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## Anatomy of a failed sustainability initiative: government and community resistance to sustainable landscaping in a Canadian city

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This article presents a case study of a “failed” sustainability initiative to establish sustainable landscaping demonstration sites in a northern, resource-dependent Canadian community. This failure is attributable to fears by municipal staff regarding public acceptance of landscaping alternatives and, in consequence, partial and ever-changing levels of support for the project. The outcomes suggest several lessons for achieving success in sustainability initiatives, including ensuring education for all parties, establishing and maintaining mutual commitments, and overt planning for potential negative public response.

KEYWORDS: landscape planning, public lands, public opinion, attitudes, case studies, cooperation

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### Introduction

In 2004, researchers from the University of Northern British Columbia (UNBC) developed a collaborative research project in cooperation with the municipal government of Prince George, British Columbia, to explore more sustainable options for landscaping public lands that would reflect the demands of a northern climate. This project became the Prince George Northern Sustainable Landscape Initiative (SLI).

At the beginning of this project, Prince George’s municipal government had some pre-existing interest in moving toward sustainable practices in its operations, including landscaping in public areas, but had made only preliminary starts. One of the key research questions we investigated was the potential attitudes of Prince George community members toward the introduction of sustainable landscaping initiatives. Two considerations triggered this question. The first is that a significant percentage of landscaping resources (e.g., water, mowing, pesticide, and fertilizer) are used on private property. To change community practices, one would need to ensure community acceptance in private spaces. Public landscaping that demonstrated sustainable practices could provide an impetus to private citizens to change their own landscaping choices and to build public tolerance for new designs. The second consideration is that for a municipal government to adopt sustainable landscaping practices on its lands, it would need some assurances that the voting public would accept such

changes. While some municipal governments are willing to take on a leadership role in changing to sustainable practices, others avoid citizen disapprobation.

As it turned out, this last issue became the project’s crucial challenge. While some municipal personnel were supportive, and remained so, over the project’s life we faced significant resistance from other staff, who were highly apprehensive about public acceptance of a different type of landscaping. As we heard anecdotal stories about verbal abuse to staff when the color of tulips in parks was changed, for example, we realized that these were valid apprehensions. Over the project’s four years, the municipal government became increasingly uncomfortable with the idea of changing landscape options, in part due to their personal preferences and in part due to their concerns over public acceptance. In the end, only one site on city property was permanently converted to sustainable landscaping, despite an original commitment of 30 acres (other sites exist on property belonging to other partners).

In addition, we committed some crucial errors that also contributed to difficulties achieving this project’s objectives. These mistakes included a certain amount of over-ambition on our part, but also in assuming that our municipal partner was fully committed at all levels to such a project. This article presents a case study of the nature of the potential difficulties of establishing alternative sustainable landscaping schemes. It further draws some lessons learned about engaging a municipality and its tax-

payers in a highly visible sustainability initiative. Although not the original intent of the project, in the end, some of the most interesting research questions became what actions (or lack of actions) limited municipal acceptance of sustainable alternatives, questions that offered some of the most profound, if painful, lessons.

## Literature Review

Innovation failure (more commonly called the failure of new ideas) is found in all aspects of research and design. From landscaping (reflected in our own experience) to the design of city ports and the provision of foodstuffs, the literature notes a number of causes and examples of failure in encouraging individuals to adopt new ideas. A few of these conditions considered most relevant to our project are offered here.

Paluszkiwicz & Mak (2009) cite the general success-gauging criteria offered by Wiegman (2005): how well a new idea fits an existing infrastructure (see also Smith, 2003), as well as the difficulty caused by people not understanding a new idea (see also Stahl, 1999). Wiegman (2005) suggests that success lies in social compatibility, simple technology, and social acceptability. He claims that failure is strongly related to insufficient funding for implementation, lack of skills, and perceptions of risk. This is particularly true when the benefits are not seen to be adequate to offset the risk. Wiegman (2005) concludes that the most common factors affecting the success or failure of new ideas include technological issues, government policy and regulatory frameworks, opposition from vested interests, and psychological dimensions (e.g., perceived risks, an unfavorable image or unfamiliarity, or future expectations). He also notes that development of a new idea often occurs through “learning by doing.”

Foxon et al. (2004) note that failures in innovation are a result of the innovation not being a subject of “deliberate policy delivery,” as well as processes that work against integration if long-term challenges receive low priority. Smith (2003) observes that vested practices limit a new idea’s ability to enter into everyday practice. Further, and following the theme of vested interests, Könnölä et al. (2005) suggest that difficulties lie in organizational, social, and instructional changes that affect the diffusion of solutions.

Although aimed at improving distance education, Stahl (1999) draws on lessons from social psychologist Kurt Lewin’s 1930s work that illuminated challenges in fostering innovation. Lewin saw three important aspects in a successful change: participants must be active in accumulating knowledge for them-

selves; knowledge dissemination must be cohesive to permanently change attitudes, ideas, and behaviors; and the social environment needs to support any change. Moreover, the participants must be able to adjust their self-perceptions, as it is easier to change a social context than an individual one. Thus the introduction of new and innovative ideas, such as sustainable landscaping, often face considerable challenges in gaining acceptance.

Human interactions with natural or naturalized settings in urban areas are reasonably well studied, particularly in Europe. For instance, Matsuoka & Kaplan (2008) examined 90 articles from one publication focused upon landscape studies. This work confirms that the availability of natural settings is important for human well-being within urban settings, and that this need is consistent across a variety of cultures. However, how that need is perceived or articulated varies widely depending upon gender, age, and socioeconomic status. Psychologists and other researchers have, for some time, examined this human attachment to nature; the classic work is E.O. Wilson’s *Biophilia* (1984; see also Kellert, 1993). Thus, the human need for nature is increasingly accepted; however, as Matsuoka & Kaplan (2008) and others note, what that need looks like can vary quite dramatically.

