Council of Educators in Landscape Architecture

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DILEMMA : DEBATE

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LANDSCAPE RESEARCH RECORD is published annually and consist of papers focused on landscape architecture subject areas. Each issue is a collection of papers presented at the Council of Educators in Landscape Architecture annual conference of that year. Conference theme is expressed as the subtitle of *Landscape Research Record*. The views expressed in papers published in *Landscape Research Record* are those of the authors and do not necessarily reflect the views of the conference planning committee, or the Council of Educators in Landscape Architecture.

PEER REVIEW OF PAPERS: All papers published in *Landscape Research Record* have been reviewed and accepted for publication through the Council of Educators in Landscape Architecture's peer review process established according to procedures approved by the Board of the Council of Educators in Landscape Architecture. Reviewers are recruited by track chairs from among conference attendees and other outside experts. The track chairs also serve as co-editors in the peer review process. The Council of Educators in Landscape Architecture requires a minimum of two reviews; a decision is based on reviewer comments and resultant author revision. For details about the peer review process and reviewers' names, see REVIEWERS in Table of Contents.

IN THIS ISSUE: In 2016, the conference committee accepted 393 abstracts for presentation and rejected 30 abstracts. Authors of accepted abstracts were invited to submit a full paper. A total of 32 papers were received, 27 papers were selected for peer review. Finally, 17 papers were accepted for publication in this issue. Additionally, five (5) Theme Track papers have been added to this issue. The organization of this issue follows the standard conference tracks listed in the table of contents.

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FOREWARD

Welcome to the fourth issue of *Landscape research Record*, published by the Council of Educators in Landscape Architecture (CELA). In 2013, the CELA Board approved and adopted a procedure to become fully responsible for publishing peer-reviewed conference papers annually and named the publication Landscape Research Record (LLR). LLR is a post-conference publication and published online only.

This fifth issue of LLR is a collection of peer-reviewed papers presented at CELA 2016 hosted by Utah State University, with the theme “Dilemma : Debate.” The annual conference called to reflection research, scholarship and creative activity that highlighted the 21st century dilemmas facing our profession. The meeting focused on and how a process of constructive debate and discussion can bring about constructive solutions or proposals for future work that can shape the critical dilemmas of our future.

This issue contains 22 quality peer-reviewed papers resulting from the conference. We hope you find them to be a collection of provocative and insightful research that enriches CELA’s dialog of research and creative inquiry on the processes of debate and discussion.

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RURAL INTERDISCIPLINARY SERVICE-LEARNING PROJECTS: FRAMEWORKS FOR ENGAGEMENT WITHIN REGIONAL RURAL DEVELOPMENT CENTERS

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1 ABSTRACT

In recent decades, design programs have engaged communities' tangible needs through service-learning, civic engagement, and participatory action research. These approaches offer experiential learning opportunities for students and provide services to underserved communities (Lee, 2008). Recognizing these benefits, academic programs employ these models of engagement in their pedagogical approaches at the project, course, or program levels. In the current era of urbanization, rural communities and their landscapes represent an array of large-scale design challenges. While landscape architecture maintains a body of work in the planning, design, and management of large-scale and rural landscapes, opportunities for allied design disciplines also exist. Relatedly, the urbanist paradigm that dominates the state of the art of contemporary design education has resulted in a reticence to equally engage in rural projects within the university studio setting. This paper showcases an alternative focus to the dominant urbanist paradigm by suggesting opportunities for university design programs to engage in rural projects. Land-grant institutions were originally conceived for applied teaching, research, and outreach, much of which was focused on rural and agricultural-based issues. Design programs situated at land-grant institutions are uniquely positioned to advance this mission. Using a content analysis of publicly available publications, we identify potential strategic opportunities for the design disciplines located at land-grant institutions within the region of the Western Rural Development Center (WRDC). We recommend ways in which design programs based in all four United States Department of Agriculture (USDA)-funded Regional Rural Development Centers (RRDCs) can enhance their engagement in rural issues while fulfilling the land-grant missions.

1.1 Keywords

Rural, service-learning, interdisciplinary, civic engagement

2 INTRODUCTION & BACKGROUND

What role could design programs housed in land-grant universities play in addressing rural design problems? How can existing university-community partnership frameworks facilitate involvement of the design disciplines in engaging rural issues? This exploratory study evaluates university landscape architecture, interior design, and architecture design programs' involvement in one of the four regionally located United States Department of Agriculture (USDA)-funded Rural Community Development Centers (RDCC), as reflected in the center's quarterly publication, *Rural Connections*, and recommends ways in which the four centers can provide an organizing framework for interdisciplinary service-learning endeavors. Through greater engagement of the design programs with rural issues, benefits may be realized for three constituencies: rural communities that would benefit from the creative resources of university design faculty and students, design faculty who would benefit from the availability of collaborative design and research opportunities around shared projects, and university design students—who through experience with rural-based design problems—might develop greater understanding of the unique design challenges of rural settings and empathy for those who inhabit these dynamic and critical built environments.

2.1 Rural Issues as Design Problems

Due to globalization, shifting demographics, and economic changes precipitated by the decline of natural resource based economic sectors, rural communities experience a unique set of challenges. These challenges include rapid growth and change within natural amenity-rich areas (Howe, McMahon, and Propst, 2012), shifting economic conditions, decline of natural resource extraction employment opportunities, depopulation in many areas, changes in food and energy production, and interdependent relationships between significant public lands and the communities that adjoin them (Winkler et.al, 2007). While these challenges often reflect economic and cultural dimensions (Smith and Krannich, 1998), they present in a geographic and spatial context that comprises a built environment ripe with design opportunities (Bartuska and Young, 2007). These challenges are not merely social or economic in nature—rather they are impacted by and manifested within the physical environment. The spatial dimensions of rural challenges present unique engagement opportunities for the design disciplines—landscape architecture, interior design, and architecture—particularly those situated at land-grant universities. As publicly funded universities founded for the purpose of furthering agricultural and technical knowledge, land-grant universities have a heritage of applied teaching, research, and outreach that is geared toward the unique challenges and well-being of rural places. Due to their complexity and scale, meeting these challenges often requires an interdisciplinary approach.

2.2 University Design Response

Many university design programs have responded to these challenges by offering collaborative service-learning models that synthesize the creative expertise of their faculty and students with community members' local knowledge to improve the physical conditions of rural communities—thereby facilitating positive economic and social change (Angotti, Doble, and Horrigan, 2012). Typically, these endeavors employ a co-design process (Lee, 2008) that collaboratively engages those who will use the space, place, or product of design in the design process itself. This partnership model differs from traditional design models in which designers assume the role of expert and design for, rather than with the client. The design team serves the client by sharing their professional knowledge, while their community partners share their expertise of the values and identity of their community. When successful, co-design involves generous knowledge sharing between two groups of experts. By identifying community members as experts, their contributions are empowered. In the same vein, participatory action research (Reardon, 2000) offers methods to engage community residents and designers in the identification and planning for community-defined issues. Although the specific steps of this process may differ depending on the type of issue being addressed and the unique context in which engagement occurs, participatory action research brings together diverse stakeholders to collaboratively identify and solve community-based problems. Notable examples include the East St. Louis Action Research Project (Reardon, 1998), which involves design students from the University of Illinois in urban issues and the Rust to Green NY Action Research Initiative (Horrigan, 2014).

