Turning Brownfields into Greenspaces: Examining Incentives and Barriers to Revitalization

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Abstract This study employs interviews, document review, and a national survey of local government officials to investigate the factors that influence the success of efforts to convert underutilized contaminated properties into greenspace. We find that the presence of contamination continues to be a concern despite federal and state efforts to ease liability fears but also that site and project features can overcome this hurdle. In particular, jurisdictions appear more likely to convert distressed properties into greenspace if recreational parks, rather than open space, are planned, sites are already owned rather than available only through tax foreclosure, and the state is perceived as being supportive of the conversion. In addition, mixed public-private funding and site locations in residential areas are more likely to attract community support for conversion projects.

The redevelopment of brownfields — properties that contain abandoned or underused facilities in which expansion or redevelopment is complicated by real or perceived contamination — presents both a problem and an opportunity to the active-living community. Left unattended, brownfields have accumulated and dragged down the quality of life in numerous American neighborhoods, burdening local residents with shuttered businesses, empty lots, and polluted soil and groundwater. At the same time, many of these neighborhoods suffer from a shortage of greenspace

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for parks, playgrounds, gardening, natural open-space areas, and walking (Harnik 2001). Converting brownfield properties into greenspaces offers a potential solution to both problems, improving the natural environment by addressing contamination, as well as helping transform distressed neighborhoods into healthier human environments that provide more venues for walking, recreation, and other physical activities.

To realize such gains, however, potential brownfield-to-greenspace conversion projects must confront the financial realities of brownfields revitalization. Such revitalization typically is powered by the promise of housing opportunities or the economic gains—jobs, increased incomes, heightened tax revenues, for example—associated with commercial or industrial reuse. The benefits of greenspace, in contrast, frequently appear more invisible, qualitative, and longer term. As a consequence, conversions have frequently lacked the political champion necessary for implementation. Much of the federal and state financial support for brownfields redevelopment has contributed to this dynamic by focusing primarily on reuses designed to furnish more immediate economic gains.

Despite all of these challenges, scores of communities have successfully transformed contaminated properties into valuable parks and open spaces. Regulatory and programmatic changes in the wider brownfields arena that continue to reduce liability concerns, the emergence of dedicated funds to support brownfield-to-greenspace transformations, and the growing sophistication of local advocates have driven many conversions; such projects may now account for 5 percent of brownfields redevelopments in major cities, according to one estimate (De Sousa 2004). Our goal in this article is to explore a variety of policies and other factors that shape these conversions. To this end, we seek to (1) describe on-the-ground efforts to encourage the conversion of brownfields into greenspace and (2) systematically assess perceptions about the trade-offs among the incentives that can promote and the barriers that can hinder brownfields conversion. For our analysis, we rely on a series of interviews of state and local stakeholders involved in brownfield-to-greenspace conversions as well as a survey of the perceptions of nearly 450 officials with responsibilities that touch on these conversions.

Background on the Brownfields and Greenspace Nexus

The number of brownfields in the United States is not known with certainty, because no single registry of such sites has ever been developed—

the federal government does not maintain a roster of brownfield properties, and while some state governments do, the rosters are neither universal nor uniform in terms of what constitutes a brownfield. However, commentators place the number of brownfield properties in the range of hundreds of thousands nationwide, with some estimates as high as one million (Simons 1998; U.S. General Accounting Office [GAO] 1987; U.S. Environmental Protection Agency [EPA] 2007).

The origins of the brownfields problem lie in the economic activities — industrial, commercial, transportation, and residential — that have taken place over the last one hundred years that may have generated contamination, coupled with the specter of liability associated with the 1980 federal Superfund law.[1] Court interpretations of this law have held that a wide range of entities involved in a contaminated site — past and current owners, waste transporters, lenders, and local governments, for example — may be responsible for cleanup, even if they did not cause the contamination. This has cast a shadow over all sites at which contamination is present or suspected.

Since the late 1980s, most states have reformed their legislative and regulatory language and developed programs to encourage the redevelopment of brownfield properties. In addition, the federal Small Business Liability Relief and Brownfields Revitalization Act of 2002 authorizes up to $250 million per year to support brownfields redevelopment and clarifies the process by which new purchasers and users of brownfield properties can reduce their liability exposures. As a result of these and other reforms, brownfields redevelopment has greatly expanded over the last ten years. This has improved public health and the natural environment through site cleanups that reduce exposure to hazardous substances, and it has heightened economic activity as measured by such traditional impacts as job creation, increased incomes, sales, taxes, and the enhancement of off-site property values through spillover effects (Wernstedt 2004b).

The benefits of greenspace conversions can also be substantial, particularly in terms of off-site property impacts. The International Economic Development Council's (2001) examination of the off-site impacts of a half-dozen brownfield-to-greenspace projects estimates that property values in neighborhoods surrounding these projects have increased more than two times those in control neighborhoods lacking conversion efforts.[2]

1. The Comprehensive Environmental Response, Compensation, and Liability Act, or CERCLA (42 U.S.C. §§9601–9675).

2. More generally, McConnell and Walls's (2005) recent review of over sixty studies examining the nonmarket benefits of open space notes that while a number of site-specific features

Such property enhancements do not necessarily translate to widespread public support for greenspace conversions, but there is some evidence that conversion benefits can be attractive in a range of settings. For example, 90 percent of respondents to a survey by Greenberg and Lewis (2000) of residents in a New Jersey municipality — most of whom were lower-income renters — indicated that in brownfield redevelopments they preferred or strongly preferred greenspace uses (play areas and parks) to small businesses, stores, or factories. This, in part, reflects a demand for active-living features in core and inner-ring urban neighborhoods.

Although not specific to brownfield conversions, a number of other studies also suggest substantial health benefits associated with urban greenspace features, particularly for older residents (Tinsley, Tinsley, and Croskeys 2002; Godbey et al. 1998). Moreover, a large body of research has demonstrated the obvious: that urban environments lacking access to recreational infrastructure hinder physical activity (Saelens, Sallis, and Frank 2003) and that such activity can be substantially increased by enhancing urban design and environmental features in both residential and nonresidential settings (Duncan, Spence, and Mummery 2005; Zaza, Briss, and Harris 2005; Humpel, Owen, and Leslie 2002; Kahn et al. 2002; Zimring et al. 2005; Everett Jones, Brener, and McManus 2003). Sallis and Glanz (2006) recently highlighted the importance, from a health perspective, of recreational opportunities and access to places where children can be physically active on a regular basis. This requires adequate provision of outdoor and neighborhood spaces and places, including parks, commercial facilities, and urban greenways (Lindsey et al. 2004; Shafer, Lee, and Turner 2000; Braswell 1999; East Bay Regional Park District 1998; Scott and Moore 1995).

The nexus of brownfields, greenspace, and active living in urban environments has gained some attention at the policy level (see, for example, Hirschhorn 2002 and International City/County Management Association [ICMA] 2002), but it still remains relatively unexplored by policy, practitioner, and academic communities. From a practical perspective, this partly reflects the reality that relatively few brownfield-to-greenspace conversions have occurred.[3] The lack of local public financial support

critically influence that value of open space — the size of the area, its proximity to different kinds of land uses, and the type of open space — the studies generally demonstrate a value to preserving open space in urban areas.