Meeting this need in urban settings can take the form of conventional landscapes (mowed parks and carefully controlled plantings), but cities are increasingly exploring options for such areas to add value by contributing to the new drive for “sustainability,” or fewer ecological costs. Landscaping initiatives meant to meet sustainability criteria are increasingly common in Europe (Ruff, 2002). Again, studies in Europe have noted that the public, while attracted to “nature,” may have very different perceptions of that nature. Some people, for example, are scared or disgusted by places that are too wild or find such places frightening to visit and thus might prefer more controlled outdoor designs (Ozguner & Kendle, 2006). More naturalized settings often fail to meet aesthetic preferences for tidiness or are simply not part of the landscape patterns that people are used to experiencing. Thus, public preference for landscaping is quite mixed, and sustainable landscaping choices, depending on their appearance, need to reflect that diversity of opinion. Indeed, Ozguner & Kendle (2006) demonstrate that the public (in the United Kingdom) wants “naturalized” landscapes, but also wants them to appear to be maintained. Similarly, Jorgensen & Tylecote’s (2007) examination of interstitial wilderness areas noted that such naturally landscaped areas were often viewed as not cared for and therefore undesirable. Jorgensen et al. (2007) examined the proximity of dense woodlands to residential sites in

the United Kingdom and came to similar conclusions: the public appreciated aspects such as privacy and a feeling of closeness to nature, but any sense that the area was not managed caused community concern and limited a sense of social engagement. Despite mixed public reactions, agencies exist that successfully promote naturalizing unused landscapes for ecological values (Taylor, 2008). However, North Americans are perceived as possessing different sensibilities from Europeans and certainly are engaged with a very different set of landscapes and sense of history about those landscapes. Given the setting of this research project, the remainder of this literature review focuses upon the North American context.

In North America, controlled plantings in public and private spaces, largely using lawn grass, are a recognized obsession (although some areas, such as California, have begun to encourage alternatives). Researchers have noted a rise, beginning in the 1920s, in the popularity of expanses of lawns with a scattering of trees and perennials and characterized this preference as “remarkably persistent and stable” over time (Henderson et al. 1998). Speculation on the reasons for the enduring popularity of lawns range from a perception that their presence contributes to feelings of good citizenship and neighborliness on the part of homeowners and the maintenance of property values to a sense of “controlling” nature and a mark of status dating back to European aristocracy maintaining a pristine sward of green (Jenkins, 1994; Shern, 1995; Henderson et al. 1998; Steinberg, 2006; Dorsey, 2010; Mustafa et al. 2010). Such social determinants are bolstered by civil reinforcement through municipal ordinances regarding lawn length, landscape composition, and “weed control,” as well as significant investment by lawn-care companies, garden centers and other businesses in promoting lawns as a social good (Jenkins, 1994; Lynch & Hofmann, 2007; Dorsey, 2010).

This preoccupation comes with extensive social and environmental costs. The social costs include the time spent maintaining a lawn (e.g., mowing, watering, weeding). Statistics Canada (2009), for example, reported on any average day 11% of Canadians over 30 years of age were working on their lawns or gardens and the average participant spent two hours daily on yard work (Lynch & Hofmann, 2007).

More problematic are the environmental costs of lawns and conventional landscaping. Lawns, in particular, require extensive resources to maintain, with water being a significant input. However, most jurisdictions in North America are presently experiencing lower levels of precipitation or overt drought conditions (see Mustafa et al. 2010 for a Florida case study on lawn and water regimes). In Canada, domestic water consumption can increase by 50% during the

summer months when lawns are watered and 54% of Canadian households routinely water their lawns (Lynch & Hofmann, 2007). Pesticide and herbicide applications are also key environmental costs, resulting in acute and long-term health concerns. Studies suggest that pesticides/herbicides are a leading cause of acute poisonings in Canada and can also cause chronic health effects, both as outcomes of acute poisonings and from chronic exposure (Canadian Association of Physicians for the Environment, 2000; Union of Concerned Scientists, 2008; see also Daniels et al. 1997; Infante-Rivard & Weichenthal, 2007; Rudant et al. 2007; Ecojustice Canada, 2008). Furthermore, fertilizer runoff contributes to algae blooms in water bodies and can reduce soil health (Mustafa et al. 2010). While poorly studied outside of the nursery industry, the costs of growing conventional ornamentals and bulbs for the garden trade, particularly annuals, in terms of fertilizer, pesticide use, and loss of land for food production, are likely considerable. Finally, there is the environmental cost of all the mowing resulting from water and fertilizer application. As of 2005, two-thirds of Canadian households with lawns and gardens owned a gas-powered mower, despite research demonstrating that gas mowers contribute disproportionately to poor air quality (Lynch & Hofmann, 2007). Few studies document the costs in time or resources for municipalities engaged in similar activities for the purposes of maintaining their manicured public spaces.

Awareness of the costs of maintaining lawns and conventional landscaping have grown since the 1980s as local organizations and interested homeowners have pressured municipalities to accept sustainable landscaping alternatives (Dorsey, 2010; Mustafa et al. 2010). Today, many popular magazines and journals promote alternatives to conventional lawns (see Best, 2002 and Correa, 2010, for examples); however, the majority of the North American public seems surprisingly resistant to these options (Dorsey, 2010; Mustafa et al. 2010). The key roadblock, according to Nohl (2001), is the question of aesthetics. As Dorsey (2010) notes, individuals might be well motivated toward better environmental management in theory, but in practice, their self conception and interest in maintaining good relations with neighbors (linked to the values attached to lawns cited earlier) limit the adoption of alternative landscapes on private property (or its acceptance in municipal spaces, as our experience demonstrates).

Congruent with the rise in public interest in lawn alternatives has been growth of interest in “sustainable” landscapes among professionals such as landscape architects, horticulturalists, and planners, among others. Sustainable landscapes were promoted

as early as the late 1960s (see McHarg, 1969), but much of the critical literature began appearing during the 1980s (Lyle, 1985; Van der Ryn & Cowan, 1996; Franklin, 1997; Mendler & Odell, 2000; Thompson & Sorvig, 2000; Melby & Cathcart, 2002; France, 2003; Antrop, 2006; Potschin & Haines-Young, 2006; Selman, 2008). Nevertheless, as Calkins (2005) notes, this upsurge of activity has not been mirrored in application. Of the “green building” practitioners responding to her survey, only a third characterized their projects as “very green.”

Further complicating the discussion is the diversity of opinion about what the term “sustainable landscaping” might mean. For example, Antrop (2006) notes that since landscapes constantly evolve due to natural disturbance and human actions, the definition of sustainability is dependent upon time and place. He identifies two key definitions: the first is not linked to a particular landscape, but is identified through elements of natural or human history or persistent practices to maintain traditional values. His second definition focuses on the potential of a landscaping choice to contribute toward enhancing the continuing well-being of natural and human communities. However, Selman (2008) notes that sustainability remains undefined by many of the very practitioners citing the concept. Further, the concept might be dependent upon differences between “old world” and “new world” perceptions of landscape, time, and the background of the individual applying it. None of this debate leaves either individual homeowners or municipal governments much the wiser on either the desirability or acceptance of alternative, “sustainable” landscaping.

