



Our Place

Community ecodesign for the Great White North means re-integrating local culture and nature

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Many people think of the suburbs as an inexpensive alternative to downtown living. But sprawl is very costly – in time, money, energy, land and other resources.

"We live in two interpenetrating worlds. The first is the living world, which has been forged in an evolutionary crucible over a period of four billion years. The second is the world of roads and cities, farms and artifacts that people have been designing for themselves over the last few millennia. The condition that threatens both worlds – unsustainability – results from a lack of integration between them."

– Sim Van der Ryn and Stuart Cowan, 1996¹

"It's been snowing in Toronto for 10,000 years. Deal with it."

– Running shoe advertisement, Toronto, 1998

THINK OF AN IMAGE that typifies the Canadian city. You may picture in your mind's eye the colourful wooden houses of the Maritimes, the duplexes and triplexes of urban neighbourhoods in Quebec city and Montreal, or the tree-lined streets of Edwardian box-houses in Toronto. But the reality is that these images belong to a bygone age. Since WWII, if anything typifies the way we build our cities, it is the amorphous urban form we uneasily refer to as "suburbia". Too low in density to be called cities, but too built-up to be considered rural, these ambiguous landscapes sprawl outwards from older, more compact urban centres.

As you cross the transition zone from the older city to suburbia, store-fronted mainstreets give way to shopping malls and "big-box" retail chains. The bustling marketplace is replaced by the oxymoronic "bedroom community", and street design starts to favour cars rather than people.

Suburban sprawl is easy to recognize because it uses a highly stan-

standardized set of urban design templates. These include tracts of single-family housing, offset by the occasional block of rental apartments; shopping malls floating in seas of parking; factories and office parks; places of learning, and worship and leisure. And roads. Big, long, straight roads designed for going long distances at high speeds contrast with the shorter, looping roads in residential areas, many of which are cul-de-sacs.

Sprawl can also be defined as development that does little, if anything, to respond to its unique natural and cultural context. More often than not, sprawl replaces the diversity of nature and culture with its own homogeneous form. Although plant materials are added as landscaping elements, they amount to little more than "greenwash". Non-native plant spe-

cies, in the form of sterile lawns, are introduced as decoration. Nature, as complex, diverse and uncertain ecosystems, is something foreign to be kept at bay "somewhere out there."²

Many people think of a place in the suburbs as an inexpensive alternative to downtown living. But in fact, sprawl is very expensive – in time, money, energy, land, and other resources. In a sprawled community, driving is the only effective way to get around to accomplish daily tasks such as going to school, getting to work, or going for piano lessons. Suburbanites are dependent on their cars, which are a major source of environmental degradation: from the energy and materials that go into building them, and the fuel required to run them, to the time spent driving them and the wastes they emit – including air pollu-

John Todd's Miniature Ecosystems

The conventional flush of a toilet is a simple act with complex ecological repercussions. If you – like many Canadians – are connected to a municipal sewage system, your "flush" will travel through an elaborate system of underground pipes and end up in a centralized treatment facility, where it may be bombarded with a battery of toxic chemicals, then separated into a water effluent and "sludge".

The liquid will be discharged to a local surface water body, and the sludge will often be incinerated (as it is in Toronto and Montreal) and the residual toxic ash will be buried in a landfill site. This sounds bad, but it could be worse. If you live near an ocean, your sewage might be unceremoniously dumped into the sea, more or less as is.

Quite aside from doubts that transporting sewage in very expensive underground infrastructure is a wise use of public resources, this system clearly has serious ecological downsides.

Redesigning wastewater treatment systems has been the life work of Dr. John Todd, an ex-pat Canadian biologist living in Burlington, Vermont. There he runs the Center for Restorative Waters at Ocean Arks International, a nonprofit organization leading the way in designing ecological systems that carry out work for society in partnership with nature.

"The challenge of the 21st century is to right the wrongs of the 20th Century," says Todd. "This will require, at a minimum, a

design revolution. Where do we go to get the instructions for this design revolution? I think we need to turn to the 3.5 billion-year experiment that produced life."