Other notable collaborative models of design engagement in rural settings include the Rural Studio at Auburn University (Hinson, 2007), The Rural Communities Design Initiative at Washington State

University, and Extension Landscape Architectural endeavors at Utah State University, University of Kentucky, Cornell University, University of California Davis, and North Carolina State University, in which landscape architecture faculty fulfill extension roles (Evans and Anderson, 2016). Due to the scale and uniqueness of rural design challenges, some have even proposed that rural design should be defined as a new and distinct design discipline (Thorbeck, 2013). Many university design initiatives engage tangible design problems in urban communities; however rural-based design problems have fallen out of fashion among some design faculty (Ryan, Krikac, & Sleipness, 2015). Reflective of national demographic trends and urbanization, most academic design programs are instead oriented toward urbanism and there is much greater interest in engaging urban issues through design (Sleipness, Ryan, & Krikac, (2013, 02-07). Phone interview with T. Barrie). From the point of view of using design to impact large populations of people in their immediate physical context, an urban focus is a laudable and rational response to demographic patterns. However, vibrant urban areas still require functioning rural hinterlands to supply the food, energy, and other natural resources necessary to sustain large urban populations. Furthermore, rural communities provide urban dwellers respite and access to surrounding natural amenity-rich recreational landscapes. Consequently, the physical qualities of rural built environments must be holistically considered as part of an interrelated regional system of human settlements situated on a continuum of urban to rural. But independent of their relationship to urban populations, rural areas also possess intrinsic values, with meaning, significance, and senses of place that cannot be replicated elsewhere. The economic value and vitality of rural places is a central goal of the USDA and promoted through its system of land-grant universities.

Land-grant universities were first enabled by the Morrill Acts of 1862 and 1890, which allowed states to sell federally controlled land for endowment of public higher education. These land-grant institutions were originally purposed for teaching, research, and outreach of applied subjects, much of which was focused on rural economic development and agricultural-based issues. The USDA established four regional rural development centers (RRDCs) with the goal of aggregating common research initiatives conducted at individual member land-grant institutions in order to maximize their regional impacts. The RRDCs are housed at land-grant universities within each region in four regions of the United States; member land-grant universities for each of the RRDCs are illustrated in Table A1. The Western Rural Development Center (WRDC), housed at Utah State University, has 12 member institutions represented by land-grant universities in the western region of the United States. The Northeast Regional Center for Rural Development (NRCRR), housed at Pennsylvania State University; Southern Rural Development Center (SRDC), housed at Mississippi State University; and North Central Regional Center for Rural Development (NCRCRD), housed at Michigan State University, all mirror this organizational model. Tasked with providing economic and community development guidance to rural communities, the centers "form a one-stop shop to connect to the nationwide network of land-grant college and university researchers, educators, and practitioners to provide sound information and hands-on, community-level training. The trainings help rural communities make science-based decisions about their community and economic development investments” (WRDC, 2014 p17).

Influenced by unique rural dilemmas in the western, southern, north central, and northeast regions, the four RRDCs are a potential mechanism for connecting design programs at land-grant institutions with pressing rural issues within their respective regions. How can university design programs be more engaged in rural contexts? This study identifies ways in which design programs can increase their engagement with rural issues through collaboration with RRDCs, with an emphasis on the western region.

3 METHODOLOGY

An interdisciplinary team of faculty representing landscape architecture, interior design, and architecture used a grounded theory approach to analyze the content of publicly accessible publications of the four RRDCs to illuminate regional foci and to identify opportunities corresponding to each of these three design disciplines. The team assessed the apparent involvement of design disciplines in the RRDCs based on published materials available on the websites for each of the four centers. Based on the results of this initial assessment, the team identified opportunities for each of the three design disciplines to engage in the projects described in the examined publications. A preliminary review of the publications representing each of the four RRDCs revealed that while their foci often engage the built environment, design disciplines at each center’s member schools were not overtly engaged within regional development center initiatives, as reflected in the publications.

Initial review of WRDC, NRCRR, SRDC, and NCRCRD public materials also revealed that each of the centers maintains distinct formatting of annual reports, publications, and presentations and emphasize unique information ranging from the number of website visits, listings of board members, and project highlights. Due to the wide variance and overlapping thematic content of each center's publication archives, the research team focused in-depth analysis on one center. We determined that the WRDC maintained the most prolific and extensive collection of online published materials describing its activities and the work of contributing institutions.

Due to its relatively high level of detail and thematically organized content, the research team selected the WRDC's publication *Rural Connections* for further detailed content analysis. According to the WRDC (n.d.), *"Rural Connections*, the magazine of the Western Rural Development Center, is published to inform the nation on timely research and activities by the West's land-grant institutions and regional/national agencies as it relates to rural development issues in the region. Contributors include researchers, faculty, extension researchers, specialists and agents, practitioners, and professionals from throughout the West with occasional contributions from outside the region."

3.1 Overview of Process

Archived issues of *Rural Connections* for the previous seven years (see table 3-1) were reviewed and closely examined for initial content themes and the presence of descriptions of the following design disciplines—landscape architecture, interior design, and architecture—particularly those housed at WRDC member institutions. Subsequently, each of the 125 articles within these issues of *Rural Connections* was searched for the presence of keywords associated with the three design disciplines. The presence of keywords within an article triggered in-depth analysis of the context surrounding these keywords. This contextual analysis highlighted opportunities for design engagement.

Table 3-1. Issues of *Rural Connections* and Thematic Content

Issue	Topical Theme
June 2015	*Extension in the West: Team Building*
May 2014	*Extension's Role in Sustainability*
Nov 2013	*Immigration*
June 2013	*Our Energy Future*
Jan 2013	*Drought and Wildfire in the West*
May 2012	*Local and Regional Food Systems Boost Local Economies*
Sept 2011	*The Rural West: Daring to Innovate Job Creation*
June 2011	*Climate Change Adaptations in the Rural West*
Sept 2010	*Healthy Communities*
May 2010	*Water in the Western U.S.*
Nov 2009	*Food Security in the Western U.S.*
April 2009	*Creating Sustainable Communities in a Changing America*

3.2 Initial Content Analysis and Keyword Search

Within each thematic issue of *Rural Connections*, subthemes were mapped out to determine where design disciplines could potentially engage. Following this initial thematic mapping, each volume of *Rural Connections* was analyzed for inclusion of keywords associated with the design disciplines. These keywords were derived from disciplinary descriptions published by professional organizations affiliated with each of the three design disciplines—landscape architecture, interior design, and architecture. Specifically, the research team surveyed the words each professional organization used to define and describe their respective design discipline in their webpages. These keywords were subsequently reviewed and augmented with additional keywords as deemed appropriate by the interdisciplinary research team (see Table 3-2). A preliminary keyword search was conducted to illuminate the relative frequency of keywords associated with each of the three disciplines. However, some of the keywords affiliated with each discipline were found to overlap and may be interpreted as more closely aligning with one of the other three disciplines; the research team determined these characteristics reflect the professions' overlap of project types and contested territories found within professional practice. To mitigate this effect, all keywords were thereafter treated as a collective list for all three disciplines, rather than specific to any one discipline.