### The Study Community

Prince George is situated in northcentral British Columbia, Canada. It is largely a primary resource extraction and primary processing economy, reliant upon timber production and saw and pulp mills. Much of the timber has been adversely affected by insect attack in recent years, leading to a significant reduction in fiber availability. Sawmills have seen closures due to the drop in housing construction in the United States, while pulp production has also declined. Other primary resource sectors, such as mining and oil pipelines, are anticipated to drive future economic growth. In addition, the city is a government-services center for federal and provincial agencies, that are assisting it explore new economic opportunities as an industrial transportation hub. The government services-center status provides other economic options, including a university, a community college, and other small industries. The city’s population has fluctuated somewhat, but as of 2010

was approximately 80,000 people.

The municipal population is politically conservative in its values. Further, anecdotal evidence suggests that older residents have reacted negatively to change, particularly that brought about by the advent of the university in 1993, and have not responded positively to a concomitant rise in the diversity of social values. The community is proud of its logging town reputation, and the environmental and sustainability movements are viewed with both suspicion and some hostility, often as values coming from the large urban centers of Vancouver and Victoria far to the south. Municipal recycling initiatives and water-conservation strategies, to take the least controversial in other provincial districts, are routinely resisted by taxpayers as not necessary. As a consequence, the municipal government has moved very slowly on introducing any initiative that might be viewed as “green.”

However, as with all cities in British Columbia, the municipal government is under pressure from the federal and provincial levels to institute sustainability initiatives, including moving toward carbon neutrality, reducing waste generation, and developing and implementing a municipal sustainability plan (City of Prince George, 2010). As such, the municipality is caught between a conservative population (often seen as characteristic of northern Canada) and government initiatives that must be implemented under threat of lost tax revenues and other punitive measures.

### Study Methodology

This project began when two UNBC professors were asked to give a presentation on Prince George’s sustainability initiatives to a panel of judges from an international program, “Communities in Bloom,” that was judging the city’s landscaping for a provincial level award. The professors had difficulty identifying any landscape-based sustainability initiatives, which made for some awkward conversation with the judges. Having identified a potential research question—why there are sustainable landscape initiatives in the urban centers of Canada, but none in northern resource-dependent communities—we approached the city’s environmental manager regarding what sustainable landscaping could mean in Prince George. He was highly supportive and almost immediately committed funding to undertake plant trials on city properties and to engage in public outreach. Upon receipt of additional funding, a commitment was made to undertake plant trials on three public sites. This limited proposal was presented to the city council for approval, which was granted.

During the first two years, the principal researchers—a hired horticulturalist/project manager

and the core municipal staff group (comprising horticulturalists, the parks manager, and the environment manager)—served as the project’s steering committee with day-to-day decision-making authority. Extensive, often weekly, meetings occurred to identify and agree upon the questions, potential sites, landscaping design, plant choices, and work schedule. In addition, throughout the project all new major initiatives were presented to, and cleared by, the city council and affected departments. The steering committee provided regular written reports to the council and department heads. In addition to meetings between steering committee members, the researchers engaged in weekly, often daily, interactions and consultations with other key staff, managers, and department heads, as well as with our partners. Many meetings actually occurred on sites, as municipal staff came frequently to observe activities and progress (and often ended up helping to get plants into the ground). Much project communication was informal, but we also had regular meetings with staff and biannual review sessions to ensure that the city and all our partners were aware of and involved in the project and to address concerns as they arose. The researchers always made themselves available for meetings when questions came to the surface.

After the project’s first year, we began to lose some of the early municipal members of the steering committee due to reassignments or employment changes. As it turned out, these initial collaborators were the crucial, enthusiastic partners and their departure began a gradual disintegration of that committee, despite the engagement of replacements over several subsequent months. By the project’s third year, the steering committee was reduced to the researchers, who could no longer rely on day-to-day contact, but continued with an increased schedule of individual meetings and communications. At the time, the municipality indicated that it accepted this arrangement.

The original steering committee considered it crucial to engage other municipal staff, particularly those in closely affected departments. City representatives on the steering committee agreed to the need for professional development on sustainable landscaping; however this aspect of the project was to be handled internally by municipal staff, given concerns over potential union issues.

One group we did not actively engage in the project was the general public. We made this choice for three reasons. The first was an urgency expressed by the city and other funding agencies to actually get the project into the ground, literally, as soon as possible. Extensive public consultation prior to the project was not seen as a productive use of available resources. We did, however, undertake a great deal of

passive public engagement through signs at the sites, media coverage (including provincial and national radio coverage), and presentations to local groups such as the Rotary Clubs and schools. The second reason for not engaging the public was that we saw the project as “research” rather than as a municipal infrastructure project, which would have required a public consultation. While we expected successful trial sites to remain, these were identified to our partners and in our outreach as trial sites. Third, we wanted to measure public responses to new types of landscaping choices. Rather than attempt to obtain their support prior to the start of the project (with the problematic question of what to do if the public refused to allow the research to go forward), we decided to install the sites and *then* measure reaction.

Our preliminary investigations into other sustainable landscaping projects in North American jurisdictions revealed rather vague, and individualistic, definitions of sustainable landscaping, generally involving lower environmental impacts as an outcome. We held several discussions over the project’s first two months with key municipal staff to develop a definition of sustainable landscaping that was reflective of other areas but that addressed Prince George’s particular, northern concerns, including issues of climate particulars. As a result, we reached a jointly negotiated consensus. Sustainable landscaping design is multifaceted. It must permanently reduce the size and number of high maintenance, purely aesthetic turf areas and eliminate the need for mowing, the application of supplemental water, and all other forms of maintenance. Sustainability, in this context, also requires an end to nonorganic fertilizers, pesticides, and herbicides in favor of natural means and a reduction even in these applications. We considered this to be achievable by selecting plants that would successfully survive under Prince George’s climate conditions. We were therefore willing to trial non-native (but noninvasive) species.