Since the early 1980s, Todd has been developing living machines (patented in Canada as Solar Aquatics) that use solar energy and a panoply of organisms (plants, bacteria, mollusks and fish) to purify sewage or clean up contaminated water bodies.

The system is odourless, quiet and typically housed in a greenhouse to take advantage of solar energy. From the outside it looks like your average garden greenhouse.

By passing sewage through a number of different miniature ecosystems (each in a separate containment unit), living machines are able to reduce all contaminants typically regulated by health agencies to levels comparable or better than what is produced by the best conventional municipal wastewater treatment. In fact, the effluent from a living machine is considered by some to be clean enough to drink, although most people's commitment to "recycling" stops short of consuming purified sewage water.

Living machines are not only highly efficient and sustainable, but also extremely flexible – they can be used at the level of a single building or at the community scale.

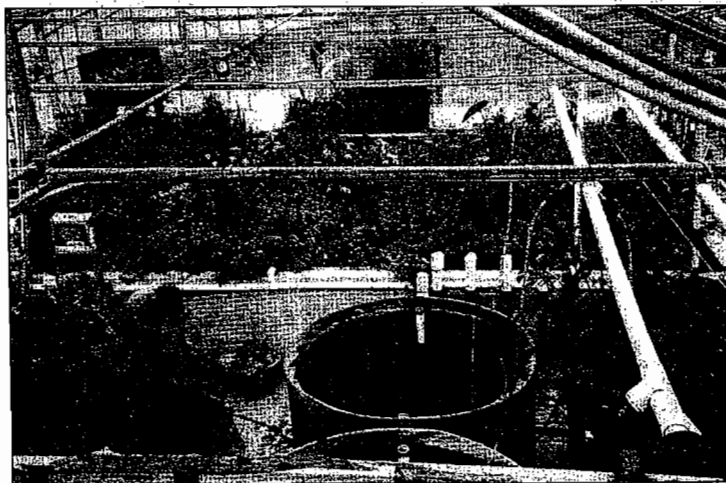
At the building level, the Body Shop in Toronto uses a living machine system to treat its production wastewater. So does the Boyne River School, about 100 km north of Toronto, where children from inner city neighbourhoods spend a few weeks studying Native American culture and natural history.

The first living machine in Canada for treating sewage on a community level was installed in Bear River, Nova Scotia, in 1995. The plant was initially designed to handle 100 homes in this small coastal community and releases exceedingly clean effluent to the bay. Bear River residents have been enthusiastic advocates of the system and its effectiveness.

Many of our conventional technologies perform important tasks for human society but are detrimental to the earth's ecosystems. Eco-technologies are being designed, grown or constructed, and implemented to offer a more sustainable solution.

As Todd puts it, "This work on ecological design has convinced me that it's possible to create a culture, as many cultures have before us, where wilderness permeates into every place and there's harmony with the natural world." ■

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Bear River Solar Aquatics Facility: The first solar aquatics system in Canada, Bear River, NS, has won three international innovation awards. The plant has the capacity to treat 68,000 litres of sewage per day.



Home away from Home: rescued from demolition, this heritage farmhouse must be moved away to make space for Home Depot and Walmart's customer parking. Big Box retail chains are a prime feature of suburban sprawl.

tion and greenhouse gases.

In recent years, an overwhelming volume of evidence from many disciplines has led to a long-overdue acknowledgement by academics, professionals, and lay-people alike that this model of Canadian urban form is not sustainable. The indicators are hard to miss – for example, the rate of destruction of natural ecosystems and fertile farmlands; the lengthening commute time in most cities; the fiscal crisis facing many cities; and the perpetual lack of affordable housing. It is beginning to be understood that these problems are intertwined, and that they tend to aggravate one another in a vicious circle. Simply put, there is a growing consensus that the ways in which we plan, design and manage urban development are causing more problems than they solve. In response, the concept of ecological design is emerging.

