BEATING THE PROPERTY BARRIER: BUILDING COMMUNITY TO BUILD ECOLOGY IN CITIES

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1 ABSTRACT
Many cities are under increasing pressure to maintain crucial ecosystem services with limited public open space, yet private residential landscapes often occupy an additional, untapped quarter of the urban land base (Evans, Newson & Gaston, 2009; Gaston, Warren, Thompson & Smith, 2005; Loram et al., 2007, Mathieu, Freeman & Aryal, 2007). Cities face a dilemma: how might they best engage private landowners in improving their own landscape performance? As strategies to catalyze stewardship on private property emerge (Cerra, 2014) alongside research suggesting that direct engagement with landowners is an effective tool for encouraging landscape changes (van Heezik, Dickinson & Freeman, 2012; Goddard, Dougill & Benton, 2013), can a combined process of community visioning and site-by-site design influence landowner motivations for change? This paper discusses a three-year studio effort to engage three communities in such a process, each with a different primary interest— including urban habitat enhancement, water quality and climate adaptation. In collaboration with the landowners, students in each of the studios outlined a project vision and goals, developed ecological neighborhood design guidelines, created individual parcel designs, and calculated the potential environmental benefits of their designs. Hands-on “client” engagement significantly influenced student design decisions as they navigated tensions between environmental performance and residential aesthetics. Landowners expressed satisfaction with the results of the process; 80% of survey respondents indicated that their individual interests were heard and reflected in the community approach, while 70% or more rated their design as “just what I need” to meet identified neighborhood-level goals. While few respondents indicated they would implement all of their property’s design, 70% said they were likely or very likely to implement some of it. Ongoing installation of the designs is also described as an indication of how engaged, design-based stewardship strategies may inspire collaboration and change landscapes for the benefit of cities.

1.1 Keywords
Community engagement, service learning, stewardship, urban habitat, water quality

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2 INTRODUCTION

With over 50% of the human population living in cities (and climbing), global urbanization has been and will continue to be a major landscape driver. Urbanization has major effects on environmental processes, including urban ecosystems (Pouyat et al., 2007). Urbanization also increases stormwater runoff into streams, impacting stream hydrology, chemistry and habitat in urban watersheds (Arnold and Gibbons, 1995; Paul and Meyer, 2001). Another concern for cities is climate change and its anticipated impacts on urban areas (Gill et al., 2007; Semadeni-Davies et al., 2008).

At the same time, as cities grow and change they are under increasing pressure to enhance their environmental performance to meet regulatory requirements, address community interests or for other reasons. However, the areal footprint of public property—the land base that municipalities can most easily influence—is limited; privately-owned greenspace, on the other hand, comprises nearly a quarter or more of the entire urban land base in cities studied (Evans, Newson & Gaston, 2009; Gaston et al., 2005; Loram et al., 2007; Mathieu et al., 2007). Privately-owned greenspaces have considerable potential to contribute to urban ecosystem performance and ecosystem services in cities (Cameron et al., 2012; Tratalos et al., 2007), and landscape ecological modeling indicates that wildlife are likely using urban private property (Rudd et al., 2002). Likewise, empirical studies investigating use of residential properties by birds show they can be important components of habitat (Daniels and Kirkpatrick, 2006; Belaire et al., 2014; Smith et al., 2014). The emphasis on public lands thus far has even led to researchers actively calling for management-strategies like “thinking outside the park” when it comes to conserving and enhancing urban habitat in the urban landscape matrix (Marzluff and Rodewald, 2008). Greenspaces on private property in the form of gardens, green infrastructure, tree cover, and other vegetation extend beneficial ecosystem impacts of public lands and also have the potential to limit watershed impacts and climate change impacts for many cities (Gill et al., 2007; Douglas, 2011).

Of course, accessing private property for conservation purposes presents a unique set of challenges not faced when focusing on parks and other public property. Chief among these concerns is that these parcels are managed privately: ten parcels often have ten “land managers.” While often framed as a tension between competing land use purposes, making it seem as if the values and interests of individuals are in conflict with those of ecologists (Gobster et al., 2007), there is some research hinting that property-owners are at least somewhat susceptible to social norms in their neighborhoods when it comes to the residential landscape. For instance, Nassauer et al. (2009) found that people identified landscaping as attractive so long as it met their cultural expectations for residential landscaping. And, where were these expectations established? By the neighborhood norms in place locally. People want landscapes that adhere to their local norms suggesting that communities working together to “tinker” with landscaping norms can slowly shift towards more ecologically sound landscape design by working together. The key is to maintain a common set of cultural expectations that aligns with individual parcel-owners’ interests.

Assessing local neighborhood norms and making cultural and ecological assumptions visible is likely a critical part of any conservation effort targeting private property; and, along the same vein, allowing norms and interests to be somewhat emergent in the community may be critical for the success of any attempts to shift landscaping practices. Emergent goals played a significant role in each of the cases we describe here, helping us leverage community buy in in order to access the hidden conservation potential of residential yards. The dilemma for designers is in navigating designs constrained at the community level, which demands tactics that take into account more than is typical in a designer/single client relationship.