3. The estimate cited in the text that 5 percent of brownfield projects in major cities in the United States have involved open space or recreational reuse is based on data from the U.S. Conference of Mayors (2003) annual survey of municipalities with brownfields. In contrast,

for site acquisition and remediation of a brownfield property, especially funds for the maintenance of greenspace, to support more active living can pose nearly insurmountable barriers absent private involvement or federal or state funds (Knee et al. 2001). Such private and external public involvement has appeared critical in most success stories. In addition, fee simple public acquisition of contaminated sites for greenspace creation historically has often been stymied by liability fears even when financial resources may have been available. While these fears have eased with the passage of liability reforms, private competition for brownfields has increased acquisition costs (Heberle and Wernstedt 2006). Alternative routes to public ownership of sites, such as tax foreclosures, may be unavailable in some jurisdictions that lack the political support for foreclosures as well as in jurisdictions that pursue in personam (taking action against a person) rather than in rem (taking action against property) foreclosures (Wernstedt and Hanson 2006).

For its part, much of the academic work related to greenspace conversions has focused on design and planning or environmental aspects (Kirkwood 2001; Braswell 1999; Harrison and Davies 2002; Burger 2000). The transformation of larger sites, especially waterfront areas, into parks, ball fields, and open space particularly has garnered attention (Lowrie, Greenberg, and Knee 2002; Lerner and Poole 1999; Garvin and Berens 1997). Such efforts can yield large amenities to help revitalize downtowns, although use of these features by residents of adjacent distressed inner-city neighborhoods is often very limited. However, several states have developed area-wide brownfield approaches to help revitalize such neighborhoods, and some literature has also appeared on this topic (Wernstedt 2004a).

A notable exception to the paucity of work on the potential health benefits of brownfield-to-greenspace conversions comes from a series of greenspace studies by De Sousa (2003, 2004, 2006). Although not focusing on active living per se, De Sousa's (2004) survey of twenty U.S. brownfield-to-greenspace project coordinators revealed that over one-half of the twenty projects involved the creation of both recreational land and open space, and eight of the twenty coordinators identified the provision

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De Sousa (2003, 2004) notes that about 20 percent of the reuse of derelict and vacant land in Scotland from 1993 to 2002 involved open space, recreation, and leisure space, and roughly the same proportion of British brownfield sites were converted into greenspace over the 1988–1993 time period. An estimated 10–15 percent of brownfields in the Netherlands become greenspace.

of recreation space as the most important objective of the conversion.[4] In De Sousa's (2003) earlier study of such projects in Toronto, Canada, interviewees identified public recreation as a key benefit in six of the ten projects examined. More recently, De Sousa (2006) has surveyed nearly five hundred users of three parks developed from brownfields in Chicago and Minneapolis. Nearly three-quarters of the users surveyed visit the converted parks at least once per week, with nearly 90 percent undertaking walking or hiking activities and about 40 percent either jogging or biking or both. The most frequently noted personal benefit of the greenspaces by the users was an increase in their physical activity. As for the effect on the quality of community life, a majority of the respondents viewed the greenspace as having a positive impact on the provision of trails, access to recreational areas, and improvements in personal health.

De Sousa's surveys and interviews of project managers and other stakeholders involved in brownfield-to-greenspace projects in Canada and the United States provide insight into the factors that encourage such conversions and those that retard it. In both settings, the presence of political leadership appears as one of the most frequently identified facilitators. However, while more than one-half of the Canadian interviewees selected community involvement and collaboration as an important factor to facilitate conversions, only 15 percent of U.S. respondents indicated this. A more important factor in conversions in the U.S. setting appears to be location in an area whose economic potential the project could enhance. Conversely, the four most frequently identified obstacles to the conversions include, in decreasing importance, the high costs of and lack of funding for conversions, remediation issues, land acquisition problems, and redevelopment and long-term maintenance issues.

Study Design

The above literature on brownfield-to-greenspace conversions and on greenspaces more generally suggests that a disparate set of factors shape the conversion of brownfields to greenspace. Many of the most important ones not surprisingly relate to financial constraints. They include the extraordinary costs of site remediation, expenses associated with main-

4. In contrast, park officials interviewed by Knee et al. (2001) from twenty-five cities around the country with recent park redevelopments indicated (in open- rather than closed-ended responses) that about one-third of smaller parks (five acres or less) had benefits from meeting recreation demands. For parks bigger than five acres, officials indicated that less than 20 percent of the projects entailed benefits from meeting recreation demands.

tenance of publicly owned parks and recreational areas, and the lack of revenue from recreational and open space uses (absent the imposition of user fees). Some of these constraints can be mitigated by external funding from federal and state programs — although these are oversubscribed and often limit awards to projects that support job-generating redevelopment activities — or partnering with private for-profit and nonprofit entities. In addition, at any given site, other forces that may depress interest in a greenspace conversion may include the project location and its surrounding land uses. Even if none of these constraints applies, demand for conversions also may be low if ample greenspace already exists.

Gaining a better understanding of these disparate factors — both barriers to and incentives for the conversion of brownfields into greenspaces and areas of physical activity — would be useful on two fronts. First, it would help delineate the types of brownfield settings most conducive to such conversions. Second, and related, a better understanding of the factors that shape the success of conversions could help to more effectively target local, state, and federal efforts to encourage brownfield-to-greenspace conversions to further active-living objectives.

In the first part of our study, we develop short vignettes of two state-level greenspace conversion initiatives. These are qualitative and center on a small set (ten) of telephone and in-person interviews conducted from December 2005 to February 2006 as well as on a review of relevant program documents. The two initiatives represent the only state-level efforts in the country known to us that have come to fruition, and the principal purpose of the vignettes is to highlight features to explore in the nationwide survey described later. For each state, we identified an initial contact based on our extensive prior brownfields work in the region (Wernstedt and Hersh 2006). From this initial contact, we generated a snowball sample of policy and project-level stakeholders (from both the public and private sectors), whom we then contacted to schedule interviews. Prior to the interviews, we circulated a list of general questions grouped into four categories. These relate to

- experiences with contaminated land (e.g., scale of land in question and barriers to its reuse),
- greenspaces (e.g., financial aspects of greenspace development and political support for its creation and maintenance),
- financial incentives (e.g., experience with grant program and recommendations for improvements), and
- active living (e.g., adequacy of greenspace resources and opportunities for improving physical activity in them).

In addition, for those interviewees linked with a specific project, we asked for information on that project.

In the second and more extensive part of our investigation, we used the interviews and follow-up contact as scoping sessions to design and administer a national-level survey of local officials and other individuals with responsibilities that bear on brownfield-to-greenspace conversions. This survey collected information on the relative importance of different barriers to brownfield-to-greenspace conversions and incentives to overcome them. Rather than asking direct questions about the importance of different factors to conversions, however, we elicited data on perceptions about how different attributes of brownfield-to-greenspace conversions jointly determine whether specific conversion projects are likely to be undertaken.

Methodologically, our approach in this second part rests on the use of choice experiment methods, which are widely used by marketing, transportation, decision analysis, and environmental valuation research for investigating and modeling individual decisions (e.g., Louviere, Hensher, and Swait 2000) to elicit preferences over different decision alternatives. Choice experiments are designed to assess what drives individual preferences over different alternatives. They present individuals with a choice between two or more exclusive alternatives, each of which consists of a specific bundle of attributes. Using statistical models for qualitative dependent variables (discrete choice models) to examine the elicited choice data then enables estimation of the quantitative trade-offs between the effects of different attributes on choices (see appendix A).

In this study, choice alternatives comprise different potential brownfield-to-greenspace conversion projects, which in turn comprise different attributes — site contamination, funding source, capital and operation/maintenance costs, surrounding land use, site ownership, and type of greenspace — each represented by two or more possible levels. For example, site contamination is a binary attribute with levels designated as "contaminated" and "not contaminated." Cost attributes comprise multiple monetary levels that reflect the potential variation in site redevelopment costs. Although each attribute comprises multiple levels, by definition, each attribute takes only one level for any single specific alternative.