ECOLOGICAL DESIGN

"Design" is a complex concept, bridging the artistic and the scientific domains. It can be seen as any purposeful change to the face of the earth, or in the words of Sim Van der Ryn and Stuart Cowan, "the intentional shaping of matter, energy, and process to meet a perceived need or desire." The word "ecology" (like "economy") derives from the Greek term for household (from *oikos* for house). Linking these concepts, Van der Ryn and Cowan use the metaphor of a hinge connecting culture and nature and explain ecological design as "the effective *adaptation to* and *integration with* nature's processes." In this sense, ecological design is the problem-solving process of connecting nature's household (the natural environment) to that of humankind (the sociocultural environment) in such a way that our mutual interdependence is at once honoured and embraced. Implicit in this approach is the need to reconnect our communities with natural processes: to "come home" to the natural environment through the creation of meaningful places by re-integrating culture and nature.

Ecological design must respect many important factors, including topography, vegetation, wildlife, cultural histories, and so on. But in the Canadian

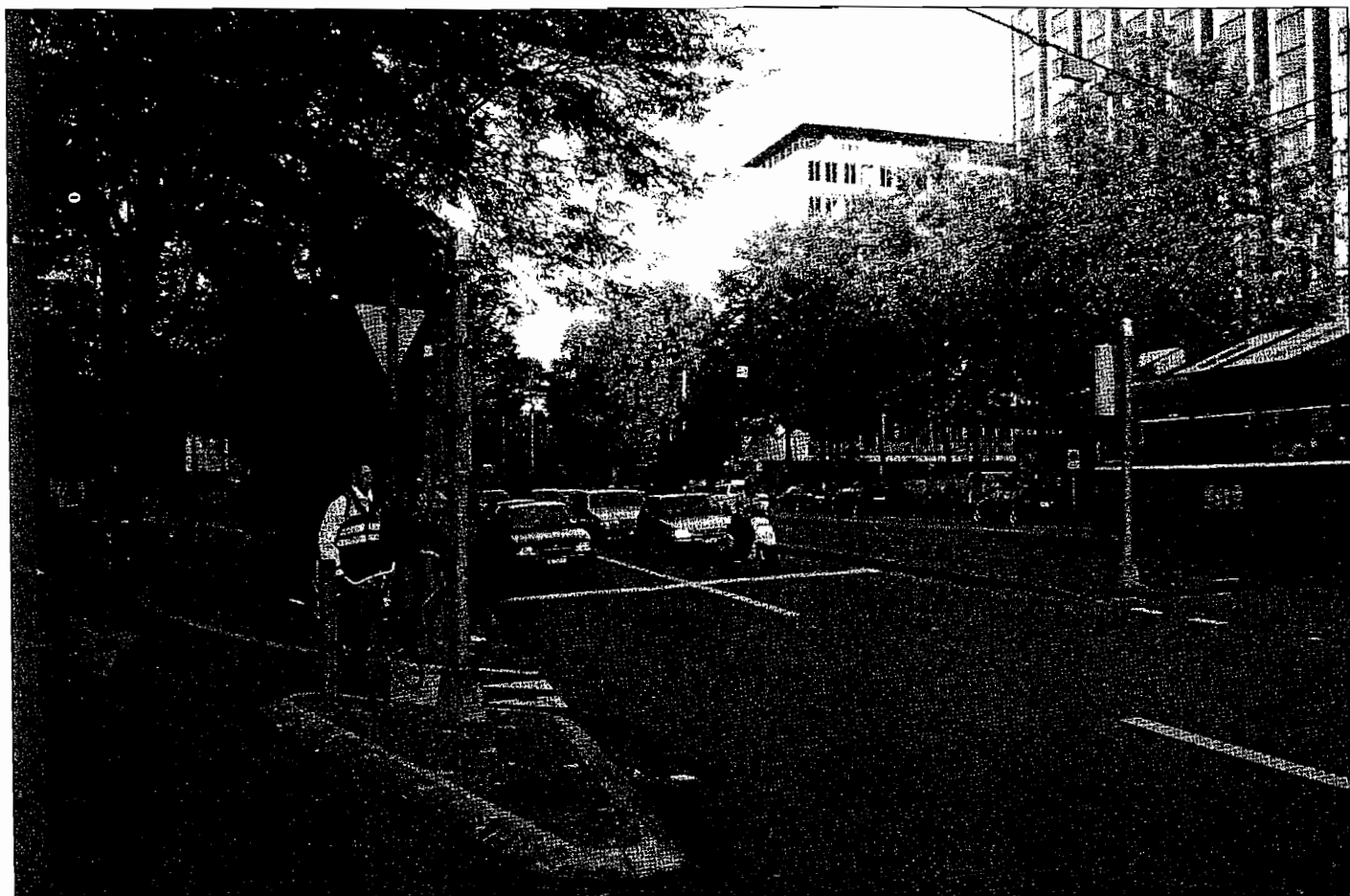
context, the one factor that stands out is the perennial reality of our harsh winters. The poet Gilles Vigneault expressed this elegantly when he wrote, "Mon pays, ce n'est pas un pays, c'est l'hiver." Although we tend to deny it, the fact remains that the cold season lasts four to eight months, albeit with conditions that vary from coast to coast. Vancouver has a cold, dismal rain; Calgary, Edmonton, Saskatoon, and Winnipeg experience bone-chilling deep freezes; Toronto, Ottawa, Montréal and Québec City are blanketed in wet snow and freezing rain; and Maritime cities experience a range of cold winds, rain and fog.