There are also important physical considerations to consider, as many environmental issues have a spatial component related to landscape ecological position, watershed condition, microclimate, and/or climatic susceptibility. This ecological complexity is compounded by the need for not only designers, but landowners to understand, at least at the basic level, what kinds of ecological systems are at play in their neighborhood. We know that educational tactics based on transfer of information are especially unproductive for environmental issues. One meta-analysis on proenvironmental behavior adoption found that informational prompts were consistently lower performing than interventions that utilized social norming and goal-setting (Osbaldiston and Schott, 2012). Research specifically on proenvironmental residential landscaping has found that a process of assessment, dialog, and feedback yields much greater action on the part of homeowners than sharing information alone (van Heezik et al, 2012). Successful work with homeowners on proenvironmental landscape design requires understanding some of the research about how to motivate action. For instance, some research indicates
that people are encouraged when potentially positive effects of many small actions in aggregate are emphasized (Dickinson et al., 2013); and, research on the ecological impact of such small yard-by-yard actions confirms that it can be a powerful tool for changing ecological potential in residential landscapes (Belaire and Whelan, 2014). Cities and organizations have developed programs to coordinate greater stewardship participation on residential properties (Cerra, 2014) that also work to make aggregate effects more visible. Some of these are incentive-based like the Clean River Rewards program in Portland, Oregon that provides a stormwater utility discount to residential landowners who manage their rooftop stormwater, and the Waterwise Landscape Rebate that rewards landowners for maintaining landscapes that reduce or eliminate the need for irrigation (City of Austin, n.d., City of Portland, n.d.). Others are voluntary initiatives offering a certification for meeting certain standards like the National Wildlife Federation (NWF) Certified Wildlife Habitat Program (NWF, n.d.). Other initiatives include programs that use the Web to allow people to assess, document, share and enhance habitat and ecosystem services on their own property like the Cornell Laboratory of Ornithology’s YardMap program (yardmap.org).

Building from this prior work the YardWorks Project was created at the Cornell Department of Landscape Architecture in collaboration with Cornell Laboratory of Ornithology and Cornell Cooperative Extension (CCE). The project is grounded on the fundamental understanding that many issues are bigger than what just one person or institution can resolve on their own; and, individual contributions, while sometimes small, can, in aggregate, contribute large and significant benefits.

The YardWorks Project is a new approach for catalyzing multi-parcel stewardship for urban habitat and ecosystem services benefits on both private and public property. In this article we describe the YardWorks “social process” or engaged methodology for working with communities and individuals in an academic studio environment, and share landowner sentiments and perception of the effectiveness of these methods. We discuss the goals developed by the three communities and our process for incorporating these goals during design of the properties of these community members. Finally, we discuss resources and potential for this work in future stewardship outreach and coordination programs that readers may themselves be leading, in the interests of overcoming the dilemma of optimizing urban environmental performance across multiple properties and owners.

3 APPROACH

The YardWorks Project process is loosely based on a community engagement approach described by Morrish and Brown (2000) for public park visioning and planning. This process was adapted in private practice by the author in 2008 as a voluntary, community-based strategy for rural stewardship planning for sensitive butterfly and plant species on rural private properties in the Oregon Coast Range foothills (Oregon Solutions, n.d.). This project, which developed a consensus-based vision and goals with community members followed by property-by-property management planning of the parcels owned by the participants, was adapted and refined for the YardWorks effort by scaling the approach for use with urban private property in an academic, studio-based design environment.

Community design and service learning have an established history in both the practice and the pedagogy of landscape architecture. In the 1970’s Hester described a set of policies and guidelines for community design—“designing with people”—for practicing audiences (1974, 52). Methods and techniques for community design have since been described by Hester and others (Sanoff, 2000, Toker, 2012). Hester also pioneered the related field of service learning as a pedagogical approach for landscape architectural education in the 1970’s (Deming and Swaffield, 2011). Service learning, “is a pedagogical strategy that links academic study with community service” (Lawson, 2005, 158). Service learning began to enjoy wider use in academic studio settings in the 1990’s and continues today (Deming and Swaffield, 2011). Studio-based service learning results in mutual benefits for both students in terms of skills development in public engagement, collaborative work, and consensus building, and for community participants in terms of access to design assistance in pursuit of neighborhood interests (Forsythe, 1999). For students, service learning studios can provide invaluable “knowledge, skills and attitudes needed to function in a diverse and democratic world” (Hill, 2005, 120) via a cross-cultural learning context that “should be experiential, provide for reflection and self-knowledge, develop new knowledge and skills, and provide for new strategies for engagement and transformation” (Hill, 2005, 121). While providing these competencies is core to the service learning model, “the expectation of a useful service also requires that engagement be a means towards good community design” (Lawson, 2005, 168). By communicating and working directly with the community the studio can identify opportunities and challenges, grow and build support for a project vision, and develop design proposals and strategies to implement them (Sullivan,
2011). As described by Sullivan, this work can be catalytic, inviting the potential to transform urban environments and "begin a cycle of positive change" (Sullivan, 2011, 239).

