well as community members and organizations. Each of the courses listed in figure 4 participates in the project, integrating the study and concern for the lake into course themes. Students learn about the local community, their ecological address, and how human activities are interdependent with the rest of nature. They also develop skills for engaging in sustainable living.

Expanding and improving architectural education. In August 2001, the deans and faculty of several prestigious architectural schools; some of the country's leading architects; and representatives from all architectural professional and accreditation organizations, well-respected NGOs, and charitable foundations convened at the Wingspread

Conference Center in Racine, Wisconsin. The 38 participants focused on sustainable design in architectural education and practice, given the large impact of the built environment on humans and the natural world and estimates that the built environment will double in size in the coming decades. Their recommendations call for several changes in architectural education and practice including:

- An expanded role for architects as design team leaders involving a wide range of design professionals, property owners, and building inhabitants and residents from the surrounding community in the earliest stages of planning and design as well as through the design and construction process
- Practicing sustainable design for community, landscape, and building design (including understanding the local and regional environmental contexts; the complex network and impact of materials and construction; and the cultural, social, and economic contexts)
- A broad-based effort to make sustainable design a core part of all architectural education in the next decade (Glyphis 2001)

Several organizations involved in the conference are now involved in planning for and implementing several of the conference proceedings.

The Implications for College and University Planners

This kind of broad transformative change and leadership in higher education has large implications for college and university planners. Taking the educational experience from a theoretical to a practical level will have an impact on the

Figure 4 **Unity College Curricula**

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|---------------------------|--------------------------------------|----------------------------------|
| • Introduction to Drama | • Advanced Oral Communications | • Instruction and Evaluation |
| • Biology II | • Composition II | • Land and Water Law |
| • Environmental Pollution | • Introduction to Aerial Photography | • Introduction to Interpretation |
| • Freshwater Ecology | • Geology of Environmental Problems | • Advanced Interpretation |
| • Ichthyology | • Environmental History of the World | • Fisheries Science |
| • Microbiology | • Great Issues in World Civilization | • North American Wildlife |
| • Analytical Chemistry | | • Statistics I |
| • Environmental Education | | • Statistics II |

way the academy will interact with the external community. This shift will certainly affect the leaders who are necessarily the most interdisciplinary and long-range thinking and connected to the decision-making structure of higher education. College and university planners have the unique ability and unprecedented responsibility to help higher education fulfill its responsibility to create a healthy, just, and sustainable world. Planners will be important in making colleges and universities “learning organizations” (Orr 2002, p. 31). Planners must focus as much on the education and research being done in higher education as on the physical, operational, and external community functions of the university and do so in an integrated, interdependent manner. This is profound. I believe that a college or university that models sustainability in all its operational functions and actions to collaborate with local and regional communities but does not involve the faculty and students as an integral part of the educational process will lose 75 percent of the value of its efforts and cannot fulfill its role in society.

Planners must be able to understand and articulate the necessity and advantages of higher education institutions being leaders in creating a sustainable society to a wide variety of stakeholders. These include internal decision makers and other stakeholders (e.g., faculty, operational personnel, students) and external stakeholders (e.g., parents, alumni, local and regional communities, future employers, funders of education and research, and accreditation organizations). Following are some of the important advantages:

- Improved learning for all—inside and outside higher education
- Students prepared for citizenship and career
- Increased external respect
- Attraction of students, faculty, and funding
- Reduced economic, social, and environmental costs
- Cooperation and satisfaction across the university
- Fulfillment of higher education’s moral and social responsibilities

We know the steps. If we are willing, this future is possible. Through our imagination, the Society for College and University Planning can become a critical linchpin in making sustainability a foundation of all higher education and practice. ❧

References

- Benyus, J. 1997. *Biomimicry: Innovation Inspired by Nature*. New York: William Morrow.
- Bridges, W. 2001. *The Way of Transitions*. Cambridge, Mass.: Perseus Publishing.
- Calaprice, A., ed. 2000. *The Expanded Quotable Einstein*. Princeton: Princeton University Press.
- Campus Compact. 1999. Presidents’ Fourth of July Declaration on the Civic Responsibility of Higher Education. Retrieved December 1, 2002, from the World Wide Web: www.compact.org/presidential/plc/plc-declaration.html.
- Chambers, N., C. Simmons, and M. Wackernagel. 2000. *Sharing Nature’s Interest: Ecological Footprints as an Indicator of Sustainability*. Sterling, Va.: Earthscan Publications, Ltd.
- Chronicle of Higher Education. 2000. The Chronicle Almanac 2000–01. *Chronicle of Higher Education*, 1 September.
- Cortese, A., and J. Benner. 2001a. *Education for Sustainability: Content, Context, and Process of Learning and Research*. Retrieved November 30, 2002, from the World Wide Web: www.secondnature.org/history/history_writings.html (see “Fact sheets”).
- . 2001b. *University Modelling Sustainability as an Institution*. Retrieved November 30, 2002, from the World Wide Web: www.secondnature.org/history/history_writings.html (see “Fact sheets”).
- Glyphis, J., ed. 2001. How Can the Architect Contribute to a Sustainable World? Proceedings of the Wingspread Conference, 24–26 August, Racine, Wis. Retrieved November 30, 2002, from the World Wide Web: www.secondnature.org/pdf/snwritings/proceedings/wingspread.pdf.
- Hawken, P. 1997. Natural Capitalism. *Mother Jones*, March/April, 40–53.
- McDonough, W., and M. Braungart. 2002. *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point.
- McIntosh, M., K. Cacciola, S. Clermont, and J. Keniry. 2001. *State of the Campus Environment: A National Report Card on Environmental Performance and Sustainability in Higher Education*. Reston, Va.: National Wildlife Federation. Retrieved December 1, 2002, from the World Wide Web: www.nwf.org/campusecology/stateofthecampusenvironment.cfm.
- Meadows, D. 1997. Places to Intervene in a System. *Whole Earth* 91: 78–84.
- Orr, D. 2002. *The Nature of Design: Ecology, Culture, and Human Intention*. New York: Oxford University Press.
- . 1994. *Earth in Mind: On Education, Environment, and the Human Prospect*. Washington, D.C.: Island Press.
- Ryan, J., and A. Durning. 1997. *Stuff: The Secret Life of Everyday Things*. Seattle, Wash.: Northwest Environment Watch.
- Texas Transportation Institute. 2001. 2001 Urban Mobility Study. Retrieved November 30, 2002, from the World Wide Web: mobility.tamu.edu/ums/2001.