While the choice experiment approach in principle allows exploration of dozens of attributes, sample size and cognitive considerations generally restrict attributes to a half dozen or so. Collecting informative data on preferences is ensured by using experimental designs that vary the levels

of the attributes across different choice alternatives and respondents. Generally, attributes in choice experiments can be qualitative (e.g., privately versus publicly owned sites) or quantitative (e.g., capital cost in dollars). In addition, attributes can be binary (e.g., contaminated versus noncontaminated sites) or comprise multiple levels, although multiple levels are often best incorporated in statistical analyses by defining multiple binary variables.

Obviously, everything else being equal, respondents will almost always prefer some attribute levels over others. For example, noncontaminated sites will be preferred over contaminated sites, and less costly projects will be preferred over costly ones. However, we are less interested in whether a certain attribute is considered good or bad (such information would be easier to obtain with direct questions) than in the implicit trade-offs between different attributes. For example, up to what level of cost difference do respondents continue to prefer noncontaminated sites to contaminated ones, and what is the trade-off for respondents between operation and maintenance (O&M) costs and capital costs? Choice experiments are specifically designed to discern these preferences by recovering the relative weights of different attributes.

The sampling frame for our survey comes from the Leadership Library Directory (LLD), a database of institutional decision makers across the country. We discuss the LLD in more detail in the fifth section, in which we also highlight characteristics of our recruited sample, but briefly our goal is to reach officials who are most likely to be involved with brownfield-to-greenspace conversions. Thus, in the LLD, we focus on staff in local public agencies with development ties and on elected local officials. This sampling frame necessarily limits the generalizability of results, but it allows us to employ a unique method to elicit perceptions related to brownfields redevelopment issues from a diverse and knowledgeable sample of officials focused on local issues across the nation. Moreover, while we recognize that the LLD cannot be considered a random sample of local decision makers because it likely overrepresents larger communities, such a bias may offer some advantages for our research insofar as larger communities may be more likely to have relevant experience with brownfield-to-greenspace conversions. Nevertheless, we caution that the reader should consider the limitations of our sampling frame when interpreting and generalizing the results we present.

State Level Brownfield-to-Greenspace Conversion Efforts

Policy-level promotion of brownfield-to-greenspace conversions to heighten active-living opportunities and provide health benefits is a relatively new emphasis in brownfields. We are aware of state-level initiatives to promote these goals in only Minnesota, Pennsylvania, and Wisconsin, and one of these — the Green Opportunities for Brownfields: Conservation Planning for Recycling Land effort in Pennsylvania — never went further formally than a brochure.[5]

Wisconsin

The Wisconsin Brownfields Green Space and Public Facilities Grants program was awarded $1 million from the 2001–2003 biennial budget and another $1 million from the 2005–2007 biennial budget to help communities in the state clean up brownfield sites intended for long-term public benefit (including greenspaces or recreational areas) by a local government. Of the nineteen projects receiving awards to date, all but two have an explicit park, greenspace, or active-recreation component.[6] Eligibility for the grants is restricted to local governments — including cities, villages, towns, counties, tribes — and redevelopment, community development, and housing authorities. Allowed expenses are largely limited to remediation and exclude acquisition and development costs.

The impetus for the greenspace and public facilities grant program came from the state's Brownfield Study Group. This comprises an advisory body of diverse interests — local and state officials, business representatives, attorneys, private consultants, environmental and health groups, and educators — that the state legislature established in the late 1990s to advise the Department of Natural Resources on brownfields reform (Wernstedt and Hersh 2006; State of Wisconsin 1999). Group members recognized that the principle brownfields grant program in the state stressed traditional

5. As noted by one reviewer, the neighboring states of Wisconsin and Minnesota have similar political cultures in some respects and may be more positively disposed to brownfield-to-greenspace conversions than most other states. They likely are not representative cases. However, our study of them served an important function in helping us to develop our survey questionnaire and the vignettes of the two states' efforts provide a flavor of the central issues involved in brownfield conversions.

6. Following the structure of the brownfields grant program in the state's Department of Commerce, the greenspace and public facilities grants program divides funding into separate pools for large (>$50,000) and small (<$50,000) grants, thereby increasing its appeal to a wider cross section of communities and state legislators. Both grant pools require local matches.

economic development objectives — taxes, jobs, and local and private investment — making it difficult for greenspace conversion proponents to compete for grants under the program's scoring criteria. Moreover, study group members were aware of situations in which the appropriate end use of a brownfields parcel was not privately led economic development. This was particularly the case in older communities around the state that could offer only limited recreational opportunities for their residents and yet lacked room for park expansion. In addition, contrary to the findings of De Sousa (2004) and Knee et al. (2001), state officials believe that in many of these communities, capital rather than long-term maintenance costs represents a big financial obstacle to greenspace development. Communities with strong economies face particular obstacles if appreciating land prices make potential parkland too costly to acquire.

At the site level, the role of funding is more complex. Our interviews suggest that the state funds typically do not make or break a greenspace development, but rather the grants provide a seed or an extra measure of security to project proponents and help build support within the community for committing local funds to leverage state support. In many communities with flat or declining revenues and the threat of cutbacks in city staff — older midsize cities in Wisconsin and Rust Belt states, for example — resistance to local public expenditures for what many may perceive as unnecessary luxuries is common. State support can alter this dynamic by dangling greenspace conversion and offering nonlocal dollars to help stem continued neighborhood deterioration, funds that will be lost to the community absent local buy in to a conversion project.

In addition, echoing Knee et al. (2001), an important factor at one project we examined was the combination of private and public funding. The publicly led greenspace conversion enhanced the potential value of a contemplated private investment adjoining the greenspace, heightening the firm's interest in locating a storefront that could take advantage of public exposure to the greenspace. The conversion effort in a formerly blighted neighborhood made the private investment less risky. From the public side, the greenspace conversion effort was the centerpiece of an effort to make the area more palatable to private investment, thereby stimulating overall recovery of the neighborhood.

Minnesota

Unlike Wisconsin's Department of Natural Resources, the Minnesota Pollution Control Agency (MPCA) has never developed a formal, state-funded

brownfield-to-greenspace conversion program. However, the MPCA has worked assiduously for a number of years with a broad coalition of interests to promote these conversions. This work originated with the National Heritage River Initiative, a federal National Park Service/EPA effort to designate rivers for which the federal government could provide technical assistance to local citizens' groups involved in river preservation efforts. A stretch of the Mississippi River in the Twin Cities area received such designation, and one of the working groups involved in the initiative's planning activities was on brownfields. It focused specifically on the conversion of brownfields to greenspace, both for amenity values and to reduce pollution from runoff at sites that generated wastes. Efforts to find sites that might fit these criteria expanded to include businesses, nonprofit land conservation groups, and community development agencies, and thirty-four potential projects were identified, about one-half of which are moving forward or have been completed at the time of this writing.

Like their Wisconsin counterparts, the MPCA staff recognized in the late 1990s that conversion projects could not compete with traditional brownfields development projects applying for funding from the state's Department of Employment and Economic Development. The conversions would yield few if any jobs and tax benefits. However, lacking a dedicated grant program for cleanups to support such conversions—efforts in 2002 for a $5 million bond proposal to fund assessment and cleanup grants in a proposed Brownfield to Greenspace Grant program failed to gain approval from the governor—the MPCA has taken two other approaches.

First, after passage of the 2002 federal brownfields law, MPCA management received approval from the EPA to give priority to conversion projects applying to the state for a Targeted Brownfield Assessment grant (which is supported by EPA funds). These grants, while not usable for site cleanups, can support site investigations and cleanup planning. Although not restricted to conversions, they give preference to sites where the proposed reuse contributes to a broader vision benefiting the community. As a consequence, ten of the thirteen sites that received Targeted Brownfield Assessment support from 2004 to 2006 have a brownfield-to-greenspace element. These ten sites have received a total of nearly $200,000 in assessment funds.