At its best, service learning also integrates scholarship and research with these teaching, learning, and service benefits (Angotti et al., 2011). Associated with service learning is participatory action research, a type of engaged action research whereby participants--be they academic or from the community--function as co-researchers rather than as subjects by combining pedagogy and learning, activism within the community, research, and community service (Angotti et al., 2011, Deming and Swaffield, 2011). The YardWorks Project is type of service learning, and because of its directly-engaged focus with communities identifies with principles of participatory action research. It incorporated social and ecological aspects of place by blending two research areas--social strategies for engaging urban private landowners in collaborative visioning and design development, and ecological design strategies for enhancing habitat quality on private property based on expert recommendations and the best available science--to accomplish two goals. The first was to develop an effective service-learning methodology for catalyzing community-based cooperative stewardship on multiple private properties in an academic studio setting. This approach engaged participants on a neighborhood-level through a collaborative visioning and goal-setting process, followed by site-by-site design development of their properties in the spirit of this collective vision. The second research goal was to leverage this process to identify compatibilities between science-based research recommendations for enhancing urban ecological conditions, and the programmatic needs and preferences of private landowners for their own properties.

We focus on the former goal in this paper, emphasizing development and evaluation of a strategy for engaging landowners in urban ecological design exercises in an academic studio environment to catalyze landscape change on private property. Urban ecology is fundamentally a combination of systemic human and ecological processes interacting with one another (Alberti, 2008). Urban ecological design should therefore operate in both arenas to optimize its effectiveness. Considering the multi-property objectives of this project, we felt it critical to build social networks of people in order to build the ecological networks necessary for landowners to meet their objectives. This process is summarized in three basic steps--recruitment, project visioning and design strategy development, and site-by-site design development-- in this section. In Section 3.0 we share the results of participant feedback and the aggregate design and implementation results of the project effort to date, followed by a discussion of qualitative conclusions from the process for consideration.

3.1 Recruitment

The YardWorks recruitment process began with an outreach campaign to find New York State neighborhoods with landowners who would be interested in the project. We issued a press release describing the project and launched a website with directions for entering a “contest” to work with the project. We recruited two communities through this contest and statewide contacts (names of the actual neighborhoods and participants are not used to preserve anonymity of participants in accordance with our research protocol). In Fall 2013 we worked with a dense downtown neighborhood in a city in New York State (the YardWorks I community). Houses in this neighborhood are situated closely together on relatively small long rectangular lots, many 2500-3500 square feet in size. See Figure 1. Most of the houses have small front yards with short street setbacks. The neighborhood is bordered by two stream corridors to the north and west and a wooded escarpment to the east. Street tree canopy is diverse and variable in age. Sixteen residential landowners participated in the project as well as a representative of a local church and a city staff member for a part of a public park.
The second YardWorks design cycle was conducted in Spring 2014. It combined two neighborhoods situated on the shores of a lake (the YardWorks II community). Both neighborhoods are beautiful, historically significant lakefront communities composed of a mixture of lot sizes. See Figure 2. Properties in both neighborhoods consist primarily of turf, vegetation around buildings, and scattered mature trees typical of suburban residential communities. Both neighborhoods have large waterfront open spaces. In one neighborhood a river corridor cuts directly through the neighborhood and connects to the lakefront parks. These open spaces are owned by the community’s homeowners association (HOA). Many members of each community are not year-round residents, but use their properties as summer second homes. Seventeen private landowners participated in the project, as well HOA representatives for the lakefront and park properties.
For the Spring 2015 cycle we did not reinitiate the contest to find a community. Instead, we reached out to two previously-identified communities by mailing flyers with information on urban ecology and design and the potential for watershed and climate adaptation benefits through the program. We selected two historically significant neighborhoods in another city as the third project community (YardWorks III). See Figure 3. Properties in both neighborhoods generally consisted of older houses with front, back and side yards. Existing vegetation was characterized by turf, limited canopy, and shrubs. Both neighborhoods are near parks with significant, large forested canopy. The city, its school district, and a community organization also participated in the project on 5 public properties: two parks, two school district properties, and the community organization’s property itself.

Despite the relatively dispersed nature of the parcels across all three YardWorks project communities, and the potential this has for limiting some ecological impacts, it is worth noting that these are neighborhoods with distinctive social norms and identities. These factors can be barriers to widespread ecological landscape design when they clash with recommendations from ecologists. As described above, developing a service learning methodology with the potential to transcend these barriers became an important goal for our study and is the focus of this paper.

![Figure 3. YardWorks III Community neighborhood parcels (2016). Image by the author.](image)

### 3.2 Surveys

Two anonymous surveys were distributed electronically to all participants: a pre-survey at the beginning of the project and a post-survey at the end of the project. The initial survey focused on respondents’ motivations for joining the project. The second survey focused on landowner experiences with the process and their future intentions. A select set of survey results is discussed in Section 3.0.