Table 3-2. Keywords by Discipline

Landscape Architecture	Interior Design	Architecture
Landscape architecture	Interior design	Architecture
Landscape	Interior	Façade
Garden	Residence	Office
Exterior	Tenant improvement	Open space
Land	ADA	Downtown
Planning	Accessible	Infrastructure
Land use planning	Space planning	Motel
Parks	Education	Housing
Recreation	Institution	Sports
Site	Multi-family	Industrial
Streetscape	Design*	Design*
Public space	Sustainable*	Sustainable*
Urban design	Adaptive reuse*	Adaptive reuse*
Water resources	Retail*	Retail*
Greenway	Commercial*	Commercial*
Path	Residential*	Residential*
Trail	Building*	Building*
Campground	Transportation*	
Ecology		
Parking		
Storm water		
Pedestrian		
Design*		
Sustainable*		
Transportation*		

*Keywords overlap with at least one of the other design disciplines' self-descriptions

Each volume of *Rural Connections* was searched for presence of the keywords. Their presence within particular articles was noted and corresponding articles were flagged for in-depth content analysis. Articles containing keywords were then analyzed for potential engagement of the three design disciplines. During this analysis, potential projects were identified in which design disciplines could be involved to enhance an existing project, advance its progress in subsequent phases, or provide service-learning opportunities for design students.

3.3 Contextual Analysis

Following determination of the presence of keywords, these keywords were analyzed in the context of the individual articles and thematic volumes to illuminate potential for design engagement. Through a close reading of the contextual text and imagery, the research team assessed the applicability of the article content to the three design disciplines. These opportunities were evaluated rated on a scale ranging from low, medium, and high in terms of the strength of their potential relationship to one or more of the design disciplines in a service-learning context. Members of the research team first identified these opportunities during their individual evaluation of the articles. Subsequently, the team reviewed, corroborated, or challenged and collectively revised these ratings and developed recommendations for how university design disciplines might engage each of the opportunities highlighted in the *Rural Connections* articles. The research team's assessments of these potential relationships were informed by each member's knowledge of their respective discipline and pedagogical requirements and experience with interdisciplinary service-learning projects within academic settings. The applicability of the design disciplines to each reviewed article is presented in summary (see Table 4.1), along with discussion of selected design opportunities generated by the interdisciplinary research team. The intersection of two emerging trends in design education: participatory design as a tool for service-learning through civic engagement and efforts to integrate the work of design disciplines at the university level are identified for each selected *Rural Connections* article.

4 RESULTS

4.1 Keyword Frequency

Initially, each issue of *Rural Connections* was searched for keywords by disciplinary category. Of the three design disciplines, landscape architecture keywords were used most frequently (55%), followed by interior design (14%), architecture (13%), and overlapping combinations (18%). Their presence within the articles triggered in-depth contextual analyses of the articles for potential design engagement opportunities for landscape architecture, interior design, and architecture.

4.2 Content Analysis and Design Opportunities by Thematic Issue

The following are analyses of each of the thematic issues of Rural Connections from June 2015 to April 2009. For each thematic issue, selected articles determined to have particular design relevance are discussed and arrayed in summary (see Table 4.1). The research team's assessments of potential design engagement for each article are also displayed in the Appendix, organized by thematic issue (see Tables A-2 through A-8). Design relevancies for each article were identified within the context of how they could be engaged by design programs, with emphasis on service-learning projects.

4.2.1 Extension in the West: Team Building

Colorado River Basin Agricultural Water Conservation Clearinghouse

Drought is becoming heightened in the Colorado River Basin and without adaptation, water will eventually be directed away from agriculture to meet other water demands (Plombom, Kallenberger, Waskom, & Smith, 2015). The design disciplines would be integral to the formulation of solutions, especially in reducing domestic water needs that will demand the use of agricultural water. These would be in the form water saving strategies, especially in the design and installation of drought resistant landscapes, which would provide service-learning opportunities for students within and outside the design disciplines.

Nevada's Living with Fire Program

Nevada has a high wildfire risk along the wildland-urban interface but risks can be minimized through building and site design strategies (Smith, Sistare, & Miller, 2015). The described program relies on educating landscape workers, who then share their knowledge on wildfire risk management. Design disciplines can work with authorities to develop strategies that reduce the risk of damage to sites and structures through landscape design, specification of materials, building design, zoning and codes.

4.2.2 Extension's Role in Sustainability

Extension Sustainability Outreach: Rising to Meet Public Sustainability Demand

This article discusses sustainability publications, programs, and an Extension Sustainability Summit. According to the article, the summit achieved benefits including educating "local officials and communities in fundamental principles of land use planning and zoning" (Brain, 2014 p4). Design disciplines would be a valuable asset in bringing clarity to principles of land use planning and zoning by providing graphic visualizations of different land use planning and zoning strategies, site development, building design, and materials selection. Service-learning opportunities could include engagement with the public during the summit, or design and implementation of sustainability demonstration projects.

Land Use and Sustainability in the West

"Extension educators from around the West gathered to present and discuss the relationship of land, air, food, water, and energy" (Apel, 2014 p11). This article focuses on land use and how it engages with sustainability as we face population growth, diminishing water, and climate change. "Extension agents are in a position to facilitate, consult with, and educate stakeholders on land use planning…" (Apel, 2014 p14). Examples of resources for these include GIS mapping and other web-based collaborative planning tools. The article identifies landscape architects and planners as a collaborative resource for helping extension educators engage these complex issues.

4.2.3 Immigration

LIFE (Local and Immigrant Farmer Education) in Hawaii

Underrepresented agricultural areas need education on responsible and sustainable farming, business, risk management, and environmental protection stewardship. In Hawaii, these are offered through the Local and Immigrant Farmer Education (LIFE) program (Sugano, Fukada, & Swift, 2013). The program in this article was determined to have a high potential for design involvement, particularly if these programs include design disciplines to help educate clients on spatial awareness.

4.2.4 Our Energy Future

The Energy Future of Rural America.

The article outlines large-scale multi-dimensional and complex problems dealing with energy scarcity, population growth, and food production amid a changing and urbanizing western U.S. (Oliver, 2013). Design disciplines have critical roles in addressing these issues, due to their emphasis on systems thinking. While the article does not define a specific project in which the design disciplines could engage, the broader issue of energy provides a framework within which multiple design and service-learning engagements could occur.

10-Year Energy Vision- Western Governors' Association Energy Initiative

The article on the Western Governors' Association Energy Initiative describes the array of conventional and renewable energy resources including coal and oil, wind, solar, geothermal, and biomass, and their role in a national energy policy (Herbert, 2013). The topic has great applicability to landscape architecture, particularly in visual analysis work inherent in siting and routing power transmission lines and pipelines.

In the Good Times and the Bad: Shale Gas Development and Local Employment

Housing shortages in shale gas development areas and the effects of gas infrastructure on landscape aesthetics and property values are described in the article (Weber, 2013). Design disciplines should be integral players in assisting energy development companies and the communities affected by booms to develop strategies for providing worker housing. Potential options include housing that could be quickly constructed, easily relocated, re-purposed, or recycled and sites that could be readily adapted for alternate uses after the boom has passed.

4.2.5 Drought and Wildfire in the West

Fire and Drought in Paradise- Say it Isn't So, Smokey

The article describes the relationship between native versus non-native invasive plant species, drought conditions, and wildfire in Hawaii (Cram et al., 2013). Design disciplines, especially landscape architecture would be valuable allies in promoting the planting of native species and illustrating a variety of options for using native species to obtain effects similar to the allure that leads to planting invasive non-native species.

Community Wildfire Planning as a Tool to Enhance Trust: Case Studies from Western Montana

This article details the study of wildfire in communities in the wildland-urban interface. Results of survey data are directly applicable for designers of residential communities, especially landscape architects and architects (Lachapelle & McCool, 2013). Siting of structures, selection of building materials and vegetation, and perhaps most importantly, areas where development should not be constructed are fundamentally design issues.