At its best, sustainable landscaping would protect the environment, including the general health of human, animal, and plant life, and provide economic benefits by saving maintenance costs and creating opportunities for entrepreneurs, including sustainable gardening specialists and educators. It would incorporate the improvement of environmental understanding, economic security, and social harmony. Finally, we posited that a truly sustainable landscape must meet not only the above criteria, but must also be fully acceptable to the public at large. Therefore, the project explicitly operationalized the definition of “sustainable landscaping” as landscaping meeting the following criteria:

- Is acceptable to the community;

- Is appropriate for the community and region. In Prince George, this means tolerant of snow accumulation of up to ten feet annually (a range of temperatures from  $-37^{\circ}\text{C}$  to  $+35^{\circ}\text{C}$ ), decreasing precipitation levels (summers are increasingly dry, particularly in the spring and high summer), salt and sand accumulation from ice-control operations, and vandalism;
- Takes into account changing conditions such as climate change;
- Is relatively cost effective;
- Requires minimal or no artificial watering;
- Requires no herbicides or pesticides;
- Requires minimal fertilization;
- Needs limited or, ideally, no mowing or trimming;
- Is aesthetically pleasing;
- Provides other ecological benefits such as slope stabilization or weed control.

The municipal government made an original commitment to provide the assistance and some time of its staff horticulturalists. While supportive, and essential to the project, the engagement of the horticulturalists came at a cost: they had a huge backlog of research questions that they wanted included in the proposed project, a desire supported by their supervisors. Suddenly, we were being asked to find mechanisms to undertake a much larger research project than originally planned. Further, city staff spread word of the research to other agencies, and suddenly additional questions, and funds, were being proposed. City officials began to refer colleagues from other government agencies who also had landscaping questions (as well as funding to provide). These new questions and funds were incorporated where they met the following criteria: the new proposal appeared congruent with the general direction of the overall project objectives; the proponent stated that they understood that the project's primary goal was research, rather than a cheap landscaping option; and we *thought* we could reasonably undertake the project proposed (as will be seen, we were sometimes mistaken in that last assumption). As the additional projects and funding allowed an opportunity to pursue a large funding grant, which was received based upon certain commitments, we found ourselves, unexpectedly but not unwillingly, committed to a four-year, multifaceted, and multipartner undertaking.

Our "successes" were largely dependent upon which partner and land base we were working with. Key partners included the City of Prince George, the University of Northern British Columbia, the Prince George Regional Corrections Centre, and the Prince George Airport Authority. These institutions pro-

vided the major land base for the research. In addition, we received funding from twelve agencies for different projects and had obligations to several other community partners. The different collaborating organizations were involved in very different ways, both in terms of the types of research conducted and in how they were engaged. Some of these differences had implications for whether their involvement was "successful" or not in terms of project acceptance and outcomes.

Our early discussions led to the development of the original project objectives, which were based upon goals and questions articulated by the core group of municipal staff and our project horticulturalist. Those objectives were to, over four years,

- Demonstrate that ecologically sound landscaping could be undertaken in a northern ecosystem and a resource-dependant community.
- Determine which planting combinations and maintenance regimes are most appropriate for different site requirements.
- Determine which planting combinations provide the most net ecological benefits.
- Increase public awareness of, interest in, and knowledge of ecologically sound landscaping.

Our objectives were to be developed through the following strategies: over the first three years of the project, approximately 30 acres of highly visible city property and key community partners' property were to be identified and relandscaped. These areas were to be revegetated with a mix of native plants and northern adapted plants in a planting regime that would allow us to measure the impacts of the plantings on several environmental variables. We would measure public perceptions and interest and initiate community education. Measurements were to be undertaken over the course of the project, but after at least two growing seasons.

As the project progressed, additional experiments were added to the list. These included:

- Investigate alternative (nonherbicide) weed-control initiatives. Final choices were mechanical mowing, applications of vinegar (acetic acid), livestock grazing (donkeys and then goats), and weed-suppressing perennials.
- Assist the Prince George Airport Authority to investigate both more sustainable landscaping on the facility's grounds and landscaping choices that would limit wildlife incursions onto runway areas. This included a bird and wildlife study to determine what species occur in what areas around runways, plant attractiveness to different wildlife

species, and test plots planted with two plant mixes which a literature review suggested would be least attractive to wildlife of concern, i.e., non-edible.

As noted earlier, these multiple objectives were frequently driven by funding opportunities. So, too, were some of the commitments. For example, a commitment of relandscaping 30 acres was highly ambitious (although that number did include a weed-control project at a 20-acre park). However, our biggest funding agency, which wanted a large project, mandated this size.

Specific methodologies were dependent upon the type of projects that we pursued. For our plant trials, we established test plots in a variety of locations and environmental conditions and spent several years visually monitoring the success of different plants in various locations and conditions and taking physical growth measurements. The work with various weed controls, including vinegar and domestic grazers, included establishing trial plots in test areas, undertaking weed counts, and monitoring, through these counts, the impacts of the controls on weed numbers and health (Booth & Skelton, 2009). Our work on bird and mammal deterrents at the airport included identifying and monitoring visually and by radar species, numbers, and habitats on airport grounds. Literature research was conducted to identify plants thought to be both mammal and bird resistant that would do well in the Prince George ecosystem. Trial plots of these plants were established on airport grounds and their use by birds and mammals has been monitored (this work has continued to receive funding; see Hesse et al. 2010). To measure public attitudes, we mailed to 1,300 residents a survey on perceptions of sustainable landscaping in 2007, after several of our sites were installed. The returned surveys were statistically analyzed to determine community views toward different types of landscaping choices on both private and public lands. However, different sites/projects had specific undertakings, as we will now summarize.

#### **University of Northern British Columbia (UNBC)**

A number of different projects were conducted at UNBC. While some were experimental in nature, seed and plant trials largely, the focus at this location was on installing demonstration sites. We installed four demonstration sites (three other sites failed, for a variety of reasons).

##### *Wabooz Garden*

This garden was installed in 2005 as our first demonstration site, and officially named the Wabooz Garden (rabbit in the Anishanabe language) in 2007.

This site attracted initial resistance from senior university administrators, given fears of public disapprobation, but a year after its installation was receiving positive community reaction, including its use for weddings, graduation photos, and university social events. Casual and outdoor class use is extensive.

##### *UNBC Sign*

A substantial garden site, including conifers, perennials, and bulbs, was installed at the university entrance sign in 2005.

##### *Teaching and Learning Building*

The UNBC administration was interested in using the space surrounding this newly constructed building to demonstrate a new commitment to sustainable landscaping on campus grounds. Perennials and bulbs were installed adjacent to the two entry ways in 2007 and a rock garden was installed in 2008.

##### *The Charles Jago Northern Sports Centre*

After extensive discussion with the City of Prince George regarding a municipal location for a sustainable landscaping demonstration site failed, the campus-sports facility was used as a public demonstration site. It was planted in 2008.

##### *City Sites*

Over the project's four years, several city sites were added to the project for different experiments. At the end of the project, only two sites remained.