Second, the MPCA has helped to start and nurture a coalition of local and state agency representatives, nonprofit organizations, and private parties that has raised the visibility of brownfield-to-greenspace conversion issues. One early success was the awarding by the Legislative-Citizen Commission on Minnesota Resources—a committee of legislators and

citizens that makes funding recommendations to the legislature for natural resource projects — of a $10,000 grant to an environmental nonprofit organization to spearhead a pilot effort to encourage conversions. More recently, this coalition has encouraged the restoration of a signature twenty-seven-acre nature sanctuary along the Mississippi River in St. Paul at the site of a former railway switching yard. Although not receiving Targeted Brownfields Assessment funds, the restoration has moved forward largely because the visibility and viability of conversions has been raised. The project has attracted interest from a diverse set of stakeholders, including bike advocates, watershed districts, development corporations, neighborhood associations, national environmental organizations such as the Trust for Public Land, and an array of federal and local agencies. More than $10 million has been garnered to support land acquisition, cleanup, revegetation, restoration of wetlands, and trail construction.

Not surprisingly, much of the action in Minnesota on conversions has taken place in the state's metropolitan areas. For example, three-quarters of the thirty-four potential brownfield-to-greenspace projects noted above are located in one of the state's metropolitan areas, and twelve of the thirteen projects that received Targeted Brownfield Assessment money lie in the Minneapolis-St. Paul-Bloomington metropolitan area. Many of these projects may be located in smaller communities within these metropolitan areas, but our interviewees suggest that local capacity to develop a brownfield-to-greenspace project is a limiting factor for nonmetropolitan local units of government and nonprofit organizations. The interviewees also note the prevalent resistance to devoting redevelopment dollars to greenspace conversions in many of these areas. In particular, many agricultural and resource extractive communities with brownfield sites are struggling to regain an economic footing that provides employment for local citizens. While tourism and environmental amenities may offer greater economic development potential in the long run in these communities, shorter-term efforts to attract revenue and job-generating businesses often have made greenspace conversions a hard sell.

Lessons from the Wisconsin and Minnesota Experiences

Both the Wisconsin and Minnesota experiences echo some of the themes in the broader literature on greenspace conversions, particularly on the difficulty such conversions encounter when competing with brownfield redevelopment projects that offer tax and employment benefits. This

appears to be particularly problematic in Minnesota, where nonmetropolitan areas with limited economic opportunities have been less active than their metropolitan counterparts in applying for conversion support and in moving forward on projects. In both states, momentum for grants to help underwrite conversion projects that did not offer such economic benefits depended on broad coalitions of interests that could pressure the legislature and state environmental agencies to find funds to support conversions. In addition, because neither the Brownfields Green Space and Public Facilities Grants in Wisconsin nor the Targeted Brownfields Assessment grants in Minnesota fund acquisition or greenspace maintenance costs, projects receiving conversion money from state sources have had to cobble together support from a mix of public and private sources. However, even when dedicated conversion money is absent or small relative to other sources of support, many projects have moved forward because they have been able to use the support from the states' environmental agencies to leverage other funds.

At the local level in both states, the location of conversion projects appears to be a key factor for building support. Projects that are part of larger areawide redevelopment — particularly ones that combine private and public funding — make it possible to access higher levels of financial commitments from outside the greenspace arena and to generate revenue streams that can be capitalized to support greenspace investments. Similarly, projects that are seen as protecting or furthering community assets — areas with particular historical or ecological significance — have energized local stakeholders and attracted more community buy in.

Evidence from Wisconsin and Minnesota on other themes vetted in the greenspace conversion literature is less clear. Some, although not all, of our site-level interviewees noted the difficulty that long-term maintenance costs pose for greenspace conversions, but state officials argued that initial capital costs constitute a bigger hurdle. Problems with site acquisition also generated some discussion, particularly in the context of recent court decisions and subsequent legislative action on acquisition of property through eminent-domain proceedings. Finally, the nature of the greenspaces developed from brownfield sites differs notably between the two states. Most of the projects supported by Wisconsin's grant program have emphasized recreational facilities, while the Minnesota greenspace projects represent a broader mixture of both recreational parks and open space. This discrepancy likely relates partly to the different origins of the two states' initiatives.

National Survey

As noted in the third section, our national-level survey of officials who focus on local issues employs a set of choice experiments to elicit information on the incentives, barriers, and potential for conversions of contaminated land to greenspace. The structured questionnaire presents respondents with a series of paired hypothetical greenspace-development alternatives on a previously used but currently vacant property. The alternatives differ in six attributes:

- the type of project (nature park with few developed facilities, recreational park),
- status of site acquisition (already owned, available through tax foreclosure),
- state grant (available, not available),
- site contamination (present, not present),
- expected capital cost of the project to the jurisdiction, and
- expected annual O&M costs of the project to the jurisdiction.

These follow from the principal themes of the literature discussed in the second section of our article and were developed from interaction with our interviewees in Wisconsin and Minnesota in lieu of formal focus groups (which are frequently employed to develop choice experiments). As figure 1 shows, each respondent is asked to indicate which of two hypothetical alternatives with different values or conditions in the six attributes is more likely to be developed.

Following the first choice question, the survey has two more similarly structured choice questions related to the likelihood of development, with the conditions varied among the set of six attributes. It then presents two additional choice questions related to the likelihood of community support for different alternatives, each with a set of four attributes:

- end use (nature park with few developed facilities versus recreational park),
- project neighborhood (residential versus commercial versus industrial),
- funding sources (public only versus mixed public and private), and
- amount of public funding required for implementing the project.

In each of the latter choice questions, respondents are asked to indicate which alternative "would the community more likely support?"

Across all respondents and both types of choice questions, the survey

Consider the following hypothetical greenspace development scenarios, A and B. (Please assume that they differ only with respect to these attributes.)

Project Conditions	A	B
1. Project Type	Nature park	Recreational park
2. Site Acquisition	Already owned	Already owned
3. State Grant	Available	Not Available
4. Site Contamination	Not present	Present
5. Capital Cost	$2 million	$100,000
6. Operation and Maintenance Cost	$ 25,000 per year	$50,000 per year

B. 1. Which project do you find more likely to be developed, A or B? (Please check only one. If both unlikely, check the more likely alternative.)

- A
- B

Figure 1 Likelihood of Alternative Developments, Attributes, and Choice Question Illustrated

uses a wide variety of combinations of attribute levels to ensure that the relative importance of different attributes can be statistically estimated. The attribute levels were chosen using the principles of statistically efficient experimental design for choice experiments (e.g., Louviere, Hensher, and Swait 2000). Appendix B contains a more detailed explanation of this design.

Survey Administration

The LLD, as noted earlier, is a database of institutional leaders across the United States. It includes contact information and job functions of approximately four hundred thousand individuals from forty thousand leading U.S. government, business, professional, and nonprofit organizations. From this universe of contacts, we identified two subsets of survey

recipients by using the information available through the database: (1) individuals who work chiefly at the local level and who fit within specific job subject criteria and (2) elected local officials.