These climatic factors create unique constraints and opportunities for urban form that are not experienced in warmer climes. For example, statistical data confirm that many physical and mental disorders have roots in environmental stressors that dominate during the cold season. Depression, hostility, violence, alcoholism and suicide have all been noted to increase in winter.³

As Canadians, we sadly have a poor track record of dealing with these perennial environmental factors in a constructive – let alone creative – manner. Consider the housing found in most of our communities. Structures are situated without regard to solar exposure – windows and doors face in all directions, often directly into the prevailing winter winds. On the west coast, for example, the developers' building façade of choice is often a pastel-stucco, better suited to a Mediterranean villa than to a structure in the temperate coastal rainforest. In the east, typical landscape plantings are limited to manicured lawns and ornamental deciduous trees, planted lollipop-style and providing almost no wind buffering.

In contrast, most enduring cultures have adapted to the peculiarities of their local climate. Think of the quintessential Alpine village: the dark-coloured houses are clustered on the sunny, south-facing hillside to maximize exposure to the sun and turn their backs on the cold winter winds. Their large roofs shed snow but allow the sun to warm the house interiors in winter when the sun follows a lower path in the sky. Inuit igloos are a similar (if stereotypical) example of responding creatively to climate. We can even find evidence of this responsive approach in the *maison canadienne*, a northern French house type with porches (or "snow galleries") added to reduce the

Promoting the notion of the environment as "home" means that housing and community must heighten awareness of the natural processes that sustain life.



The Aeschengraben – an urban boulevard built where the Basel, Switzerland, city walls once stood – is a complex and diverse example of ecological design. Private vehicular traffic is balanced with other modes. Cyclists have a separate roadway with their own stoplights, while a tram runs along a greenway, which reduces water runoff and noise, and is nicer to look at than asphalt or concrete. Gardens and trees green the streetscape that is both a compact and human-scaled urban form.

need to shovel in the very snowy winters of Nouvelle France.

Somewhere along the line, we lost the art and science of designing our communities in response to their natural and cultural contexts. As Canadians, we ought to develop innovative, intelligent, responsive strategies to help offset the stresses of winter. The architect Ralph Erskine eloquently expressed the importance of doing so over 30 years ago:

Here houses and towns should open like flowers to the sun of spring and summer but, also like flowers, turn their backs on the shadows and the cold northern winds, offering sun-warmth and wind-protection to their terraces, gardens and streets.⁴

Recognizing this catalyst for ecological design, we must explicitly acknowledge and actually design *within* (rather than in spite of) the Canadian climate. Our communities would better reflect their local context and help create a collective sense of meaning and understanding of place. A greater awareness of local context, inspired largely by seasonal rhythms and climate, might begin to foster in our communities the ecological literacy that is a fundamental prerequisite for long-term sustainability.⁵

So how can we move forward in redesigning our

communities? We suggest several principles for ecological design in the Great White North.