Extension Disaster Education Network Responds to 2012 Drought and Wildfires

The economic and financial costs of wildfire and other natural disasters are outlined in the article (White, Cain, & Cassel, 2013). Public awareness of wildfire and other natural disaster risks is key to preventing loss of life and loss of property. The Extension Disaster Education Network (EDEN) would have direct design relevance, particularly if the design disciplines were involved in the design of educational exhibits.

4.2.6 Local and Regional Food Systems Boost Local Economies

A Food Hub Challenge

Systems thinking, particularly the infrastructure necessary to produce, transport, process, and distribute food for human consumption is the focus of this article (Merrigan, 2012). Designers' routinely apply systems thinking to problems—especially landscape architecture and land use suitability analyses. Consequently, designers are naturally situated to think holistically about food systems. Also, the physical components of the food infrastructure system—such as gardens, transportation systems, warehouses, and markets—are opportunities for architecture, interior design, and landscape architecture.

Land Use Planning and Spatial Configuration Benefit Community Agriculture

Coordination of urban agriculture with recreational and green infrastructure development is the topic of this article by University of Idaho landscape architecture professor, Gary Austin (2012). The topic presents many opportunities for design, particularly in landscape architecture, planning, and development of underutilized land. While land suitability analyses provide clear opportunities for landscape architecture, interior design and architecture can also play critical roles in the development of urban agricultural systems, particularly in the design of buildings and other structures associated with agricultural production, processing, and sales.

Developing a Healthy Food Hub in Rural Nevada

Community gardening in the context of public schools and how the practice of sustainable gardening extends into the greater community are described in detail (Lakes, 2012). Naturally, the design of gardens and associated facilities is an opportunity for landscape architecture, and could also include interior design and architecture.

Rebuilding Alaska Foodsheds: No shortage of good ideas

Local food production and local food consumption in Alaska are described in the context of the biophysical challenges of growing food in harsh climates. The authors note "a striking lack of infrastructure for butchering, processing, and marketing the end products" (Gerlach and Loring, 2012 p24), as well as contributions of food infrastructure to communities' social functioning. The lack of supporting infrastructure is challenging for sustainable food production. While possibly unconventional, the infrastructure for butchering, processing, and marketing food products are clearly design opportunities for interior design and architecture, particularly to promote the humane treatment of animals.

Table 4.1. *Rural Connections* Thematic Issues and Selected Articles*	Planning Scale Projects and Broad Scale Topics	Focused and Site Scale Projects	Service-Learning Opportunities	Landscape Architecture	Interior Design	Architecture
Extension in the West: Team Building						
Colorado River Basin Agricultural Water Conservation Clearinghouse		•	•	•	•	•
Nevada's Living with Fire Program		•	•	•	•	•
Extension's Role in Sustainability						
Extension Sustainability Outreach: Rising to Meet Public Demand	•	•	•	•	•	•
Land Use and Sustainability in the West	•			•		
Immigration						
LIFE (Local and Immigrant Farmer Education) in Hawaii		•	•	•	•	
Our Energy Future						
The Energy Future of Rural America	•		•	•	•	•
10-Year Energy Vision- Western Governor's Association Energy Initiative	•			•		
In the Good Times and the Bad: Shale Gas Development	•	•	•	•	•	•
Drought and Wildfire in the West						
Fire and Drought in Paradise- Say it Isn't So, Smokey		•	•	•		
Community Wildfire Planning as a Tool to Enhance Trust	•	•		•		•
Extension Disaster Education Network	•	•		•	•	•
Local and Regional Food Systems Boost Local Economies						
A Food Hub Challenge	•	•	•	•	•	•
Land Use Planning and Spatial Configuration	•	•	•	•	•	•
Developing a Healthy Food Hub in Rural Nevada		•	•	•	•	•
Rebuilding Alaska's Foodsheds		•			•	•
The Rural West: Daring to Innovate Job Creation						
Creating Value for Place-Based Businesses		•		•	•	•
Agricultural Tourism and Rural Development	•	•	•	•	•	•
Climate Change Adaptations in the Rural West						
Assisting Arctic Inhabitants in Responding to a Changing Climate	•	•	•	•	•	•
Healthy Communities Improving Health and Well-Being						
Mental Health Outdoors: the Benefits of Nature		•	•	•	•	•
Poverty Reduction Project Increases Social and Natural Capital		•	•	•	•	•
Investigating Places for Active Recreation in N.C. Communities	•		•	•		
Health, Economy, and Community: USFS Managers' Perspectives	•		•	•		
Community Recreation and Healthy Living in Rural Settings	•	•	•	•		
Thermus aquaticus and You: Biodiversity, Health, and Interpretation		•	•		•	
Water in the Western U.S. Is There Enough?						
Constructed Wetlands for Wastewater Treatment as Landscape Amenities		•	•	•		
Food Security in the Western U.S.						
Food Insecurity and Stress Among Children in the West		•	•	•	•	•
Creating Sustainable Communities in a Changing America						
Providing Workforce Housing While Preserving Natural Character in N.H.	•	•	•	•	•	•
Local Decision Maker	•			•	•	•

*Titles of selected articles are abbreviated for efficiency.

4.2.7 The Rural West: Daring to Innovate Job Creation

Creating Value for Place-Based Businesses

Extension economic development agents advocate for small business clients in a broad range of business models and outcomes (Falen, Gray, Sluder, & Westerndorf, 2011). The authors emphasize that working with small business owners is an organic process. Because of the open co-learning process, extension and small-business owners were able to collaborate. Business models that require physical facilities would benefit from early input from the design disciplines so that they are not caught off-guard by the requirements associated with new construction or renovations.

Agricultural Tourism and Rural Development— Developing Value-Added Farm and Ranch Resources to Diversify Operations Beyond Agricultural Production

Evolution of rural agricultural economies from conventional farming to agricultural tourism are described in the article (Burr, 2011). "Agritourism" is identified as providing a rural experience for those living in urban centers. The allure of agritourism relates to urban-dwellers' desires to have immersive experiences in a rural lifestyle (Phillip, Hunter, & Blackstock, 2010). In their efforts to improve their economic stability, agricultural entrepreneurs participate more heavily in alternative business models. In developing branded products that fit into the gourmet food market, agricultural entrepreneurs provide on-site experiences for tourists, and greatly increase the diversity of their product development. Many modifications are necessary to accommodate tourism in existing agricultural operations. Many of these modifications are site and structure issues such as parking, signage, restrooms, and creative ways of illuminating agricultural processes while providing visitors with a positive experience. Consequently, design disciplines should be involved in the early planning stages so that business plans include necessary physical modifications. Additionally, if students had exposure and experience in preparing business plans for the enterprises for which they design, they would develop empathy for future clients and enhance their design skills.

4.2.8 Climate Change Adaptations in the Rural West

Assisting Arctic Inhabitants in Responding to a Changing Climate

The effects of climate-change have already impacted coastal village locations, and promises to impact many economic sectors. Authors (Gamble, Trainor, & Fresco, 2011) identify collaboration efforts between governmental agencies and residents in Alaska as they confront increasingly warmer winters. Design disciplines could be involved in helping plan new communities in danger of becoming submerged or developing strategies to protect existing communities from rising waters. Additionally, the design disciplines could contribute valuable visualization skills during envisioning of new economic opportunities.