### 3.3 Visioning and design strategy

Each YardWorks cycle consisted of several meetings and work periods. See Figure 4. Most meetings were held in person in the community (the first landowner meetings for YardWorks II and YardWorks III were held via video due to their distance from campus). Video conferencing was always made available to landowners in case they were not able to attend the scheduled meeting in person.
The first meeting introduced the students and landowners to one another, oriented participants to the process and timeline, and asked landowners to describe their interests in and aspirations for the project in a visioning exercise. After the meeting, the design team met in the studio to prepare a draft vision statement based on this input. They also broke into small sub-teams to conduct an analysis of the human and natural systems in the neighborhood, with each sub-team focusing on one or two analysis topics. Each sub-team created a set of boards for presentation at the next meeting.

The second community meeting began by sharing the draft vision statement with neighborhood participants for feedback and suggestions for revision. After this discussion, students shared their neighborhood analysis boards with participants in an open-house-style format. The open house was followed by a two-part discussion where landowners were first asked to comment on the analysis topics, and then to identify any specific goals or objectives they sought for the project. Students used this feedback later to revise the vision statement and develop a draft set of goals for the project, and from these developed a set of possible strategies for implementing these goals in a typical residential setting. Figure 5 provides an example. While derived from the community goals, each strategy was informed by review of select literature, other resources and consultation with experts in environmental science and design. These strategies were summarized on a set of boards for presentation during the next community meeting.
The third community meeting began by sharing the revised vision statement and the new draft set of goals. Students recorded feedback for further revision following the meeting. Students then shared their design strategy boards in an open house-style format. While viewing the design strategies, landowners were encouraged to consider what types of design strategies interested them, and what design approaches they would like to explore on their own properties. The meeting ended with a discussion about next steps as the project transitioned from the community focus into a one-on-one design process between student designers and individual property owners.

3.4 Site-by-site design development

Students were assigned specific properties and landowner “clients” to work with during this stage. Each student contacted this landowner to discuss their individual design goals for their property, including programmatic needs, interests and aspirations. Designers conducted a site inventory by taking site measurements, noting existing plant locations when possible, investigating site runoff patterns, studying building entrances and identifying key viewsheds. Students incorporated feedback from property owners and visiting topic experts through a series of in-studio critiques, then finalized their design concepts to produce a set of graphic work products including plans, plant lists, diagrams, perspective drawings and/or site metrics estimating the performance benefits of the proposed design. These were arranged into a set of final design boards for the final community meeting open house. Figure 6 provides an example of the boards. After the open house, the group reconvened to discuss project outcomes and provide the landowners with a list of resources to assist them in implementing their project, including technical assistance from the project’s CCE partner.
Figure 6. Example of student design board (2015). Graphic by and reproduced with permission of Stephanie Buglione MLA ‘16, 2015 LA6020 YardWorks Studio, Cornell Landscape Architecture.
4 RESULTS

4.1 Participants
A total of 18, 18, and 20 landowners participated in the YardWorks I, YardWorks II, and YardWorks III neighborhoods respectively. Survey participants were asked about their gender, age, level of education, property ownership, and how long they had lived in the neighborhood.
- Respondents were 85%, 71%, and 43% female in YardWorks I, II, and III respectively.
- YardWorks I respondents were almost evenly split between two age groups: 30’s and 40’s, and 60’s and 70’s, while most (71%) of YardWorks II participants were in their 60’s and 29% were in their 70’s. YardWorks III residents were overall younger and more evenly distributed in their age, with a little more than a quarter of residents each in their 30’s, 40’s, 50’s and about 15% in their 60’s.
- Nearly all respondents in all neighborhoods had a 4-year degree or higher.
- All respondents owned their property, but YardWorks II participants owned theirs the longest (43 years), versus 7 (YardWorks I) and 11 years (YardWorks III). Many YardWorks II properties were second summer/vacation homes.

In all, students produced 64 designs for 50 residential properties, and 14 public or quasi-public parcels (seven parks, two school properties, one riparian open space, two street roundabouts, a non-governmental organization property, and one church frontage). One landowner may own more than one parcel. Cumulatively, the project developed ecological design concepts for approximately 10 acres of private property and approximately 31 acres of public or quasi-public property. See Table 1.