For the first subset, which contains 1,807 individuals, we identified all individuals in the database who worked in organizations that cover local planning and development, community development, economic development, environment, outdoors, policy and planning, real estate, recreation, or urban and city issues. Of these, the environment category is the largest, containing 1,174 individuals, followed by planning and development (533) and recreation (364). No local officials are identified in the community development, outdoor, or urban and city issues subject areas. The second subset, elected local officials, contains an additional 3,237 contacts. Together, the two subsets include 5,044 individuals from every state, with California (612), Florida (443), Texas (368), New York (268), Virginia (254), and Ohio (185) providing the most.[7]

Prior to fully implementing the survey in the field, we pretested the questionnaire and survey logistics, both in house with staff in our organization and by conducting a pilot survey of a total of two hundred individuals, whom we randomly selected from the elected and other officials' subsets of our sample. We then posted an electronic version of it on a secure Web site and invited via e-mail the potential respondents from our LLD sampling frame to complete it. Each respondent was provided a unique link to the Web survey, which enabled us to control for multiple responses by a single respondent. The e-mail explained that we were conducting research on redevelopment issues — especially those concerning the provision of greenspace and promotion of active living — and that we would like to learn about the e-mail recipient's views and experiences regarding this topic. The e-mail also noted that survey responses would be used for research and no other purpose and that more detailed descriptions of our institutions and the survey itself were also available through the link. In addition, we welcomed survey recipients to contact us by e-mail regarding any questions or concerns about the survey.

We conducted the final survey during a three-week period in August

7. All of the information presented for Leadership Library Directory (LLD) entries is verified with their offices of employment. There are no benefits to participation in the LLD, and all requests for removal of information are honored. Overall, the LLD includes entries from 333 different cities and 145 counties. This provides a large number of individuals in different institutions, areas, and job functions, but as a whole it does not represent a random sample of policy actors. For example, at the local government level, in which we are most interested, the LLD is weighted toward jurisdictions with one hundred thousand or more residents.

2006. Our first participation request went out through e-mail to 3,109 elected officials and 1,735 other officials who had not received the pilot survey, for a total of 4,844 questionnaires. After the first e-mailing, a total of 601 survey requests bounced back due to invalid e-mail addresses or some other factor, yielding a viable sampling frame of 4,243 officials. The large majority of these — about 94 percent — work for town, city, and county governments, with the remainder representing regional entities, special districts, and nonprofit organizations. We sent nonrespondents a reminder e-mail three business days after the first e-mailing and a second reminder to every continuing nonrespondent a week after the first e-mailing.

Respondent Characteristics

The use of the online format allowed us to collect a nationwide sample with relatively modest resources, yielding a total of 446 unique respondents from our 4,243 unit sampling frame. This represents an overall response rate of 10.5 percent, with 92 percent of the respondents coming from local government offices and the remainder from nongovernmental organizations focused on local issues. The response rate is comparable to other online surveys (e.g., Kaplowitz, Hadlock, and Levine 2004) — which have had response rates in the 5 – 15 percent range — and to rates from mail surveys of private developers and corporate financial officers that have asked analogous project evaluation questions (Wernstedt, Meyer, and Alberini 2006; Brounen, Jong, and Koedijk 2004; Graham and Harvey 2001; Trahan and Gitman 1995).

Individuals from every state except Rhode Island and Arkansas participated in the survey (see table 1 for a summary of respondents at the regional level). While chi-square tests suggest that these respondents are distributed somewhat differently across regions than the sampling frame would suggest — the test statistic for cross-regional comparisons was 21.1 versus a 5 percent critical value of 11.07 — the differences are not large. In addition, summary statistics show that our respondents' characteristics on a number of socioeconomic and demographic variables closely resemble those of nonrespondents. For instance, the weighted mean population of our respondents' jurisdictions is 692,183 (compared to 653,976 for the nonrespondents); population density is 3,166 residents per square mile (versus 3,421 residents per square mile); median annual household income is $42,921 (versus $43,173); and annual per capita real estate taxes are $682 (versus $693).

Table 1 Regional Distribution of Respondents

Region	Count	Percentage
Northeast	46	10.4
South Atlantic	147	33.1
North Central	84	18.9
South Central	64	14.4
Mountain	34	7.7
Pacific	69	15.5
Total	444	100.0

Note: State was not determined for two respondents.

Table 2 shows that survey respondents bring a variety of job descriptions. Nearly one-third are elected officials and almost one-fifth have planning or zoning responsibilities, followed by parks and recreation and other environmental or natural resources. Each of these fields bears on greenspace development. In addition, nearly all respondents are familiar with greenspace development projects (figure 2) and more than three-quarters indicate that they are at least somewhat familiar with development projects on contaminated land. More than three-quarters also indicate that their communities have witnessed conversions of brownfields into greenspace.

Discussion of Estimation Results—Development Likelihood

A total of 368 respondents answered at least one choice question about the hypothetical scenarios in our questionnaire, with 340 of these furnishing responses to each of the five choice questions. This yielded a total of 1,758 choice responses, divided between our development likelihood (1,074) and community support (684) sections. These responses are the basis for estimating the relative weighting of the different attributes through application of a conditional logit model.[8]

The general conditional logit model is a probability model, which pre-

8. The approach to modeling the data with a conditional logit model was developed by McFadden (1974) and expanded upon by Ben-Akiva and Lerman (1985). It represents choice probability as a nonlinear function of a latent underlying index function, which is usually estimated as a linear function of individual attributes in different choice alternatives. Conditional on independent variables, the error term is posited to follow the logistic distribution; hence, the model is called a conditional logit model. Appendix A discusses the model in more detail.

Table 2 Respondents' Job Categories

Job Category	Frequency	Percentage
Administrative/public works	33	7.4
Economic/community development	22	4.9
Elected official	147	33.0
Parks and recreation	77	17.3
Other environmental or natural resources	58	13.0
Planning/zoning	65	14.6
Real estate	2	0.4
Other	42	9.4
Total	446	100.0

dicts the likelihood of a certain choice out of any number of alternatives, in our case, one choice out of two. Each alternative contained different values or levels of the six attributes in the case of the likelihood choice, or of the four attributes in the case of the community support choice. A ratio comparison of each pair of coefficients from the conditional logit model provides a sense of the preference weighting or relative effect of each pair of attributes in choices stated in the survey.

Figure 1 presents the six attributes for the likelihood choice scenarios. We represent these as

- PROJECT, equals 1 if the project represents a recreational park, 0 if the project represents a nature park (open space accessible to the public but with no developed facilities other than trails);
- OWNERSHIP, equals 1 if the project site is already under the ownership of respondent's jurisdiction, 0 if site ownership would be obtained through tax foreclosure;
- GRANT, equals 1 if a state grant is available, 0 if no state grant is available;
- CONTAM, equals 1 if contamination is present at the site, 0 if the site is not contaminated;
- CAPCOST, a continuous variable representing the expected capital cost; and
- OMCOST, a continuous variable representing the expected annual O&M costs.

The questionnaire also collects information to construct two indicators that reflect respondents' familiarity with the development of greenspace, previously used property, and contaminated land:

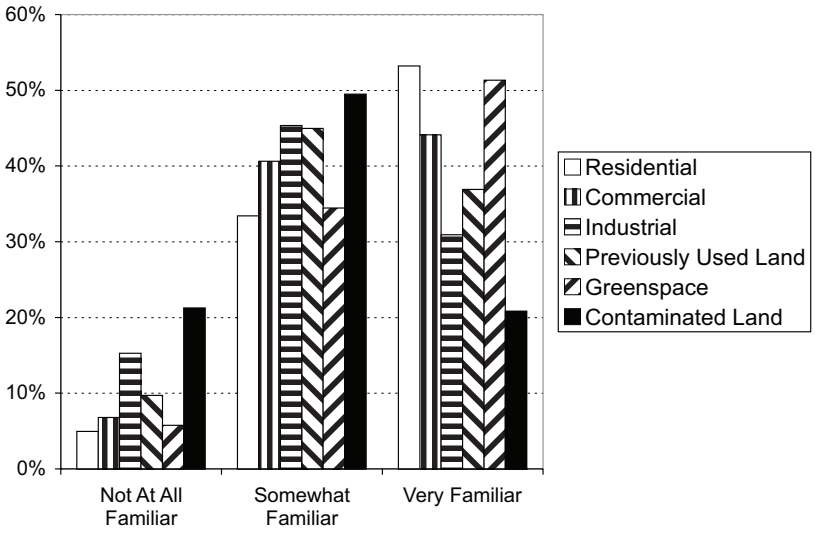

Figure 2 Familiarity with Different Types of Development

- FAM1, equals 1 if the respondent is familiar with the development of contaminated land, 0 if the respondent is not familiar with the development of contaminated land; and
- FAM2, equals 1 if the respondent is very familiar with developing greenspace, previously used properties, or contaminated land, 0 if the respondent is not very familiar with any of these.