ECODESIGN FOR THE COLD

Ecological design can be applied at several scales. It is most often applied to individual buildings in the form of architectural treatments and technologies, but rarely to whole communities through proactive planning policies and design guidelines. Plenty of strategies and associated technologies already exist at the building scale. The Toronto Healthy House, for example, is a recent demonstration project that showcases many ecological design ideas.⁶ Individual technologies such as green roofs, vertical gardens, and solar aquatic wastewater treatments are well-known applications with many demonstration projects (see “Gardens Overhead” on page 16 and “John Todd’s Miniature Ecosystems” on page 26). In contrast, with the exception of eco-villages (“Ecovillage Network of Canada” on page 40), *community* redesign tends to be neglected in theory and practice.

Translating the concept of ecological design into principles for community redesign cannot aim for fixed guidelines. What we need is a set of flexible, value-explicit principles that can help guide those involved in community design, depending on the situation and context. We suggest three overarching goals: *conservation*, *integration* and *diversification*.

If sprawl is about wasteful consumption (of land, energy, time, etc.), ecological design first and foremost entails the *conservation* of the resources of

Most enduring cultures have adapted to the peculiarities of their local climate.

nature's household. This is rooted in Aldo Leopold's notion of stewardship, or "living lightly on the land." For example, one important principle is to preserve and take advantage of existing native (locally adapted and hardy) vegetation, and to make use of indigenous species when replanting. Also important is the conservation of land – encouraging urban form that is compact enough to enable co-operative strategies. This might include the sharing of buildings by a number of users for a variety of compatible purposes (see "Shared Space" on page 33). Finally, we need to encourage the spread of green urban infrastructure and municipal services, like district heating through, for example, wind and solar power co-operatives, recycling and reuse strategies, and improved mass public transportation.

The ecological design process requires that new elements be *integrated* into existing natural and cultural contexts, rather than ignoring them and, ultimately, being imposed on them. New development should occur where the landscape, climate, and ease of access make it most feasible. This calls for an ecosystem perspective, in which complex interconnections within and among cultural and natural systems are understood and made explicit. It thus entails an inventory of existing natural and cultural constraints and opportunities and their interconnections. Promoting the notion of the environment as "home" means that housing and community must heighten awareness of the natural processes that sustain life. In this way, we ensure that redesign fits into the local context, both culturally and naturally.

Examples of integration include taking natural features (topography, trees and vegetation) into account when designing new communities. These features must be studied and understood with regard to the perennial realities of weather conditions so as to create favourable microclimates through design. For example, structures ought to be strategically placed to maximize their southerly aspect for passive solar gain in winter. Special attention must be paid to the transition from indoor to outdoor settings (through

the use of porches, galleries, and deciduous vegetation, which acts as screening for summer heat yet allows warming sunlight to enter in winter).

Integration can also be achieved by accommodating population growth in already-developed areas rather than imposing it on the agricultural and habitat lands at the sprawling edge of the city. Thus, ecological design encourages the redevelopment of urban areas such as abandoned industrial sites downtown (see "The Best so Far" on page 10), the renovation and re-use of older buildings (see "Retrofitting Fredensgade" on page 31), and the retrofitting of existing suburbs (see "Retrofitting Suburbia" on page 19).⁷

Community *diversity* is also crucial. This refers not only to the physical and aesthetic aspects of built form, but also to a myriad of other characteristics, such as including a mix of land uses and tenures, and designing for residents from different cultures and income levels. Ideally, we seek to achieve a degree of small-scale intricacy or complexity, a *fine-grained* settlement form (rather than the *coarse-grained* nature of sprawl).⁸

Two important traits can be seen in complex and diverse communities. These are what biologists sometimes refer to as *redundancies* (a variety of systems all performing similar functions) and *resilience* (the ability to adapt successfully to changing conditions).⁹ For example, a wide variety of viable transportation modes is a redundancy that characterizes healthy communities, giving residents the options of walking, cycling or using public transit, instead of relying solely on the private automobile. Another important diversification strategy is to mix activity spaces at a fine scale, such as mixing different housing types and tenures on the same street (see "Life With Less Sprawl" on page 24).