Table 1. Number and acreage of designed parcels

<table>
<thead>
<tr>
<th>Parcel type</th>
<th>Community</th>
<th>Private number</th>
<th>acres</th>
<th>Public number</th>
<th>acres</th>
<th>Total number</th>
<th>acres</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YardWorks I</td>
<td>15</td>
<td>2.6</td>
<td>2</td>
<td>0</td>
<td>17</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>YardWorks II</td>
<td>16</td>
<td>4.1</td>
<td>7</td>
<td>8.2</td>
<td>23</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>YardWorks III</td>
<td>19</td>
<td>3.6</td>
<td>5</td>
<td>23</td>
<td>24</td>
<td>26.6</td>
</tr>
<tr>
<td></td>
<td>Totals</td>
<td>50</td>
<td>10.3</td>
<td>14</td>
<td>31.3</td>
<td>64</td>
<td>41.6</td>
</tr>
</tbody>
</table>

4.2 Recruitment and landowner interest
While there were inquiries from individuals in many communities about participation, relatively few groups of neighbors applied. Those who were successful either had a CCE staff member or a self-identified community leader who took ownership of the initiative, sought additional neighbors to recruit, and helped the process move forward. We noted this in the first two design cycles, and intentionally sought community leaders and CCE staff members when targeting neighborhoods and seeking participants for the third design cycle in 2015.

Based on the pre-survey and community meeting interactions, the three participating neighborhoods possessed a well-established sense of community identity, and had existing channels for communication or the capacity to develop them. Most participants did not personally know one another prior to the YardWorks event; but they were commonly drawn to the notion of neighborhood environmental and community betterment.

4.3 Landowner surveys
Fourteen of 18 (YardWorks I), 6 of 18 (YardWorks II), and 9 of 20 (YardWorks III) landowners or landowner representatives agreed to participate and answered at least one question in the pre-survey;
and, 9 of 18 (YardWorks I), 13 of 18 (YardWorks II), and 11 of 20 (YardWorks III) landowners participated in the follow-up survey. Most of the respondents answered most questions in each survey. A select set of relevant results are provided below.

4.4 Visioning and goal setting

Survey respondents indicated that they were satisfied with the visioning and goal-setting process, with 80% of indicating that their individual interests were heard and reflected in the community approach “often,” “most of the time” or “all of the time.” See Figure 7. While enhancing urban habitat was a clear driver for the project, from the outset we intentionally left room for participants to define areas of emphasis in their own community, resulting in significant variation in the motives of the three neighborhoods. See Table 2. Figure 8 graphically depicts similarities and differences amongst the three communities emphases on key environmental themes. In YardWorks I the major focus of the vision and goals was centered on maintaining and enhancing neighborhood bird habitat and overall habitat quality. YardWorks II participants were interested in bird habitat goals, but water quality in their Lake was a major priority. The decline of the lake’s water quality over the years had resulted in algal blooms and water concerns. They saw the potential for the YardWorks process to assist with collectively reducing stormwater runoff and the associated nutrient inputs via site-by-site design decisions. YardWorks III was interested in urban habitat, but was also interested in strategies for adapting to their changing climate. While this had been an intentionally introduced topic for this design cycle, recent flooding in the area associated with hurricane events, and the city’s newly-adopted a climate action plan and waterfront flood planning efforts may also have influenced this interest. Years of combined sewer overflows contributing sewage to nearby rivers following rain events made water quality and watershed issues other important concerns.

![Figure 7](image-url)

**Figure 7.** Post-project survey results indicating extent of landowner interests incorporated into the community approach (2015). Image by the author.

**Table 2.** Vision Statement and Goals for each of three participating YardWorks communities.

<table>
<thead>
<tr>
<th>YardWorks I Community</th>
<th>Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The YardWorks Project seeks to provide residents with the knowledge and tools to establish healthy habitats in their own yards for birds, plants, and people. By working together we will build our neighborhood to improve social and ecological connections that enhance (the neighborhood’s) urban</td>
</tr>
</tbody>
</table>
ecology. These tools and relationships will nurture a sustained effort to improve urban habitat in our yards, our neighborhood, and the greater urban ecosystem.

Goals

- Build and Maintain Local Bird Diversity
- Create Local Environments that are Safe for Birds
- Support Urban Pollinator Diversity
- Right Plant, Right Place
- Be Good Watershed Stewards
- Understand Neighborhood Landscape Ecology
- Strategically Connect Habitats
- Explore the Benefits of Citizen Science
- Get the Word Out

YardWorks II Community

Vision

We are a community of neighbors that value the beauty of (the lake) and its cultural and natural heritage. We envision our common areas and private properties as places that can enhance the water quality of the lake and the biodiversity of our lands, while strengthening our neighborhood character. Together we can operate at the scale of our yards, our neighborhood and our watershed to provide benefits for our community and beyond.

Goals

- Enhance Lake Quality
- Make Sustainable Design Decisions
- Rethink Storm Water
- Improve Bird Habitats
- Support Pollinator Services
- Connect and Expand Ecological Systems
- Spread the Word

YardWorks III Community

Vision

We envision our neighborhoods as part of a healthy community with a strong sense of place grounded in its aesthetic heritage, cultural context, and environmental assets. Together we can create a resilient network of private yards and common spaces that support working water and ecological systems while adapting to a changing climate. (The community) can serve as a model, encouraging others to imagine the potential for neighborhood-scale responses to broader environmental questions.