##### *Studio 2880 Grounds*

A trellis and bed were installed in 2005, and a set of drought-resistant plants was established in 2006. We had reached agreement to establish our city-demonstration garden at this site, had plans commissioned, and were preparing to install the site when the city sold the land in 2007. This site was decommissioned and the plants relocated.

##### *Carrie Jane Grey/Massey Drive*

In the fall of 2006 and the spring of 2007, perennials with weed-suppressing properties (based upon research by Weston et al. 2006 and Eshenaur et al. 2009) were planted to determine survival and attributes under local conditions. Their growth was monitored throughout 2008, and we obtained significant data on weed suppression and plant growth. In the fall of 2008, at the request of the municipal government, all trial plots were removed and the site was returned to its original lawn-grass condition, as city staff were concerned about negative public response.

### *Green Street Project*

In 2006, eight species of trees not normally grown in Prince George were planted in various neighborhoods to determine their adaptability to local conditions. A few died for undetermined reasons; the survivors remain.

### *Connaught Park*

In 2007, we were asked to develop a plan for a site along a road where several bare patches existed from the original road construction and subsequent slope slumpage. Early in the spring of 2008, the area scheduled to be planted experienced another significant earth slide, and as the site was now unstable the decision was made to find another trial site. However, locating a replacement site proved challenging. For every site proposed by one official, other officials raised objections based upon fears of public backlash. In the end, a site was chosen by two officials who failed to advise their colleagues until after it was planted. This “sneak” planting has proven publicly acceptable, but was achieved through a problematic strategy.

### *Livestock Grazing Trials*

In 2006, we utilized donkeys for weed control at three city sites, a field, and two sewage ponds. This proved unsuccessful, as the donkeys did poorly in the available grazing. In 2007, we introduced goats into two city sewage-lagoon sites. The results were successful, both in terms of weed control (Booth & Skelton, 2009) and of acceptance by municipal officials and by a curious, largely supportive public. The difference in public and municipal acceptance is discussed below.

### *Other Partners*

A number of other partners contributed sites for specific research questions. These sites also provided significant lessons in garnering acceptance.

### *Highway 97—John Hart Bridge*

Planted in 2005, this test site was very challenging, with very poor recruitment observed in 2006. While reassessment in 2007 and 2008 demonstrated better survival than originally thought, the initial perceived failure was not well received by the partnering organization. This experience demonstrated the folly of tackling a too-difficult site too early without adequate data, an important lesson in sustainability initiatives, as the failure cost the project in terms of trust.

### *Highway 97 Bypass*

A demonstration site was to be installed in cooperation with a local nonprofit on a median in this area. Plans were commissioned but had to be aban-

doned when a change in personnel within the partner organization resulted in their inability to fulfill the original agreement. In this case, the loss of a key, enthusiastic supporter proved a critical blow.

### *Prince George Regional Correctional Centre*

The corrections center was a key partner in its provision of labor (inmate crews) and they also wished to partner as a site. A trial site was installed on the grounds in 2006. In 2007, these perennials were relocated due to access (security) issues and a second experimental garden was established in an unused field. This was to serve as a staff garden, but the location proved problematic (too far from the main building) and the key staff members (including the warden) who had originally championed the project left or moved to other positions. The site was decommissioned in 2008.

### *Ministry of Forestry Building*

Perennial trials were originally established adjacent to a parking lot in 2006 in the face of resistance by occupants who liked the existing lawn. Additional plants were added in 2007, but in 2008, at the request of building occupants who had never accepted the alternative landscaping, the plants were removed and the site was seeded with lawn grass.

### *Prince George Regional Airport*

The airport became a partner in 2007 with two interests: experimenting with sustainable landscaping on a few publicly visible sites and determining alternative landscaping, which would deter wildlife from runway areas.

To address the public areas, two plantings were undertaken. In 2007, grass trials were initiated on a site around the main parking lot to determine if the species were appropriate low-maintenance choices for the region. Poor planting and maintenance (which had been handed to an airport contractor) resulted in poor establishment. Several evergreens were also planted in 2007 adjacent to the domestic arrivals entrance. Survival has been partial due to the area's extensive use as a snow dump, a fact not known by airport administrators when offering it as a research site.

At the request of the airport, work was begun to examine landscaping and other options for limiting wildlife incursions, including deer, moose, bears, large birds, and coyotes, onto runway areas. Research examined site use by wildlife and plant attractiveness to different species. The Prince George Airport Authority embraced this research and has continued to provide funding (Hesse et al. 2010). The acceptance of this work is likely due to its perceived utility by key staff.



## Discussion

While we anticipated resistance from community members (we were, after all, residents of the community and well aware of its values), we were both surprised by and unprepared for resistance on the part of municipal staff and, in a few cases, by personnel from our partner organizations. It was this last issue that proved the most fundamental to the initiative's final "success," or lack thereof. By the project's end, only one sustainable landscaping site existed on municipal land and that was, as previously noted, a "stealth" installation. Similar results occurred on several partner organization sites; only UNBC and the Prince George Airport have retained research sites. While the data collected as a result of our efforts have been of value, if success is measured in terms of public and government acceptance of sustainable landscaping, then our various interventions must be classed as a failed sustainability initiative.

The ultimate level of resistance from within the municipal government was surprising given the initial enthusiasm from some staff and the willingness to both partner on key grants and to provide actual dollars. However, while some officials within the city had agreed to collaborate and were aware of the objectives, other staff varied widely in their support and knowledge. While some were very enthusiastic and provided invaluable assistance, others were highly resistant and constructed continuous roadblocks (one even made a point of driving over labeled research sites). As staff responsible for liaison on various parts of the project rotated frequently, no continuous support could be achieved. In some cases, the resistance was subtle (no appropriate replacement sites could be found, for example, after one became unsuitable) while in other instances it was more overt. In one incident, a new manager spent 30 minutes in agitated and hostile communication with the lead researcher denying that commitments had ever been agreed to (this was two years into the project, but fortunately the commitments had been made in writing).

Although three demonstration sites were allocated over the course of the project and plans (and sometimes plants) commissioned and paid for, only one site was ever planted. One site was sold and the second, while agreed to on one hand, was on the other hand encircled by so many restrictions and demands that it became impossible to proceed. For example, one demand was that all residents within a six-block radius of the site would need to be notified and all input accommodated. We had neither financial resources nor time to meet this requirement.