WHERE TO GO FROM HERE

In order to halt the destructive spread of urban sprawl, we need to understand *why* it takes place, and why it is difficult to change. First of all, we must recognize that sprawl appeases many immediate needs and wants of the Canadian homeowner, such as the desire for privacy and the symbolic importance of having a detached house. In addition, much of the Canadian economy is structurally dependent on the automobile industry – for instance, one in six workers in the Greater Toronto Area is directly or indirectly in its employ.¹⁰ Sprawl can thus be seen as a function of the value systems and contemporary economic structure of Canadian communities. Redesign requires dealing constructively with these factors.

But change in the form and fabric of our communities tends to be perceived negatively by many of the key stakeholders. Homeowners dread neighbourhood changes that might disturb local property values. Banks are loath to finance projects by creative developers offering to build communities for which there is no well-established market niche. Municipal planning and engineering departments fear the legal and technical implications of deviating from existing norms in community design.

Much of the resistance to change in Canada is due to ignorance: Canadians are simply unaware that al-

RÉSUMÉ

DEPUIS LES ANNÉES quarante, les collectivités canadiennes sont plutôt caractérisées par l'étalement urbain conçu pour la voiture. La diversité et la richesse de nos paysages sont trop souvent remplacées par une forme urbaine homogène, détachée de son contexte naturel et culturel. Cet article prend position en faveur d'une profonde transformation des processus de développement urbain. On doit trouver une nouvelle approche pouvant répondre aux pressions écologiques, économiques et sociales. L'article propose comme instrument pouvant rétablir les liens entre culture et nature, un design écologique adapté au climat nordique canadien. Trois principes de base, pouvant guider la réutilisation des espaces urbains, sont suggérés: la conservation, l'intégration et la diversification. La mise en place de mesures s'inspirant de ces principes sera cependant confrontée aux valeurs prédominantes et à l'ignorance du public. Certaines conditions peuvent s'avérer propices aux changements souhaités. Il s'agit d'une meilleure compréhension de l'étalement, une éducation du public, des projets pilotes de grande échelle et une transformation de la structure démographique du Canada. Bien que l'adoption des principes de design écologique se fera difficilement dans les collectivités canadiennes, elle devra se produire afin que nous vivions avec la nature plutôt que malgré elle.

ternatives exist, like the compact, diverse, integrated communities now being constructed in places such as Denmark and Sweden (which share similar climatic and ecological conditions with Canada).

Change is possible, however, through strategic interventions that build confidence in new ways of doing things. There is no better place to begin educating for sustainability than in our schools – both figuratively in terms of curriculum, and literally in terms of the physical building and site itself. By designing innovative schools that are explicitly environment-centred – from the building materials to the site plan – we can literally use the concept of redesign to “teach by example” (see the “Greening the Ivory Tower” on page 34).

More broadly, if the general public were able to see and experience an ecologically designed community, resistance to change could be softened. A wide variety of prototype and demonstration projects already exist across Canada, but they are often poorly publicized outside the design professions (several such projects are profiled in this issue). In contrast, ecological design has been brought into the mainstream of community development in Denmark and Sweden, for example, through the use of large-scale demonstration projects intended for the general public to see and experience firsthand.¹¹

Involving citizens in the visioning and planning processes that go into redesigning our communities also helps build positive understanding. Through direct involvement, people will become more aware of the importance of ecological design principles and the advantages of more compact urban form. Perhaps more importantly, when citizens are meaningfully involved in the design process, they tend to take ownership of the product over the long term.¹²

Demographic changes also favour innovations in community design. As the huge population bulge of baby boomers grows old, many will seek alternative housing arrangements from our sprawling suburban norm, especially if they are unable to drive. Winter in a sprawling community is particularly unkind to the elderly, whose daily activities may become impossible when deep snow, slippery ice and high winds prevail. Many aging residents want to stay in the communities where they have lived and will be able to do so comfortably only if we redesign existing residential areas according to ecological design principles.