Goals

- Build Resilient Community Networks
- Initiate Sustainable Design and Management Practices
- Link to Existing Ecosystems and Establish Greater Ecological Diversity
- Support Watershed Health
- Unite Local Aesthetics, Historical Context, and Urban Ecology
- Scale Up Climate Change Resiliency Property by Property
From the standpoint of the engaged methodology, using the vision statement and community input about their goals was effective in developing design strategies, as it enabled the design team to fluidly transition from big picture ideas to site specific opportunities. It also allowed the student designers to take control of new ideas, develop knowledge valuable to the project, and represent and share this information with community members. Students developed a sense of ownership as team “experts” on the design strategy topics. From a landowner perspective, discussing the community goals in the first part of Meeting #3 and then holding the design strategies open house in the last part of the meeting set up an intuitive link between community-level aspirations and potential site-specific design-based moves that could achieve these goals. The open house format was also very effective in that it allowed landowners to digest the strategies at their own pace and ask questions of the design team members. The use of illustrative graphics made the concepts behind the design strategies approachable and easy to understand, and allowed landowners to appreciate the benefits of these strategies independently of the specifics of their own yards. Finally, the design strategies introduced a common “vocabulary” between student designers and landowners for use during the site design process. The design strategy boards also served as “artifacts” for reference later in the process to reinforce this vocabulary. Student designers and their landowner “clients” both left the meeting prepared to collaborate with this shared knowledge as they developed design concepts for the individual properties. All of these activities were critical for the development of community norms known to be central in changing landscaping practices.

This article does not go into the ecology behind the design strategies in detail, but as a demonstration of the action research potential of the methodology, we share a brief description of the project results in developing design strategies. Over the course of the three-year project, we developed two types of urban ecological design strategies: a) strategies that maintained or enhanced ecosystems; and b) strategies that provided regulating ecosystem services (Mooney and Brown, 2013) such as watershed protection or climate adaptation. To improve avian habitat we developed five planting design strategies for birds that were compatible with the residential programs and interests of landowners, while consistent with the scientific literature. They included techniques to:
• Contribute to landscape networks by enhancing connectivity to nearby or adjacent corridors or enhancing patches.
• Build vegetative structure into projects by increasing vegetative cover and structural diversity.
• Provide microrefugia by massing shrubs for cover and refuge.
• Optimize forage resource availability by providing diverse forage resources when species are present in the landscape.
• Enhance plant diversity by improving plant species richness generally and within structural layers.

Other strategies developed to provide support services included:
• Incorporate discrete habitat features such as nest boxes, water sources, or bird feeders that support avian life histories, and microhabitats such as rock walls and brush piles that provide habitat and food resources for certain species.
• Reduce avian mortality by identifying urban threats to birds such as window strikes or letting cats out of doors.
• Support pollinator life histories by expanding the massing, species diversity and temporal diversity of nectar resources and providing nesting habitat and other key habitat elements.

Some design strategies were specifically developed to provide regulating services, like lake water quality protection and climate adaptation. Design strategies developed to provide watershed benefits included:
• Reducing runoff and improving water quality via green infrastructure that increases vegetative cover, integrates rain gardens and other stormwater facilities into the design and/or reduces impervious cover.
• Increasing shoreline and riparian buffers by increasing vegetative cover while maintaining views, where applicable.

Design strategies developed to provide climate adaptation benefits included:
• Adopting resilient planting design strategies that increase functional redundancy and response diversity within the plant palette (Hunter, 2011).
• Reducing urban heat island impacts by strategic shading, selection of “cool” materials, and increasing vegetative cover.
• Reducing extreme precipitation impacts by increasing cover and adopting green infrastructure techniques similar to those above.
• Assisting wildlife as species ranges shift by adopting landscape network support and habitat enhancement strategies similar to those described above.

It is important to note that most of the strategies propose changes to vegetative cover at a site in some configuration or spatial arrangement, thereby contributing value to urban ecosystems via planting design. Incorporating additional watershed or climate goals may also “stack the value” of these benefits into the design. These outcomes may also be dependent on grading or other physical landscape features in addition to plants or other ecological assets.

4.6 Site design process
Each of the 64 resulting site designs were developed to promote ecological goals while supporting other community goals and the interests and needs of the private property owner. Student designers were responsible for their “client” relationship and honed important engagement skills while managing these aspirations. Attaching performance metrics to certain goals and design strategies (for example runoff volume treated or percent change in plant diversity) challenged the students to balance programmatic needs and preferences while demonstrating the landscape performance of their designs. These metrics also provided a nice complement to the illustrative graphics student designers produced, providing talking points for students so that property owners to could better “see into” the work and the values it provided. The acts of drawing, writing about, calculating the benefits of and verbally describing their design to others also provided an opportunity for students to improve design communication skills.
Almost all of the property owners were responsive to student contact and provided feedback during the
design process; however, during each design cycle one or two property owners did not provide timely
input when needed. In these cases students moved forward with the designs based on existing
landowner input, project goals and design strategies, and feedback received from the studio instructor,
topic experts, other professors and practitioners who participated in the project during desk critiques,
pinups and reviews.