We will use FAM1 to examine whether familiarity with developing contaminated land influences how contamination is weighted in the choice. FAM2 allows us to examine whether familiarity with these development types has implications for how heavily capital and O&M costs weigh in respondents' decisions.

Table 3 summarizes the estimation results.[9] "Model 1" is a baseline model, which predicts the average effects of different attributes. "Model 2" adds FAM1 and FAM2 interaction effects, which control for the respon-

9. In a preliminary analysis, we examined whether data from the two subsamples from our LLD database, elected officials and municipal officials, are sufficiently similar to be pooled. A likelihood ratio (LR) test clearly suggested that constraining model parameters to be equal across these two subsamples does not significantly reduce the model fit in a statistical sense (LR-test statistic = 1.96, critical value with six degrees of freedom = 12.69). Because of the parameter invariance between elected officials and municipal officials, we can pool their data (e.g., Hensher, Louviere, and Swait 1999).

Table 3 Development Likelihood, Conditional Logit Estimates

	Model 1			Model 2		
Parameter	Estimate	|*t*-value|	Probability	Estimate	|*t*-value|	Probability
PROJECT	0.2586	2.732	0.006	0.268	2.813	0.005
OWNERSHIP	0.5485	5.515	0.000	0.562	5.593	0.000
GRANT	0.3711	3.692	0.000	0.384	3.788	0.000
CONTAM	–0.4825	5.104	0.000	–0.595	5.451	0.000
CAPCOST	–0.0583	7.288	0.000	–0.040	3.781	0.000
OMCOST	–1.8954	8.897	0.000	–1.624	5.758	0.000
FAM_1*CONTAM	–	–	–	0.442	1.972	.
FAM_2*CAPCOST	–	–	–	–0.042	2.534	.
FAM_2*OMCOST	–	–	–	–0.593	1.398	.
Log-Likelihood	–615.04			–609.20		
Pseudo-R^2	0.174			0.182		

Note: Number of observations is 1,074. For the pseudo-R^2, the likelihood function with all parameters at zero is calculated using a fifty-fifty chance of choosing either A or B. This model gives a log-likelihood value –744.44.

dent's familiarity with the development of greenspace, previously used property, and contaminated land.

Estimates from Model 1 are statistically significant and have expected signs, suggesting that each attribute presented in the survey correlates with the perceived likelihood of a respondent's jurisdiction in developing a specific project. More specifically, PROJECT, OWNERSHIP, and GRANT have positive coefficients, suggesting (everything else being equal) that

1. jurisdictions are more likely to develop recreational rather than nature parks,
2. sites already under a jurisdiction's ownership are more likely to be developed than those available only through tax foreclosure, and
3. the availability of a state grant increases the likelihood that a project will get developed.

The absolute weight of CONTAM is nearly as large as the weight of OWNERSHIP, implying that contamination and the lack of site ownership by the jurisdiction pose similar barriers to the conversion of brownfields to greenspace. The estimation results also suggest that the weight of OWNERSHIP is about twice the weight of PROJECT (0.549/0.259) and about 1.5 times (0.549/0.371) the weight of GRANT.

The estimated CONTAM parameter suggests that

4. sites with known contamination are less likely than uncontaminated sites to be chosen for development, even when remediation costs are controlled for.

The estimates of the CAPCOST and OMCOST parameters suggest that

5. increases in capital costs and annual maintenance costs decrease the likelihood of development.

The parameter estimates of these two monetary attributes imply that $1 in annual O&M costs has a weight equal to $33 of total capital cost.

Interestingly, estimates from Model 2 suggest that respondents familiar with the development of greenspace, previously used properties, or contaminated land differ significantly in a statistical sense in how they consider capital costs in relation to project development. This is suggested by the FAM2*CAPCOST coefficient, which has a negative and statistically significant coefficient. The FAM2*OMCOST coefficient also is negative but not statistically significant. In addition, the FAM1*CONTAM parameter, which interacts CONTAM with familiarity with developing contaminated land, has a statistically significant and positive coefficient. This suggests that

6. respondents very familiar with developing contaminated land view contamination as a lesser barrier to development than do other respondents.

Figure 3 illustrates changes in the likelihood of development due to changes in each qualitative attribute (these are calculated using equation 1 in appendix A). For example, projects on noncontaminated sites are perceived to be developed with a likelihood of 61 percent versus a likelihood of 39 percent for projects on contaminated sites. Stated differently, noncontaminated sites are more than 1.5 times (0.61/0.39) more likely to be developed into greenspace than contaminated sites, everything else being equal. Similarly, the responses to the choice alternatives suggest that respondents perceive that sites already owned have a 63 percent likelihood of being developed compared to a 37 percent likelihood for sites that need to be acquired through tax foreclosures.

We also can estimate a monetary value for each of the nonmonetary attributes included in our choice experiment by examining the ratio of the coefficient of the attribute to the coefficients of the monetary variables. The capital cost attribute presents the most straightforward means for

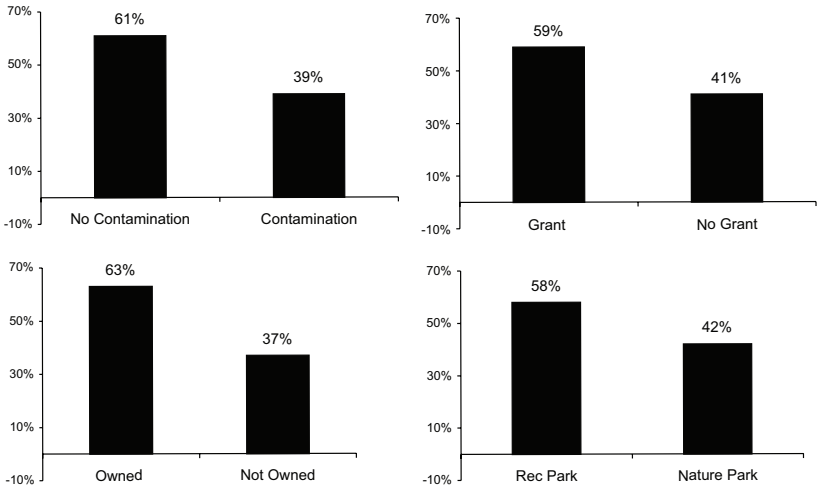

Figure 3 Attribute Levels and the Relative Likelihood of Development

doing so, insofar as it allows us to estimate a lump sum amount of money equivalent to the worth of the attributes as assessed by respondents.[10]

Figure 4 presents these equivalent values categorized by the respondents' familiarity with the development of greenspace, previously used properties, and contaminated land. The "very familiar" category — which represents 45 percent of our sample — comprises respondents who indicate that they are very familiar with at least one of these development types. As the figure highlights, the estimated values of the attributes appear to relate to respondents' familiarity with the development of greenspace, previously used properties, and contaminated lands. For example, the monetary value of the PROJECT attribute that represents park type is less than one-half as high for those very familiar with such development than for those less familiar with it. This suggests that respondents in the very-familiar subgroup perceive that their jurisdictions value recreational parks

10. One also could assess the monetary trade-offs by using the operation and maintenance (O&M) cost parameter, but this calculation would not capture the net present value of the stream of O&M costs. Aspects such as the perceived difficulty of ensuring revenue streams for O&M expenses, an unknown discount rate, uncertain project timelines, and possible local-level fiscal constraints make it impossible to estimate our O&M costs in present value terms. However, the size of the difference of the capital and O&M cost parameters suggest that O&M costs would outweigh capital costs, dollar for dollar, with any realistic discount rate and project horizon. Moreover, our examination of the Wisconsin and Minnesota initiatives revealed that capital and O&M costs are perceived differently at the local level. Therefore, separating these costs in the experimental design was important to facilitate reliable estimation of trade-offs between capital costs and different site conditions.