It seems clear that significant change to the urban form of Canadian communities will be necessary in

coming decades. The devastating social, ecological and financial impacts visited on us by recent floods and major storms are highlighting the need to make the connections between climate change and the energy-intensive way we build and run our cities.¹³

Because sprawl is now so well established as the norm in Canadian communities, adopting ecological design principles will entail major changes. The transformation will inevitably be gradual but the promised benefits are great. Here in the Great White North, paying attention to the environment and learning how to fit in comfortably has always been a good idea. Combining this traditional wisdom with new means of ecological community redesign should open many positive opportunities for urbanites who want to dwell within nature, rather than in spite of it. ■

NOTES

¹ S. Van der Ryn and S. Cowan, *Ecological Design* (Washington, DC: Island Press, 1996), p. 17.

² See R.D. Bixler and M.F. Floyd, “Nature Is Scary, Disgusting, and Uncomfortable,” *Environment and Behaviour* 29:4 (1997), pp. 443-67.

³ Some important Canadian contributions to this growing literature include V. Matus, *Design for Northern Climates: Cold-Climate Planning and Environmental Design* (New York: Van Nostrand Reinhold, 1988); N. Pressman, *Northern Cityscape: Linking Design to Climate* (Yellowknife: Winter Cities Association, 1995); and H. Strub, *Bare Poles: Building Design for High Latitudes* (Ottawa: Carleton University Press, 1996).

⁴ Quoted in P. Collymore, *The Architecture of Ralph Erskine* (London: Academy Editions, 1994), p. 26.

⁵ D. Orr, *Ecological Literacy: Education and the Transition to a Post-Modern World* (New York: SUNY Press, 1994).

⁶ See also Ontario Association of Architects, *Canadian Eco-Architecture* 4 (Toronto: OAA, 1998).

⁷ One such initiative is currently underway at the École d'architecture at Université Laval in Quebec City, where an interdisciplinary research team is “revisiting” five aging post-war suburban communities with a view to their redevelopment for long-term viability.

⁸ See K. Lynch, *Good City Form* (Cambridge, Massachusetts: MIT Press, 1981).

⁹ Redundancy is discussed by J. & N. Todd in *Tomorrow Is Our Permanent Address* (San Francisco: Sierra Club Books, 1981), and by Y. Baskin in *The Work of Nature: How the Diversity of Life Sustains Us* (Washington, DC: Island Press, 1994). The concept of resilience is central to a new understanding of living systems, and as such, is the basis for the emerging theory and practice of adaptive management – see N.M. Lister and J.J. Kay, “Celebrating Diversity: Adaptive Planning for Biodiversity,” in *Biodiversity in Canada: Ecology, Ideas, and Action*, S. Bocking, ed. (Toronto: Broadview Press, 1999).

¹⁰ T. Van Alphen, “How Auto Industry Drives Toronto,” *The Toronto Star* (February 14, 1998).

¹¹ See *Canadian Eco-Architecture* [note 6]; W.T. Perks and D. Van Vliet, *Assessment of Built Projects for Sustainable Communities* (Ottawa: Canada Mortgage and Housing Corporation, 1993).

¹² Our experience corroborates growing anecdotal evidence suggesting that citizen involvement in design processes results in community stewardship of finished projects. For example, in schools that have undertaken community-based design processes, there tend to be lower rates of vandalism.

¹³ See P. Robinson, *Canadian Municipal Response to Climate Change: A Framework for Analyzing Barriers* (University of Toronto, Department of Geography, doctoral dissertation, 2000).