Survey respondents indicated that the site design results were seen as consistent with certain
community goals. When asked whether “The design is just what I needed in order to start creating habitat
in my yard” over 75% of respondents across the three communities selected “definitely true” or “probably
true” (the caveat for “bird-friendly” habitat asked during the YardWorks I survey was dropped in
subsequent surveys). In a similar question, over 70% of YardWorks II and YardWorks III neighborhood
survey respondents selected “definitely true” or “probably true” when rating whether the design was “just
what I need” to “be a better watershed steward.” 70% of YardWorks III neighborhood respondents also
selected “definitely true” or “probably true” when rating whether their design was “just what I need” to
“better adapt to a changing climate on my property.”

4.7   Ongoing project outreach and implementation
All three communities were interested in community building and outreach to expand the project
impact, and potential partners and methods for getting the word out were introduced in the strategy
phase. Notably, over 60% of landowners across the communities rated it “likely” or “very likely” that they
would “spread the word” about creating habitat in their neighborhood or community, and 70% or more
rated that they were “likely” or “very likely” to spread the word about improving water quality or adapting to
climate change when consistent with their community goals. See Figure 9.

We took several actions after the studio to assist participants in spreading the word to others:

- We posted all student work to the project website so that participants could direct
  neighbors and others to it.
- We held a post-project seminar and/or public exhibition of the work for two
  communities following the studio so that interested community members could learn
  more about the project. The work from YardWorks I for example was displayed at a
  church open house and posted in the gallery of the public library for several weeks,
  and we held a seminar for interested YardWorks II community members.
- We sponsored installation of a YardWorks display garden in a neighborhood park
  following YardWorks I.
- We organized post-project garden tours for two design cycles so landowners could
  display their design boards in front of their house to garner interest.
- We printed small metal signs (“I’m a YardWorks Participant”) for participants to place
  in their yards in the first two design cycles.
- In the third design cycle, we instituted a “plant grant” program, which offered onsite
  consultation with CCE master gardeners and reimbursement for plant purchases
  based on recommendations informed by the project design concept.
While very few of all survey respondents rated that they were “likely” or “very likely” to implement all of the design for their yard, 70% responded said that they would implement some of it. See Figure 10. Some significant projects have been completed. The newly constructed cooperative housing community in YardWorks I (a group of three houses sited on a shared lot), which participated in the project, conducted a significant landscape installation in 2015. The YardWorks II community, in particular, has made significant strides in implementing projects on both private and Home Owners Associations (HOAs) property. YardWorks II HOAs have been particularly active, implementing extensive shoreline buffers and lakeshore garden beds, roadside buffer gardens, and planting trees in public parks and waterfront open space (personal communication). One HOA raised over 160 perennials in their greenhouse and planted them in these locations; and, both have phase-two plans. At least four YardWorks II property owners had begun installing parts of their proposed designs as of August 2015 and others have expressed interest in installing their own lakeshore plantings. A private property owner in a nearby community was interested in installing a roadside buffer, and worked with YardWorks II participants on a grant for its installation. Members also organized a successful garden walk with over 14 properties profiled, generating excitement and pride in the community, and a “lake health” category was added to a local garden club garden show (personal communication).
Figure 10. Likelihood that respondents will implement some or all of their design (2015). Image by the author.

Since YardWorks III finished in May 2015 the neighborhood “plant grant” program resulted in installation of plants on four properties. The non-government organization that participated in YardWorks plans to install a raingarden and vegetate their property based on the proposed design in 2016, with partial support from the plant grant program. A garden walk associated with the plant grant program was also attended by 29 people.

5 DISCUSSION

Our results indicating that most landowners felt like their interests were represented in the community goals, coupled with results showing at least moderate intention to act on these goals add to the ongoing dialogue among people studying the adoption of proenvironmental behaviors. From a practical standpoint, we can draw several conclusions from this action research process:

1) The community-level vision and goal-setting process is effective

Most participants felt that their voices were heard during the visioning and goal-setting process (Fig. 7). This outcome specifically makes a statement about the property owners’ perception of the effectiveness of the community visioning and goal-setting component of the engaged action research methodology. Notably, this response was observed across also all three communities in spite of diverse interests between the communities, and to an extent within them. This is critically significant because the process could not have continued without consensus on the value of the vision and goals.

2) The action research methodology was effective in incorporating community-level goals into site designs.