In another case, a construction contractor working on city lands was referred to the project by one municipal staff member as there was interest in re-

seeding the construction site with drought-resistant, low-mow seed mixes. Another staff member stopped the initiative by demanding, again, that all residents within a three-block radius of the site be notified. All of these incidents are indicative of just how deeply uncertain some staff members were over the nature of the project. In part, this was a failure of the partner to ensure a consistent approach by its own personnel. Other contributing factors included our failure for not recognizing the need early on to conduct staff education and awareness ourselves and for not developing in advance a plan to deal with potential public disapproval.

In the face of municipal officials' concern about public disapprobation (we unfortunately only had anecdotal evidence of a rise in public complaints around our experimental and demonstration sites), we were surprised when our research into public attitudes toward sustainable landscaping in the city of Prince George found general support. The 2007 mail survey demonstrated greater civic enthusiasm for implementing sustainable landscaping on both private and public lands than municipal officials had postulated. Analysis also demonstrated that the greatest limitation on the implementation of sustainable landscaping on private lands was a lack of knowledge of such landscaping, suggesting that municipalities seeking to implement their own sustainability initiatives, or to encourage them on the part of residents, should invest in appropriate educational strategies. Municipal staff and officials were, perhaps, too driven by a vocal minority of detractors.

Lest the city of Prince George be seen as unique, we note similar issues among other partners. The UNBC administration, which provided the project with its first demonstration site, also proved uncertain about that commitment. The site was approved and then cancelled three times. Possibly one circumstance that kept the project moving was the fact that, at the point of each cancellation, substantial funds had already been invested. Further, one key individual was consistent in his support. Again, the ostensible rationale for cancelling was fear of public disapproval. In this case, the project went ahead and such fears proved unfounded. Similar concerns arose at the Regional Correctional Centre (although in part this was due to a poor choice of sites). An important aspect of this latter failure was the loss of key supportive personnel; when they left or relocated, the project simply stopped.

It is a useful learning opportunity, however, to reflect upon the shared fear of public response on the part of officials, which caused challenges for this project. Considerable investment in education, not just of its community members but of its own staff and officials, is likely required on the part of any in-

stitution or government contemplating sustainability initiatives. Further, such education should occur well before the first plant is put into the ground. Upon reflection, it appears that our crucial mistake was in accepting municipal staff assurances that there was considerable governmental support for the project, with some noted exceptions (such as the worker who kept driving over our research sites: he was a year from retirement, was the explanation). We moreover accepted the argument that the municipal staff engaged in the project would undertake the necessary education and communication requirements internally. There were two reasons we agreed to this arrangement. The first was that we chose to trust our partner. The literature is certainly clear on the problem of resistance to new ideas and this issue was discussed with the municipal collaborator thoroughly during the first year. In addition, every time a specific incident occurred, municipal staff kept assuring us that the issues were being handled. Perhaps our municipal contacts were as surprised as we were at the amount of resistance, or more likely different levels of power within the municipality were unaware of each other. We continued to try to work with the municipality. The other reason we left this crucial issue to internal solutions was concerns over the use of nonunion labor on the project (the inmates). Given the perceived sensitivity to union sensibilities, for better or for worse, education and communication over concerns with municipal staff had to be left to the municipality itself.

Conversely, some aspects of the project received considerable support. The goat weed-control experiment received strong backing from city staff and from a fascinated public (many of whom visited the sewage ponds specifically to meet the goats). Press coverage of this aspect of the project was considerable and the goats were pretty charismatic—we finally had to install “Please don’t feed the experiment!” signs. The difference in levels of acceptance might be instructive. The sites being utilized were not “public” and were generally out of sight of the larger community. Further, a sewage pond is not intended to be attractive, so the presence of a goat herd would not limit aesthetics. Finally, this project met a significant and highly specific need, nonherbicide weed control, on the part of a small city department that was able to reach internal consensus on providing support. In contrast, while some municipal officials might have seen changing to more sustainable planting schemes as useful, by no means all did so and indeed many saw no issue with conventional landscaping.

For a variety of reasons, our greatest success was at UNBC, where an acre or so of sustainable landscaping remains. An additional three acres have been set aside as a botanical reserve as part of the

initiative. In part, our success at this site was due to early support from influential staff members who remained involved throughout the project’s entire life. These personnel were vocal supporters and, in one case, accepted personal responsibility for the installation’s anticipated failure. Because this installation, the Wabooz Garden, actually succeeded, the case for subsequent installations was strengthened (see Figures 1 and 2).

In addition, as a university the community proved more accepting of the concept of research, with the attached concept of learning on occasion by failure. It also merits noting that the university had a pre-existing and identified need to improve its landscaping and the project met that requirement. A similar circumstance prevailed at the Prince George Airport. Here, the research met a vital and immediate need, namely limiting wildlife from accessing runways, a serious safety hazard (Hesse et al. 2010).

Finally, we shoulder some part of the blame for failures in this initiative. We made several crucial mistakes. Lured by additional funding and potential research questions, we overcommitted, taking on



**Figure 1** Wabooz Garden (then called the Bentley Centre) prior to sustainable landscaping.



**Figure 2** Wabooz Garden, two years after planting.

challenges that we were not ready to meet. We accepted assurances that staff education would be handled internally by our key research partners. We were naïve about internal politics, staff stresses and constraints, tensions between senior administrators and other staff, and concerns over union responses. All of these matters complicated our work and we were unable to effectively head off the subsequent problems. In retrospect, we should have followed up on the anecdotal statements that the public was not accepting the installations. As we never sought proof of the claims of public concern, this issue became a vulnerability when making the case for leaving existing installations or adding additional sites.

## Conclusion

As a result of the Prince George Northern Sustainable Landscape Initiative, we learned a number of lessons that might be helpful for others planning similar interventions in North American communities. The differences in how partners perceived and worked with the Sustainable Landscaping Initiative is particularly noteworthy. We divide our concluding observations into four categories of lessons: personal, institutional, partnership, and working with the public.

### *Personal Lessons*

- Be realistic about what can be accomplished with the available time, resources, and personnel. Stay focused.
- Be clear about what you know (what is likely to work) and what you do not (what is experimental).

Our initiative pursued a few projects early on that were beyond our knowledge and/or capacity. Several were meant to be experimental and we were aware that failure was a possibility. However, those apparent “failures” cost the project support and trust as we were not sufficiently clear with our partners on the nature of “research,” with the attendant possibility of learning by failure. Sustainability initiatives need to be clear about what is experimental and subject to failure and what is reasonably established practice.