4.2.9 Healthy Communities Improving Health and Well-Being

Mental Health Outdoors: the Benefits of Nature

Biophilia and Kaplan's Attention Restoration Theory (ART) are described in conjunction with other recommendations for improving mental health. This project defines the classic use of ART and biophilia to support environmental psychology benefits of nature (Beil, 2010). The benefits of the natural environment can be supported through both activities outside, and through development of architectural and interior design that support humans' intrinsic desire for exposure to the natural environment. There are multiple opportunities for the design disciplines to develop opportunities in the built environment—including site and interior design—that promote human interactions with nature and views to the outdoors.

Poverty Reduction Project Increases Social and Natural Capital

The author (Kollock, 2010) describes a project that involved community clean-up efforts. These efforts were successful in bringing residents together in a dedicated effort to improve the townscape. The successes encouraged the community to tackle larger design issues in town, including a marina. The design disciplines could partner with the community restoration efforts to upgrade local site resources such as the marina, community garden, and other site improvements.

Investigating Places for Active Recreation in Rural North Carolina Communities

The authors reported a lack of clarity in standards about what features to include in local recreational areas (Henderson, Edwards, Casper, Bocarro, & Floyd, 2010). This provides a clear opportunity for the design disciplines, particularly landscape architecture. The importance of forming partnerships was a main finding from rural recreation directors in order to achieve goals. Design disciplines are typically structured to function best as a part of a team assembled to address issues related to the built environment. Design disciplines' involvement beginning early in the process of problem identification, using participatory or co-design methods, would help identify a range of options for recreational opportunities to assist stakeholder subsequent decision-making on standards of recreation provisioning.

Health, Economy and Community: USDA Forest Service Managers' Perspectives on Sustainable Outdoor Recreation

This project primarily focused on a survey of USDA Forest Service managers on "perceptions of sustainable recreation" (Bricker, Winter, & Schultz, 2010 p39). The authors identified that Forest Service managers indicated that residents should be involved in the process. Most felt that there was poor communication between the Forest Service and residents. Design disciplines are versed in participatory or co-design methods that include stakeholder input early in the development process, and provide graphic and written communication material that is easily disseminated to garner public feedback.

Community Recreation and Healthy Living in Rural Settings

This project addressed Louv's (2008) "nature-deficit disorder" regarding rural children, sedentary lifestyles, dependency on technology, and limitations for bicycling or walking long distances. The project refers to the "recreation road - a rural route to planning" as an important resource for rural community planning related to recreation activities (Goodwin, 2010 p45). The author notes that many recreation planners do not gather input from recreational users and recommend ways of generating greater involvement from residents. Design disciplines are well versed in participatory or co-design methods. These present excellent opportunities for involving stakeholders in identifying and prioritizing recreation amenities.

Thermus aquaticus and You: Biodiversity, Human Health, and the Interpretive Challenge

Interpretation of scientific principles behind geologic factors at Yellowstone National Park are described in the article. The authors identify the importance of employing "creative approaches to interpretation" (Dustin, Schwab, & Bricker, 2010 p50). With their emphasis on graphic communication, the design disciplines would be natural partners for scientists who desire to communicate scientific information to the general public in an engaging format. The design disciplines have experience in partnering with experts to interpret complex issues in interpretive centers, museums and other public educational venues. Development of graphic visuals and texts would tell the story of these complex scientific concepts to a general audience through exhibit design.

4.2.10 Water in the Western U.S.: Is there enough to meet the region's needs?

Constructed Wetlands for Wastewater Treatment as Landscape Amenities in Rural Communities

According to the article, small communities with populations fewer than 2,000 residents can use biological treatment systems such wetlands or tanks in greenhouses for sewage. (Austin, 2010). These constructed wetlands can not only treat wastewater but also provide public amenities. The article describes in detail how constructed wetlands are implemented and conceptually illustrates how their principles could be applied. Opportunities for the design disciplines are apparent in the design of constructed wetlands as well as in the educational illustration of their benefits.

4.2.11 Food Security in the Western U.S.

Food Insecurity and Stress Among Children in the Western U.S.

According the authors (Gunderson & Garasky, 2009), children from rural areas are at greater risk for obesity due to the stress brought on by poor quality housing. Housing stressors including living in low quality accommodations, moving in with others, and being sent away from parents, are correlated with issues of food insecurity. Quality housing for seasonal and year-round workforces are suitable design problems for both architecture and interior design.

4.2.12 Creating Sustainable Communities in a Changing America

Providing Workforce Housing While Preserving Natural Character in New Hampshire Communities

Legislation in New Hampshire requires the provision of workforce housing that is affordable and conserves land (Gagne, 2009). This legislation requires that communities consider affordable housing while preserving the natural character of the land. Design disciplines have a clear role in teams collaborating to achieve these complex goals through design of housing and impacted landscapes. The topic provides clear opportunities for design engagement with rural stakeholders as well as interdisciplinary collaboration opportunities for university design programs.

Local Decision Maker

A program developed by Purdue University assists planning decision makers in developing comprehensive plans. It uses assessment of existing conditions, development of a vision for the future, development and comparison of development strategies, and selection and implementation of the preferred strategies. The program is focused on informing and integrating natural resource and economic development decisions (Farnsworth, Kumar, & Nolan, 2009). The article describes database and planning workshop programs, which could benefit if designers could assist community planners in identifying potential design opportunities. This could include the development of solutions with various options that can be easily assessed for impacts on quality of life as well as economic impacts.

4.3 Summary of Research Findings

Content analysis of the *Rural Connections* articles revealed a wide variety of opportunities for design to engage with rural issues. Selected articles revealed opportunities for all three disciplines to engage in broad scale topics and planning-scale projects, as well as focused site-scale projects. Many service-learning opportunities were observed throughout each thematic issue. A graphic summary of these opportunities is presented in a matrix (see Table 4.1).

5 IMPLICATIONS & DISCUSSION

Many of the rural dilemmas engaged by the RRDCs—and embodied within the rural built environment—would benefit from the creative and technical expertise of landscape architects, interior designers, and architects. Within these rural dilemmas, there are opportunities for design to be involved in the projects described, either immediately or in subsequent steps that further develop the project in the future. Concurrently, incorporating rural service-learning projects into design studios promotes several pedagogical benefits including valuable real-world learning experiences for students, and potential for instilling empathy in students for populations and communities with which they would otherwise lack experience. Within land-grant universities, rural community design projects provide opportunities for students to engage with issues of community participation, green infrastructure, regional connectivity, and food security, all while involving students in the institutional mission of service and outreach (Cameron, Forsyth, Green, Lu, McGirr, Owens, & Stoltz, 2001).

Given their expertise in collaboration, visualization, and design thinking, one may wonder why design programs housed within member land-grant institutions are not more apparently involved in these featured projects? One possible explanation resides in previous research indicating the persistence of challenges for engaging in interdisciplinary rural design engagement in an era of urbanization (Ryan, Krikac, and Sleipness, 2015). As urbanism draws research funding and faculty interest, one may reason that rural design issues seem less alluring in academic design cultures, even in programs housed within land-grant universities. Or perhaps those engaged in rural issues from a non-design discipline perspective have not considered how design thinking could be leveraged within a project that may seem unconventional—or even inappropriate—for landscape architects, interior designers, or architects.