Over two-thirds of survey respondents indicated that their design was likely what they needed to address overarching community goals on their property. This is an indication that the project process was effective in linking community-level goals to site-level design outcomes. Based on our experiences, we believe that development of the design strategy boards was instrumental in achieving for this outcome. The design strategies project set up an important informational link between scales of the project, pivoting community-level ideas to site-level design proposals across a broadly distributed set of project locations and user types.
3) This process may have helped transcend potential social barriers preventing significant landscape changes

Widespread agreement on the statements described in (2) above, which included the phrase that the design is "just what I need" may be an indirect indication that participants accepted the ecological, watershed, and climate adaption strategies agreed on by their neighbors as new norms by which to judge the quality and social acceptability of their landscape designs. This is corroborated by qualitative observations of property owner satisfaction with their site design at the final meeting open houses and the closing discussions that followed. Most property owners also intended to implement at least some of the design on their property (Fig. 10). In particular, knowing that residential landscape choices are a complex behavior based not only on personal interests but on local social norms, it is interesting that these participants were willing, at the end of this process, to consider adopting landscape design that departs conceptually and/or physically from previously-established neighborhood norms. While intention to act is only weakly correlated to action--researchers call this the attitude-action gap--it is an important step towards eventual action in most models of proenvironmental behavior (Kollmuss and Agyenan, 2010). The fact that the majority of respondents indicated that they will "spread the word" to others about goal-related aspects of the project (Fig. 9) is also an indication of the norm changing, and possible future landscape-changing potential of this project effort.

Several barriers to action have been identified in the literature, ranging from practical barriers like lack of funds or information, to individual barriers like lack of interest (Blake, 1999). Overcoming these barriers once intention is established may be a matter of practicality; in this project we started to transcend potentially the biggest barrier by developing new social structures to support new social norms and knowledge sharing about acceptable residential landscape design. Efforts to engender dialogue between residents have been shown to be more effective at changing landscaping practices than "top-down education or incentives" (Belaire & Whelan, 2014, p 2140). We know the quality and quantity of informal contacts is critical to the formation of neighborhood social ties (Kuo et al., 1998), which in turn, may influence place-based social processes such as collective efficacy and feelings of neighborhood attachment. Such neighborhood attachments are shown to increase a neighborhood’s capacity for positive social action; but, to cement our understanding of how this project impacted the actual adoption of new landscapes, we would need to conduct follow-up research, not yet possible because of time it takes homeowners to significantly change landscapes.

Much of the emergent success of the YardWorks II community in implementing their designs can be discussed from the perspective of removal of barriers. Many participants in that community were older and wealthy enough to own second homes. They had the buy-in of their local HOA that acted as both an economic and norming resource, legitimizing landscaping choices which they have historically been very influential in helping to establish. This community also had two local leaders, one in each neighborhood that as participants promoted the project at its inception, coordinated resources and networked with landowners during the studio process, and continued to lead efforts with property owners after the studio project. Goddard et al. (2013) identify two mechanisms for overcoming conventional gardening norms: "(i) the mimicry of wildlife-friendly practices of neighbours or local authorities; and (ii) the actions of local champions" (p. 267) and the latter and evidence of the former seemed to be playing a role in the ongoing implementation and outreach in the YardWorks II neighborhoods.

When considering this work, it should be acknowledged that there are clear limits to interpreting the results. The neighborhood areas that serve as the focus of this study occupy a very small sample of all neighborhoods and are not necessarily representative of all neighborhoods. The participants volunteered for this process with an understanding of its general environmental intent, occupy a relatively small percentage of their community, and likely do not represent a cross section of their neighborhoods. However, it does suggest that at least some members in communities may be interested in environmental initiatives, be willing to work with others to establish common goals across properties, and discuss options for how they might meet these goals individually on their own property. They may also be willing to share the potential for cooperative stewardship with others in their community and beyond, which is a critical step toward influencing norms that currently dominate residential landscape design intent and practice. This research is a step toward to the long-term goal of the authors and others to understanding how to
better catalyze community-level environmental stewardship by removing the barriers of distributed ownership across many small parcels commonly encountered in cities.

6  CONCLUSION

Balkanized property ownership in urban areas raises multiple issues when addressing city-level environmental concerns. The kind of community engagement effort offered here suggests that there is potential for transcending these issues through organized and informed cooperative stewardship. Benefits of this process exist at both the community level by bringing people together to discuss and agree on common goals, and at the site level, by opening doors to deliver design that incorporates the needs of individuals as well as ecosystems. Students concurrently gain valuable design and engagement experience. Finally, it demonstrates that both private and public landowners can be engaged in a process about making individual landowner decisions with common interests in mind that may collectively garner larger, more significant impacts.

Unfortunately, the “tragedy of the commons” is often suffered by not only publicly-held property but also the many transient yet critical common resource flows that move across almost all property boundaries. Considering the pressures of the modern and future city, initiatives toward urban resilience must account for social capacity in order to build the ecological complexity that sustains and serves it. This process begins with the exchange and growth of ideas across social boundaries and barriers to change, from which the physical benefits upon which these ideas are centered only then can be realized. The YardWorks project moves this dialogue forward, transcending the “property barrier” so often confounding urban environmental interests, as an indication of how engaged, design-based stewardship strategies may inspire collaboration and change landscapes for the benefit of cities.

7  ACKNOWLEDGEMENTS

We would like to thank the many landowners who participated in this project as well as our collaborators at Cornell Cooperative Extension.

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Smith Lever project number 2012-13-119. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

8  REFERENCES