### *Institutional Lessons*

- Target initiatives directly to the needs of the recipients (the broader the goals the less likely they are to find clear supporters).

We tried to meet some very broad objectives which, as key supporters left their positions, became difficult to sustain. Targeted goals (such as weed control or limiting wildlife incursions) that met specific needs of key supporters or partners retained their commit-

ment over the long term, even when individuals departed.

- Identify the key supporters required in advance.

We often were given contradictory information about whose support was required for a particular project. Sometimes we had to achieve support from individuals not previously identified and usually at the last minute, disallowing fair circumstances for their decisions. Decision hierarchies need to be established in advance and adhered to by all partners.

- Be clear on the tangibles committed. Sites must be stable (not subject to future sale) and all possible sites must be fully agreed to in advance.

Our project relied upon many sites that ended up being sold or otherwise became unavailable. This not only caused delays and lost dollars (plans paid for but never used), but also allowed partners to renege on commitments after the loss of supportive personnel. Further, staff time promised in the early part of the project became more difficult to maintain as the original supporters moved away.

- Ensure both short- and long-term commitments are in place and are honored.

Several of our sites suffered, or even failed, when the partners or contractors who were to undertake tasks such as establishing watering regimes or installing seeds and plants did not honor the commitments. If obligations are contracted out, someone has to ensure that they are conducted correctly or indeed conducted at all. Clear lines of responsibility and communication are also required and must be adhered to.

- Provide education in advance of the initiative for all potentially affected parties.

While we undertook substantive public outreach through various media outlets and public events, that education happened at the same time that the earliest demonstration sites were installed. In retrospect, we should have spent a year providing education before the installations began. This might not have eliminated public concern, but it would have limited the surprise. We did not, unfortunately, have this option at our disposal. Further, we overlooked a key group: municipal and partner-organization staff. We assumed that if our staff liaisons were on board, then all staff were on board. This was in no way a correct assumption and most of our challenges arose from concerned, unsupportive staff who had not been briefed.

### Partnership Lessons

- Encourage partners to provide a single authority for decisions and to be clear that that person has the necessary authorization. High staff turnover is a serious problem and must be planned for in advance.

Changes in key staff were a serious challenge as new staff did not always support the project. Some were overtly hostile and this led to delays as reapprovals by superiors had to be sought.

- Make sure that long-term support for activities is built into the project; have a plan for the possible departure of the current champion(s).

### Lessons on Working with the Public

- Develop a strategy for adverse public reaction and be clear that staff accept this possibility.

We did not anticipate negative responses and it was a crucial failure. On occasion, we received complaints from members of the public who confided that the staff to whom they had spoken echoed their concerns. Such split messaging is a public-relations problem. We also failed in actually measuring the reported public disapprobation. Engagement with such negative responses is mandatory to truly judge levels of acceptance.

- If a partner is concerned about public disapprobation, scale down the proposed changes.

Gaining acceptance with smaller projects is crucial to building toward more ambitious ones, particularly if the partner, or any members of its staff, is likely to react poorly to public concerns.

- Be realistic about the rates of acceptance and tolerance, but recognize pushing boundaries is necessary. Be persistent: acceptance is built upon experience.

This lesson derived from our experience at the university. While our initial proposal was resisted strongly by certain key administrators (and was cancelled three times), we persevered, admittedly because we were in a position to do so. The installations that caused so much initial alarm, however, became sources of great pride by the very administrators who had opposed them in the first place, due to their overwhelming public acceptance and use.

\* \* \*

Sustainability initiatives, such as changing to sustainable landscaping, depend upon many factors for short- and long-term success. Particularly where an initiative might face uncertain public acceptance, careful planning is required to assure municipal officials, as well as other partners, that the advantages of participating will outweigh any potential public outcry. While this initiative failed to meet many of its early objectives to establish sustainable landscaping sites, it was successful in identifying key lessons for future efforts.

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### References

- Antrop, M. 2006. Sustainable landscapes: contradictions, fiction or utopia? *Landscape and Urban Planning* 75(3-4):187-197.
- Best, J. 2002. Going native: breaking free from the suburban lawn. *onearth* March 22.
- Booth, A. & Skelton, N. 2009. The use of domestic goats and vinegar as municipal weed control alternatives. *Environmental Practice* 11(1):3-16.
- Calkins, M. 2005. Strategy use and challenges of ecological design in landscape architecture. *Landscape and Urban Planning* 73(1):29-48.
- Canadian Association of Physicians for the Environment. 2000. Canadian Association of Physicians for the Environment. <http://www.cape.ca>. January 15, 2008.
- City of Prince George. 2010. My PG...in Action. <http://www.mypg.ca/Pages/welcome.aspx>. August 25, 2010.
- Correa, C. 2010. Who ever liked mowing the lawn anyway? *Ecosalon* August 18. <http://www.ecosalon.com/who-ever-liked-mowing-the-lawn-anyway>.
- Daniels, J., Olshan, A., & Savitz, D. 1997. Pesticides and childhood cancers. *Environmental Health Perspectives* 105(10): 1068-1077.
- Dorsey, J. 2010. Lawn control, lawn culture, and the social marketing of sustainable behaviors. *Ecopsychology* 2(2):91-103.
- Ecojustice Canada. 2008. Top Health, Environment Leaders Urge World-Class Pesticide Ban. <http://www.ecojustice.ca/media-centre/press-releases/top-health-environment-leaders-urge-world-class-pesticide-ban>. January 21, 2008.
- Eshenaur, B., Senesac, A., Bradley, I., & Lamb, E. 2009. *Weed Suppressive Groundcovers*. Ithaca, NY: Cornell University, New York State Integrated Pest Management Program. <http://www.nysipm.cornell.edu/grantspgm/projects/proj09/or n/eshenaur.pdf>.
- Foxon, T., Makuch, Z., Mata, M., & Pearson, P. 2004. *Towards a Sustainable Innovation Policy-Institutional Structures*,