5.1 Frameworks for Engagement

If university design programs were more involved in rural issue-based activities of the RRDCs, both rural communities and design programs' faculty and students could realize a range of benefits. As discussed earlier, rural issues are inherently design opportunities; involving design programs within the context of interdisciplinary teams could substantially advance the RRDC's aims for collaboration and aggregation of project benefits on a regional scale. Design could help the RDDCs achieve their goals of maximizing projects' regional impacts through interdisciplinary collaboration. Additionally, shared service-learning and research projects could catalyze collaboration among faculty within and across academic institutions. Design involvement would mutually benefit both students and those who inhabit rural places. Due to their urban and suburban upbringings, many university students do not have familiarity of rural communities and are unaware of the challenges, and unique assets that rural communities provide.

Because of the complex and interdisciplinary nature of professional practice, university design programs wrestle with how to equip their students with a comprehensive foundation of knowledge and experience. Through rural design service-learning experiences, students will have opportunities to develop empathy for those who inhabit rural areas and the challenges they face. By engaging in rural design issues, at the level of academic programs, future and emerging design professionals would be initiated into a culture of professional service to communities in need. While we do not anticipate nor recommend that design programs shift their priorities to the exclusion of urban issues, engagement with the RRDCs is one potential way that programs may educate more well-rounded future design professionals.

5.2 Study Limitations

This study is not without limitations. First, while the WRDC promotes *Rural Connections* as a showcase of its highest priority projects, it is possible that engagements among extension, design programs, and communities do occur, but were not showcased in this publication. Relatedly, this study does not evaluate design programs' involvement in rural issues at non land-grant universities. Additionally, due to the overlapping nature of professional design practice, opportunities assessed as most appropriate for one discipline may not preclude the involvement of additional design programs.

While this study evaluated opportunities for interdisciplinary engagement by landscape architecture, interior design, and architecture, it does not explicitly assess the potential for other allied design disciplines such as environmental design, bioregional and community planning, industrial design, art, construction management, or engineering. Future studies could further the exploratory research of this study by including these disciplines in a similar evaluation of collaborative opportunities.

5.3 Directions for Future Research

Given that topical priorities engaged by the RRDCs can originate from Extension directors, agents, and faculty, future research might include a survey of Extension individuals to more completely assess their familiarity with the expertise of design faculty and students, and their receptiveness to collaborating with design. Concurrently, future research could also include an in-depth inquiry into the urbanist inclinations of contemporary design education at land-grant institutions in order to assess levels of interest in engaging in rural projects among design faculty. While design programs' urban emphases are apparent and corroborated by previous exploratory research (Ryan, Krikac, & Sleipness, 2015), a more comprehensive review of this issue would contribute to the literature and potentially illuminate willing rural design collaborators at the regional level.

In addition to these future research directions, design programs and their faculty should self-reflect on whether they are missing opportunities for rounding out their students' learning experience and building capacity for empathy. Design programs should evaluate how they can effectively market their core skills to unconventional design partners and projects. Through exposure and networking with Extension directors and staff, design programs and their faculty might build relationships and establish professional rapport with rural partners.

As universities place greater emphasis on funded research, design disciplines must adjust to this new paradigm. The four RRDCs are a potential organizing framework for design disciplines to engage in nationally recognized and funded research and engagement priorities through service-learning studio projects. For landscape architecture, interior design, and architecture to fully engage human settlement on a regional scale, rural built environments must be holistically considered as part of an interrelated system of design challenges. While rural settings present an intriguing array of opportunities for design thinking, the greatest challenge may be to shift conventional conceptions of the work designers can do.

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COMMUNICATION AND VISUALIZATION

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THE SKETCH WALK: EXPLORATION, DISCOVERY AND A DISCUSSION OF PLACE

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1 ABSTRACT

The growth and popularity of urban sketching (Campanario, 2012), sketch walks and sketch crawls, has brought the practice of sketching to the attention of landscape architecture programs and practitioners (Richards, 2013). Both CELA and the ASLA have hosted sketch walks as an academic and practical form for groups to explore, discover and discuss place. This has initiated a discussion on the role of sketching, recording direct observations, mapping and social media sharing in the teaching of design. This paper will describe how the sketch walk and its organizational components; Location; Movement and Record, are used to explore, discover and discuss place.

The Sketch Walk mimics the skills required to experience and document space and initiates the process of analysis and conceptualization. The Sketch Walk can engage instructor, student and practitioner in an operation that contributes to the design of urban spaces. The roots of sketch walking will be mentioned and discussed, from the socio-political infusion of Situationist thinking (Debord, 1958) to Cullen's the process of Serial Vison (Cullen, 1961). A description of the planning and organization of a sketch walk and perspectives on the use of sketching, mapping and physical engagement in the landscape will be discussed.

1.1 Keywords

Sketching, Sketch Walk, Drawing, Mapping, Place

2 SKETCHING

The growth and popularity of sketching, has brought the practice of on-location sketching to the attention of landscape architecture programs and practitioners. Its popularity can be measured by the proliferation of books on Urban, On-Location and Landscape Sketching and the appearance of sketch organizations, like Urban Sketchers.

A decade ago, sketching had been relegated to studio drawing, and the analysis and representation of landscape designs was developed through digital photography, video, and two and three dimensional graphic programs. *"Digital Drawing for Landscape Architecture"* by Brad Cantrell and Wes Michaels replaced "*Drawing the Landscape"* by Chip Sullivan as the visual and representation text for landscape architects; a shift reflected across design disciplines as the speed and standardization available through digital formats made communication and collaboration among disciplines possible. A great deal can be argued on the digital-analog topic, but what is relevant to this discussion is the value of educational content and formats that integrate sketching in the analysis and design of landscapes.

Sketching and its relevance to academic practice and pedagogy was revisited in Caroline Lavoie's *"Sketching the Landscape: Exploring a Sense of Place"* (Lavoie, 2005) followed by *"Exploratory Physiocartographies of Place and Time"* A sketch crawl and panel discussion at the 2013 Annual CELA meeting in Austin (CELA 2013). Between 2005 and 2013 there were a series of lectures and activities that formally discussed the practice and theory of sketching; ranging from the history and theory of drawing and architecture in the *"Is Drawing Dead?"* Symposium at the Yale School of Architecture (Yale, 2012) to the Urban Sketchers first International Symposium in Portland, Oregon (Urban Sketchers, 2009), to the publication of *Freehand Drawing and Discovery: Urban Sketching and Concept Drawing for Designers* (Richards, 2013). Since the 2013 CELA meeting, the American Society of Landscape Architects (ASLA) has organized three sketch events (Sketch Walks) for their annual meetings and the Sketch Out/Loud public awareness event for the celebration of World Wide Landscape Architecture Month. Several Landscape Architecture programs have reintegrated sketching and sketch walks as part of their design studios.

3 SKETCH WALKS

The discussions, publications and activities on sketching have a common theme: The importance of the direct exploration and discovery of place through sketching. The basic argument for walking the city to explore, understand and mentally "remap" its conditions has been explored by Debord in his wandering *Derives* (Debord, 1958) then spatially formalized as a design tool for planners and designers in Gordon Cullen's *Serial Vision* practice (Cullen, 1961). Debord's open ended exploration and Cullen's formalized approach bookend a vast practice of mapping, exploration and discovery across media by designers, artists and cartographers.

The Sketch Walk (Sketch Walk will be used to describe the process of walking through an area and drawing what you see or calls your attention) is a practice within those bookends. It provides a structure to organize sketching activities that can address the specific objectives of a design studio or public participation program. The format for Sketch Walks can vary from structured and directed to free and rambling; from day long events to gatherings of short duration. The walking can be on a planned course or a self-directed route. This flexibility allows participation at all levels of skill and purpose.