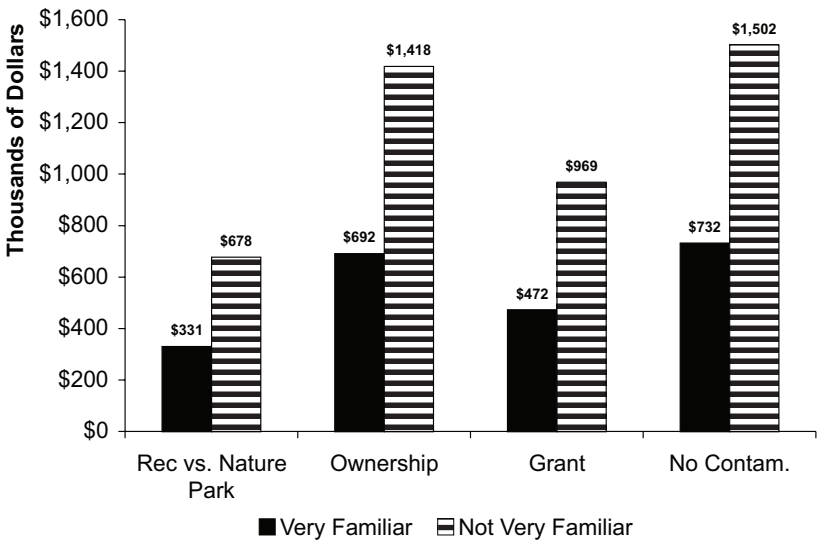

Figure 4 Estimated Trade-offs between Project Conditions, Capital Cost, and the Development Likelihood, Relative to Respondents' Familiarity with the Development of Greenspace, Previously Used Properties, or Contaminated Land

$331,000 more than nature parks, while respondents in the less-familiar subgroup value such parks $678,000 higher than nature parks. Another interpretation is that while both subgroups perceive that recreational parks are more likely to be developed than nature parks when costs are identical, the very-familiar subgroup perceives that with a relatively low-cost differential ($331,000) between the two types of greenspace, they are equally likely to be developed.

Similar differences between the two subgroups appear in the other bars in figure 4. They are perhaps most striking for the contamination attribute. Estimates of monetary trade-offs suggest that site ownership is valued at approximately $730,000 for those very familiar with the listed development types and about $1.5 million for those less familiar. As our earlier results indicated, the mere presence of contamination imposes a significant barrier to greenspace conversion — potential remediation costs are already included in each project's capital costs, so the perceived reluctance to take conversion projects with contamination suggests a residual risk not accounted for in project economics — even for those very familiar with this type of redevelopment. However, this subgroup indicates that if

project costs associated with a brownfield-to-greenspace conversion were roughly $730,000 lower than the costs associated with a greenspace development on uncontaminated land, the projects would be equally likely to be developed. Such savings could come in the form of lower acquisition costs, for example. For those respondents less familiar with such developments, the cost savings would have to increase nearly $800,000 for the two projects to be equally likely.

Discussion of Estimation Results: Likelihood of Community Support

The choice questions that asked respondents to indicate their views on expected community support for different projects contain four attributes:

- ENDUSE, equals 1 if the project would develop a recreational park, 0 if a nature park;
- RESIDENTIAL and COMMERCIAL, dummy variables equal to 1 if the project is located in residential or commercial neighborhoods, respectively, 0 if otherwise;
- FUNDINGMIX, equals 1 if the project involves both private and public funding, 0 if only public funding is involved; and
- COST, a continuous variable representing the expected capital cost of the project to the local jurisdiction.

Table 4 presents the estimation results from the community support model. Again, the coefficient estimates are statistically significant with expected signs. Only the coefficient ENDUSE is not unequivocally statistically significant at the conventional level ($p = 0.055$). These results suggest that respondents believe a local community is more likely to support projects in commercial rather than industrial neighborhoods and that yet more community support is expected for projects in residential neighborhoods than for projects in commercial areas. They also suggest that (everything else being equal) a mixture of private and public funding is viewed as more likely than only public funding to generate public support.

Trade-offs between different attributes are assessed similarly as in the development likelihood choice. Figure 5 illustrates the monetary trade-offs between different project conditions associated with this public support. For example, the respondents indicate that the public is as likely to support a project with a mixture of public and private funding — the bar

Table 4 Community Support, Conditional Logit Estimates

Parameter	Estimate	|*t*-value|	Probability
ENDUSE	0.2268	1.9200	0.0548
COMMERCIAL	0.5397	3.8360	0.0001
RESIDENTIAL	1.1149	7.3400	0.0000
FUNDINGMIX	0.4251	3.8140	0.0001
COST	–0.0760	–7.3400	0.0000
Log-Likelihood	–393.95		
Pseudo-R^2	0.167		

Note: Number of observations is 684. A model with all parameters at zero gives a log-likelihood value -474.11.

on the right side of the figure — as an alternative project with $559,000 lower capital costs but only public funding. We also see the same kind of gap for community support for recreation versus nature parks that we observed in our development likelihood scenarios. Based on their choices, the respondents indicate that the community is equally likely to support a recreation park as a nature park that costs nearly $300,000 less. If the cost difference were more than $300,000, the community might be more likely to support a nature park with few developed facilities, but this could be a steep price differential to overcome.

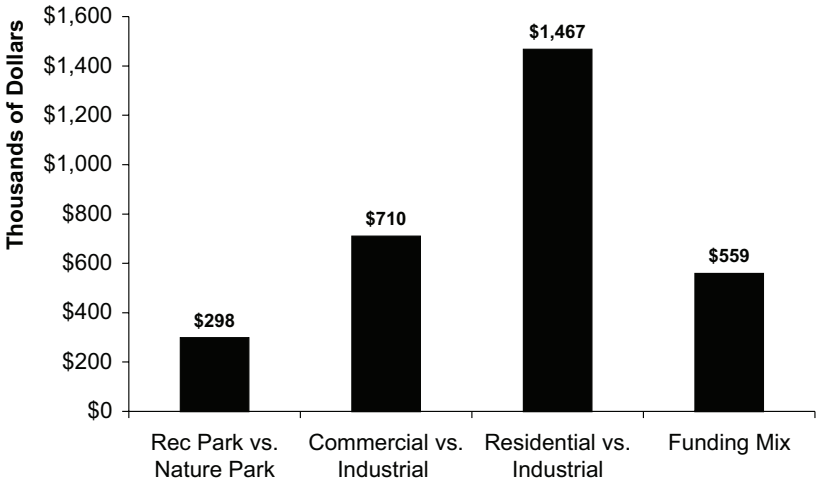

Figure 5 Estimated Trade-offs between Project Conditions, Capital Costs, and Potential Community Support

Finally, although we have presented estimates of both relative and dollar trade-offs between different attributes, these results are best interpreted with an eye toward general indicative trends and relative rather than absolute magnitudes. Two primary factors call for this caution in interpretation. First, the survey relied on hypothetical scenarios, collecting information on stated rather than actual preferences and reflecting perceptions rather than empirically observed behavior. Second, it is not feasible to comprehensively assess how well our respondents represent the entire target population of officials interested in local issues.