- Stakeholder Participation and Mixes of Policy Instruments*. Berlin Conference on the Human Dimensions of Global Environmental Change. December 3–4. Berlin: Environmental Policy Research Centre, Freie Universität. [http://userpage.fu-berlin.de/ffu/akumwelt/bc2004/download/foxon\\_makuch\\_mata\\_pearson\\_f.pdf](http://userpage.fu-berlin.de/ffu/akumwelt/bc2004/download/foxon_makuch_mata_pearson_f.pdf).
- France, R. 2003. Gray world, green heart? *Harvard Design Magazine* 18:30–36.
- Franklin, C. 1997. Fostering living landscapes. In: G. Thompson & F. Steiner (Eds.), *Ecological Planning and Design*. pp. 263–292. New York: Wiley.
- Henderson, P., Perkins, N., & Nelischer, M. 1998. Residential lawn alternatives: a study of their distribution, form and structure. *Landscape and Urban Planning* 42(2–4):135–145.
- Hesse, G., Rea, R., & Booth, A. 2010. Wildlife management practices at western Canadian airports. *Journal of Air Transport Management* 16(4):185–190.
- Infante-Rivard, C. & Weichenthal, S. 2007. Pesticides and childhood cancer: an update of Zahm and Ward's 1998 review. *Journal of Toxicology and Environmental Health Part B* 10(1):81–99.
- Jenkins, V. 1994. A green velvety carpet: the front lawn of North America. *The Journal of American Culture* 17(3):43–47.
- Jorgensen, A. & Tylecote, M. 2007. Ambivalent landscapes—wilderness in the urban interstices. *Landscape Research* 32(4):443–462.
- Jorgensen, A., Hitchmough, J., & Dunnett, N. 2007. Woodland as a setting for housing-appreciation and fear and the contribution to residential satisfaction and place identity in Warrington New Toen, UK. *Landscape and Urban Planning* 79(3–4):273–287.
- Kellert, S. (Ed.). 1993. *The Biophilia Hypothesis*. Washington, DC: Island Press.
- Könnölä, T., Unruh, G., & Carrillo-Hermosillab, J. 2005. Prospective voluntary agreements for escaping techno-institutional lock-in. *Ecological Economics* 57(2):239–252.
- Lyle, J. 1985. *Design for Human Ecosystems: Landscape, Land-use and Natural Resources*. New York: Van Nostrand Reinhold.
- Lynch, M. & Hofmann, N. 2007. Canadian lawns and gardens: where are they the “greenest”? *EnviroStats* 1(2):9–14.
- Matsuoka, R. & Kaplan, R. 2008. People needs in the urban landscape: analysis of *Landscape and Urban Planning* contributions. *Landscape and Urban Planning* 84(1):7–19.
- McHarg, I. 1969. *Design with Nature*. Garden City, NY: Doubleday.
- Melby, P. & Cathcart, T. 2002. *Regenerative Design Techniques: Practical Application in Landscape Design*. New York: Wiley.
- Mendler, S. & Odell, W. 2000. *The HOK Guidebook to Sustainable Design*. New York: Wiley.
- Mustafa, D., Smucker, T., Ginn, F., Johns, R., & Connelly, S. 2010. Xeriscape people and the cultural politics of turfgrass transformation. *Environment and Planning D: Society and Space* 28(4):600–617.
- Nohl, W. 2001. Sustainable landscape use and aesthetic perception: preliminary reflections on future landscape aesthetics. *Landscape and Urban Planning* 54(1–4):223–237.
- Ozguner, H. & Kendle, A. 2006. Public attitudes towards naturalistic versus designed landscapes in the city of Sheffield (UK). *Landscape and Urban Planning* 74(2):139–157.
- Paluszkiwicz, E. & Mak, W. 2009. *Common Factors Behind Success or Failure of Innovations: Algae Farming in the Port of Rotterdam*. Master's Thesis. Erasmus School of Economics. University of Rotterdam, Rotterdam, The Netherlands.
- Potschin, M. & R. Haines-Young (Eds.). 2006. Special issue on landscapes and sustainability. *Landscape and Urban Planning* 75(3–4):155–332.
- Rudant, J., Menegaux, F., Leverger, G., Baruchel, A., Nelken, B., Bertrand, Y., Pate, C., Pacquement, H., Verite, C., Robert, A., Michel, G., Margueritte, G., Gandemer, V., Hemon, D., & Clavel, J. 2007. Household exposure to pesticides and risk of childhood hematopoietic malignancies: the ESCALE study (SFCE). *Environmental Health Perspectives* 115(12):1787–1793.
- Ruff, A. 2002. Holland and the ecological landscape. *Garden History* 30(2):239–251.
- Selman, P. 2008. What do we mean by sustainable landscape? *Sustainability: Science, Practice, & Policy* 4(2):23–28. <http://sspp.proquest.com/archives/vol4iss2/communityessay.selman.html>.
- Shern, L. 1995. *Suburban Lawns: Dimensions of Meaning, Activities, and Environmental Concerns Reported by Home Owning Couples in Georgia and Michigan*. Unpublished Doctoral Dissertation. Michigan State University, Lansing, MI.
- Smith, A. 2003. New research agendas, transforming technological regimes for sustainable development: a role for alternative technology niches? *Science and Public Policy* 30(2):127–135.
- Stahl, S. 1999. Bringing old ideas to new times: learning principles of Kurt Lewin applied to distance education. *The Technology Source* March. [http://technologysource.org/article/bringing\\_old\\_ideas\\_to\\_new\\_times/](http://technologysource.org/article/bringing_old_ideas_to_new_times/).
- Steinberg, T. 2006. *The Obsessive Quest for the Perfect Lawn*. New York: Norton.
- Statistics Canada. 2009. *Households and the Environment: 2007*. Ottawa: Ministry of Industry, Statistics Canada. <http://www.statcan.gc.ca/pub/11-526-x/11-526-x2009001-eng.pdf>.
- Taylor, D. 2008. *Public Space Lessons. Land in Limbo: Making the Best Use of Vacant Urban Spaces*. London: CABI Space. <http://www.cabi.org.uk/files/land-in-limbo.pdf>.
- Thompson, J. & Sorvig, K. 2000. *Sustainable Landscape Construction: A Guide to Green Building Outdoors*. Washington, DC: Island Press.
- Union of Concerned Scientists. 2008. Union of Concerned Scientists. <http://www.ucsusa.org>. March 18, 2008.
- Van der Ryn, S. & Cowan, S. 1996. *Ecological Design*. Washington, DC: Island Press.
- Wiegman, B. 2005. Evaluation of potentially successful barge innovations. *Transport Reviews* 25(5):573–589.
- Weston, L., Harmon, R., & Condzella, J. 2006. *Utilization of weed suppressive ground covers in nursery and Christmas tree settings for enhanced weed management and seed amelioration*. NY: Cornell University, New York State Integrated Pest Management Program. Ithaca. <http://www.nysipm.cornell.edu/grantspgm/projects/proj06/orn/weston2.pdf>.
- Wilson, E. 1984. *Biophilia*. Cambridge, MA: Harvard University Press.