For the pedagogy of landscape architecture, specifically, sketching Place with Sketch Walks requires the formalization of a process that frames the walk within a specific need or desired outcome. The basic questions to answer, based on the experience of planning ASLA and Urban Sketcher Sketch Walks, are: "What aspects of place or design are to be stressed?" and "How will they be recorded or documented?" These broad questions allow for the exploration of design concepts through the practice of on-site discovery, and analysis. The method of recording and documenting of the walk strengthens the practice of drawing and mapping operations.

4 SKETCH WALK: METHODS AND OPERATIONS

Sketch Walks have been offered as field sessions at the last three ASLA conferences. Sketch Boston, Denver and Chicago (ASLA 2013, 2014, 2015) were guided walks that used sketching to document the unique urban character of the three cities. The walks were organized by a group of landscape architecture practitioners and educators who used sketching as an integral part of practice and studio education. The walks were structured to include the presentation of historic context, sketching demonstrations, sketching exercises with one-on-one guidance and group discussions on sketching, place and representation. The structure of this specific method, structured for and by landscape architects, consolidates aspects of wandering (*Derive*), sequential documentation (*Serial Vision*) with drawing and mapping techniques familiar to the discipline. This way of planning, organizing and documenting a sketch walk is the result of the review of sketching and mapping exercises by mappers and artists as well as the experience of participating in dozens of Urban Sketcher sketch walks.

A description of the organization and planning of the sketch walks follow, as a way to discuss methods and techniques.

4.1 Organization

The first step in planning and organizing the Sketch Walk is to prepare an outline and discuss the physical, social and historic aspects that define the city. The discussion includes a review of existing and proposed architecture and open space, significant landmarks, food, people, historic events and personal experiences. Subsequently these spaces are located on a map and we coordinate the logistics of moving from one place to the other considering the amount of time for the session. It is also important to state that these Sketch Walks are not perceived as jumping from one point to the other, but rather moving from space to space. This is a significant consideration or approach to the walks since the process mimics how landscape architects conceive and design space, as the articulation of physical spatial movement and aligns with the sequential spatial experience and documentation methods described by Cullen. At the end of these discussions we have a series of notes, conceptual diagrams and maps that outline several ways of approaching the walk. (Figure 1.)

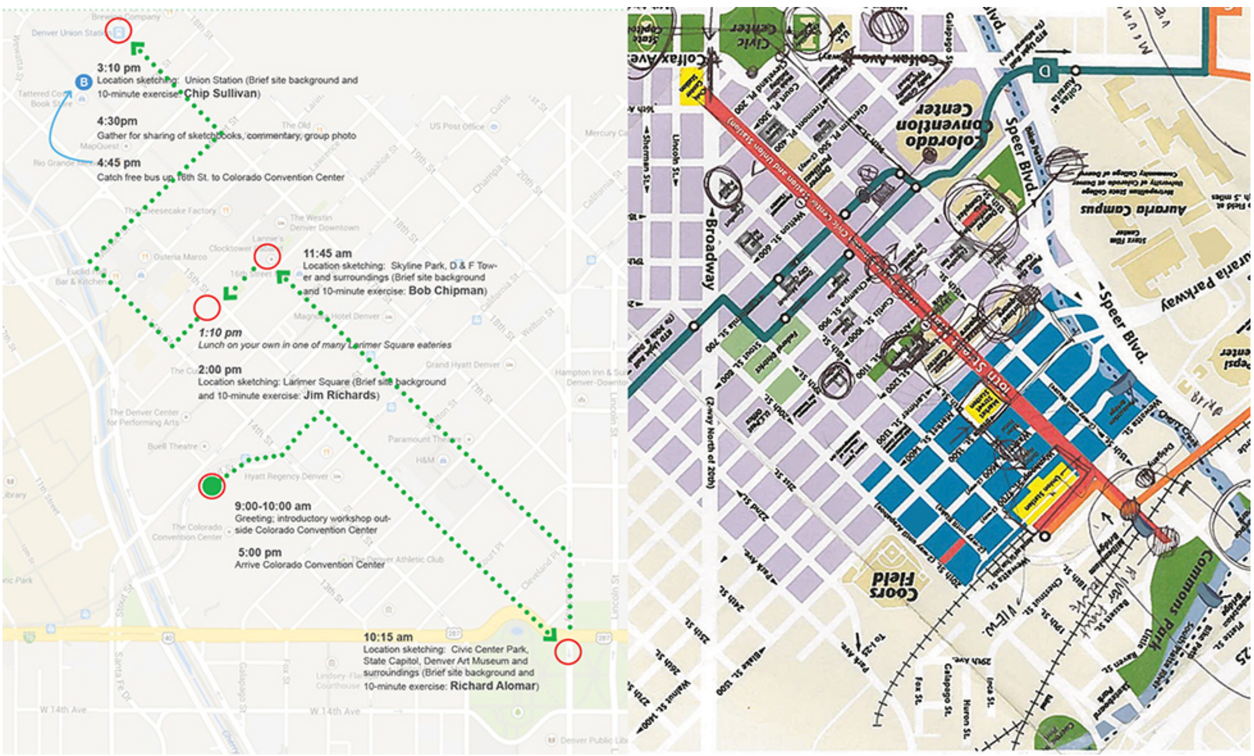

Figure 1. Final and Draft Map from the ASLA Field Session: Sketch Denver (2014). Diagrams and notations by Author.

4.2 Exploration

A field visit to the city connects the ideas and concepts about the walk with the physical reality of the space. The exploration phase of the development of the walk is phenomenological; as it considers discoveries that arise from walking the city, and cartographic (Cartesian) in its fixing of structures, streets and spaces on a map. The reconnaissance walk changes some perceptions about the spaces and allows for the inclusion of structures, spaces and views not remembered from previous visits, not apparent on maps and not seen on Google Street Views. These adjustments generate a map, path and a set of exercises that illustrated salient spatial, physical and historic components (Figure 2).