Conclusions

The literature on greenspace and brownfield developments has identified a number of factors that can influence the conversion of contaminated properties to recreational parks and open space. In this study, we combine qualitative interviews and a survey of officials to estimate the relative importance of some of these factors to the likelihood that local jurisdictions would be willing to undertake different brownfield-to-greenspace conversion projects. We also have assessed the relative importance of the different factors in attracting community support for these conversions.

Some of the factors discussed in the literature that impede redevelopment efforts are hardly unique to brownfield-to-greenspace projects — strained public budgets, limited technical capacities, competing priorities — but contamination appears to impose a particular burden. Our survey results suggest that even when projected cleanup costs are accounted for in a prospective conversion project, local officials, particularly those who are less familiar with redeveloping contaminated land, may remain leery of taking on the higher risks associated with a contaminated property. Liability at brownfield sites remains complex, even as statutory reforms have mitigated its reach (see, e.g., Chang and Sigman 2007), and our results are consistent with literature that suggests it also remains a concern for private developers with less experience working with contaminated sites (Wernstedt, Meyer, and Alberini 2006).

Notwithstanding possible concerns over such liabilities, greenspaces continue to be developed from contaminated land, as both our survey results and our vignettes of Wisconsin and Minnesota conversion initiatives highlight. Several site-specific factors appear to increase the likelihood of such conversions and community support for them. These include existing public ownership of the site and location in a residential or, to a

lesser extent, a commercial area (rather than an industrial area). In addition, the availability and type of funding appears to influence the prospects for converting a contaminated property into a greenspace. Not surprisingly, more state financial support increases the probability of a conversion taking place, but even after controlling for the external amount of money available, conversions seem more likely to happen simply because the state is seen as a partner in the project. Our examination of projects in Wisconsin confirms this. Moreover, both our case examinations and our survey indicate that a mix of private and public funding seems to boost community support for conversion.

On the flip side, funding limitations work in the opposite direction, particularly with respect to longer-term O&M costs. Much of the literature that discusses these costs indicates that they can be more problematic than initial capital costs. While the evidence from our interviews is mixed on this score, our survey results are not. They imply, with any realistic assumptions about the appropriate discount rate, that higher maintenance costs are more likely to decrease the likelihood of conversions than an equivalent amount of higher capital costs.

The results from our choice experiments are best interpreted as pointing to general, nationwide factors influencing conversions. While the reliance on generalized hypothetical scenarios is informative, its necessary consequence is that potential lessons from individual cases remain less well examined. Clearly, a number of different factors not examined by our survey will shape brownfield-to-greenspace conversions in some situations including, for example, political infighting and bargaining over conversion projects. In fact, a central lesson from our brief vignettes of the Wisconsin and Minnesota experiences is that encouraging the interaction of different conversion proponents in broad coalitions is sometimes essential. In the Minnesota nature sanctuary site in particular, this interaction has moved the project forward by substituting broad-based engagement for difficult-to-secure dollars. Such political dynamics and other potentially important subtleties warrant future research, but they are more amenable to investigation through detailed case studies rather than through a survey approach.

Finally, although our interviews and survey do not emphasize the active-living features of brownfield-to-greenspace conversions per se, our study results are directly relevant to active-living efforts. Survey respondents indicate clearly that greenspace conversion projects including recreation facilities are more likely to be developed and to gain community support

than nature parks without developed facilities for recreation. Although the latter can furnish active-living opportunities such as trails for hiking—and some literature suggests that green areas can improve psychological health and reduce stress simply by being visible in a community (see, for example, Kaplan 2001)—recreational facilities provide a more direct tie to physical activity.[11]

Communities with contaminated properties can follow the lead of the scores of brownfield-to-greenspace projects that already have been implemented around the country. This is not an easy task because, even with potentially lower site acquisition costs, the combination of the extraordinary costs of cleanup and the limited job benefits thrown off by such conversions may pale in comparison to more traditional brownfield redevelopments. However, there is ample evidence that greenspace can increase the value of surrounding properties, thus providing an economic argument for conversion, and a number of federal and state grant and tax incentive programs are available that can help offset cleanup costs. Taking advantage of the opportunities of brownfields offers a potential win-win solution for helping to transform distressed neighborhoods into healthier, walkable, more vibrant environments.

11. In a set of concluding questions in our survey, more than 85 percent of respondents indicated that their jurisdiction was supporting recreational programs that encouraged physical activity. In addition, nearly 75 percent noted that active living was an important or emerging policy issue in their jurisdiction.

Appendix A

We examine the elicited choice data by using a logit model (McFadden 1974). The general conditional logit model is a probability model, which predicts the likelihood of a certain choice out of any number of alternatives. In our case, respondents identified one choice out of two particular alternatives, *A* and *B*. In the following, let x_i^A and x_i^B be the vectors of *m* attributes of alternatives *A* and *B* presented to respondent *i*. Attributes can be measured as either continuous or discrete variables. The probability that respondent *i* selects alternative *A* is determined as

$$P(A) = \frac{\exp(V_i^A)}{\exp(V_i^A) + \exp(V_i^B)} \qquad (1)$$

where $V_i^A = \beta_1 x_{i1}^A + \beta_2 x_{i2}^A ... + \beta_m x_{im}^A$ and $V_i^B = \beta_1 x_{i1}^B + \beta_2 x_{i2}^B ... + \beta_m x_{im}^B$.

Although this model views each choice as a function of attributes only, individual specific variation can be examined by interacting individual characteristics with different attributes.

Using the method of maximum likelihood, the vector of coefficients $\beta = [\beta_1, \beta_2 ... \beta_m]$ can be estimated for identifying the relative weights of different attributes. Letting y_{is} equal 1 when respondent *i* prefers choice *A*, and 0 otherwise, the log-likelihood function with I respondents and S experiments per respondent is

$$\log L(y_i; \beta) = \sum_{i=1}^{I} \sum_{s=1}^{S} y_{is} \log P(A) + (1 - y_{is}) \log(1 - P(A)) \qquad (2)$$

Using the estimation results, the weight a respondent places on attribute *k* relative to attribute *l* is estimated as

$$\lambda_{kl} = \frac{\beta_k}{\beta_l} \qquad (3)$$

Estimates of relative weights between different attributes give a sense of how individuals, on average, trade off two attributes against each other. Ratios greater than one suggest more weight is placed on attribute *k*, with the magnitude of the ratio reflecting the strength of these relative weightings (e.g., Louviere, Hensher, and Swait 2000).

Appendix B

Statistically, the survey design was based on a full factorial (i.e., all possible combinations of different attributes and their levels were examined) design for nonmonetary (qualitative) attributes combined with orthogonally (independently) selected monetary attributes (capital and operation and maintenance [O&M] costs). Consequently, our full experimental design allows in principle the estimation of all main effects and their interactions. Having four attributes with four levels, constructing a full factorial design requires eliciting data concerning 120 differently configured pairs of alternative redevelopment projects. (A total of 16 [2^4] different alternatives can be constructed from four attributes with two levels per each attribute. The number of unordered subsets of 2 alternatives from a total of 16 alternatives is: $\frac{16!}{2!*14!} = 120$.) These pairs contrast every possible combination of our qualitative attributes. Capital and O&M costs were then randomly assigned for each alternative so that capital costs were drawn from six levels ($100,000, $250,000, $500,000, $1,000,000, $1,500,000, and $2,000,000) and O&M costs from five levels ($5,000, $10,000, $25,000, $50,000, and $75,000). Given that three choices were presented to each respondent, this design requires using forty different questionnaire versions.

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