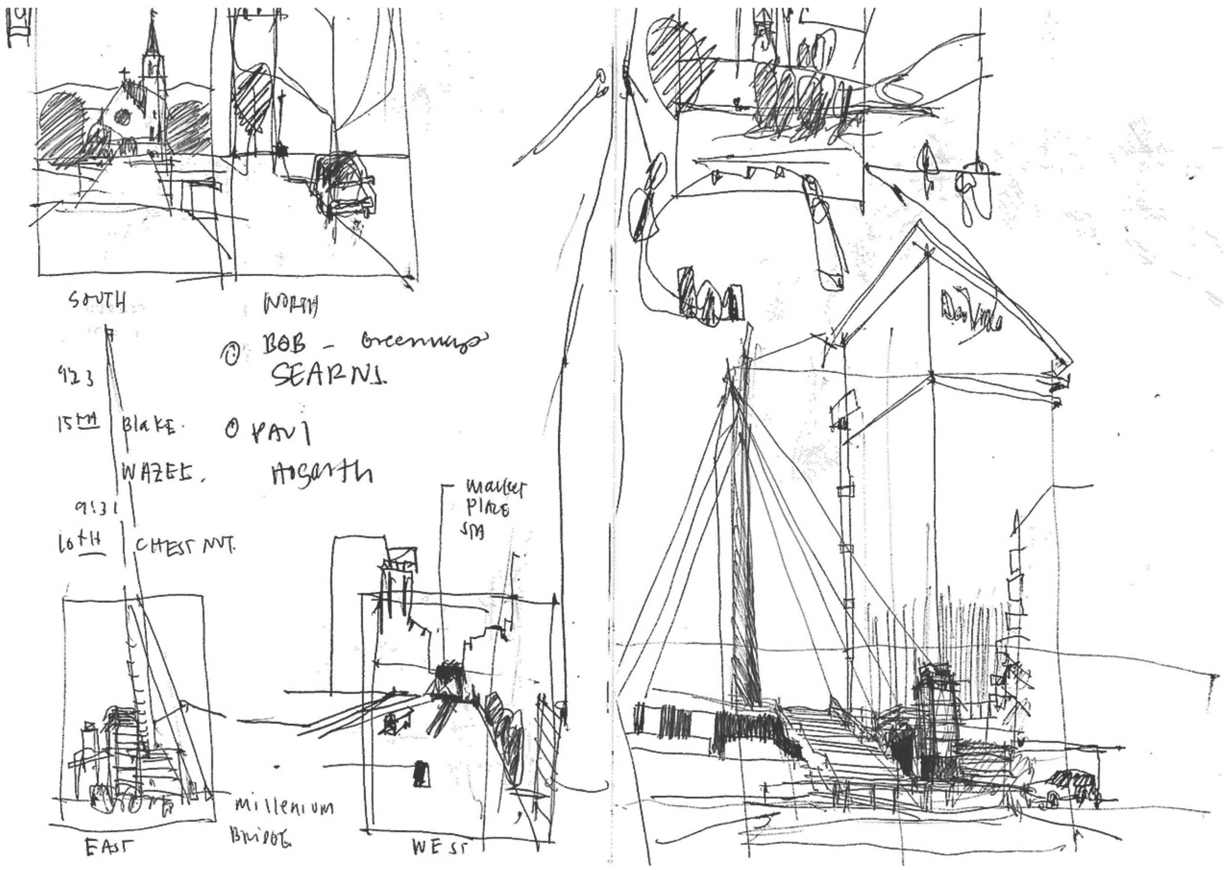

Figure 2. On-site walk preparation sketches for the ASLA Field Session: Sketch Denver (2014). Sketches by Author.

4.3 Discovery

The walks have two groups; the organizers and the participants. The organizers have, through a process of exploration and synthesis, directed the movement through a location and determined the salient aspects of the site. These aspects are explained and demonstrated through sketching and the walk itself. The participants follow the prescribed movements and exercises, first to grasp the organizer's points, then to build their own experience. In the process there are discussions between the organizer (guide) and participant (discoverer); a conversation that develops and expands the visual, physical and historic understanding of the site and creates an experience of place (Figure 3).

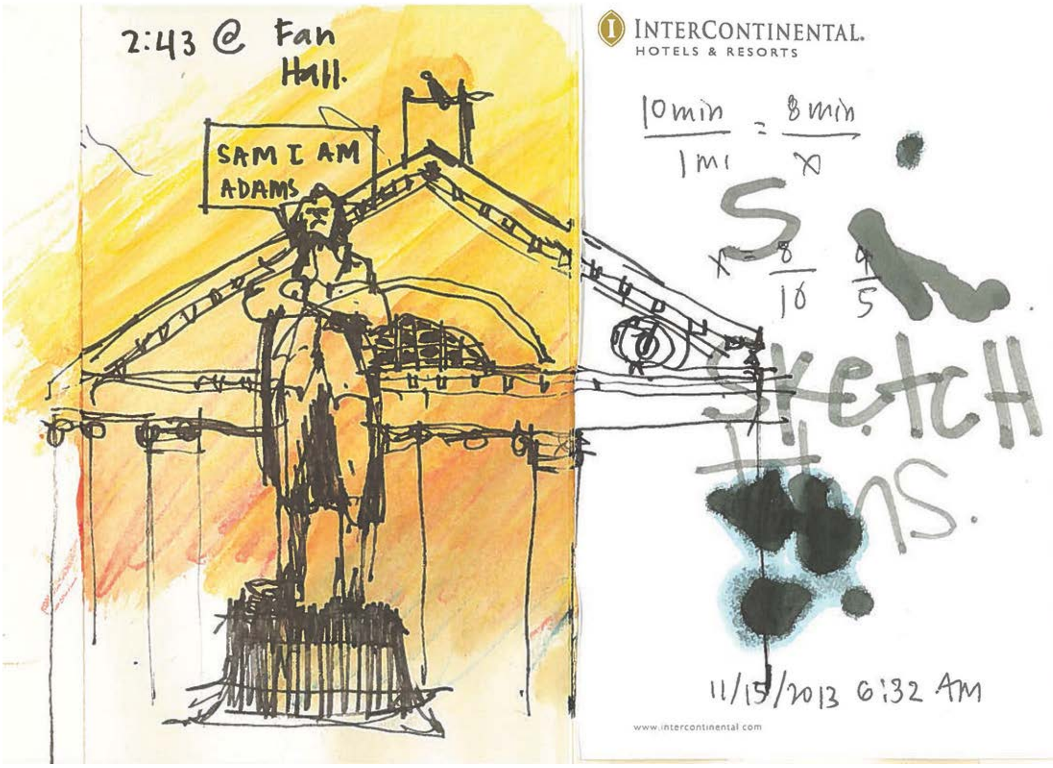

Figure 3. **Sketch from the ASLA Field Session: Sketch Boston (2013). Sketches by Author.**

5. THE SKETCH WALK AS AN OUTDOOR DESIGN STUDIO

On the surface sketch walks, and the many other on-location sketching activities available to the general public (Urban Sketchers, Sketch Meet Ups, Dr. Sketchy) seem like fun activities for sketching enthusiasts. In recent years, however, many landscape architecture practitioners, instructors and students have participated in sketch walks and have discovered that, they help hone sketching and drawing skills, have precedents in artistic and social movements, and can be used, along with the sketchbook, as an on-site analysis tool for design. The scholarly aspects of these points have been argued, in positive terms (Lavoie, 2005 and CELA 2013) and have been fixed within a historic, artistic and social framework. The sketch and the sketchbook for example, were used as a way to develop and compose a painting, as a sort of rehearsal to the final work (Petherbridge, 2010) and that sequential process, from idea to final work, is essentially the design process. The need to capture the "real world" in illustrative sketches of new found lands and its people, in explorer logs, artistic travelogues and cartographic representations used travel, discovery and sketching documentation as the way to show and relate the world to others. So the argument that walking and sketching can capture, depict and show place is clear. The use of sketches, text and maps as qualitative methods to document perception of place by designers and non-designers is tied to the planning oriented cognitive maps in Image of the City (Lynch, 1961) and mapping operations on the one hand and the socially subversive movements that questioned power, creating alternate ways to experience and depict the city, like the Situationist (Debord, 1995), and Psychogeographic movements on the other (Coverly, 2010).

It is the principal argument of this paper that the Sketch Walk, in its organization and execution, is an activity that mimics the skills required to experience and document space and initiate the process of analysis and conceptualization; that the Sketch Walk can engage instructor, student and practitioner in an operation, that contributes to the design of urban spaces. The Sketch Walk combines sketching and walking; the embodied and the cognitive, in a format that is flexible and simple to construct. Location (place to be studied), Movement (the ways to move through the space) and Record (the ways of sketching the experience) constitute the components of the walk that can be directed to focus on a specific aspect of design or analysis. Defining the purpose of the three components, the organizer (instructor, landscape architect, community designer, or place maker) can structure an activity that produces information (quantitative or qualitative) that be part of design development or team building. In addition the organization of the activity as a Sketch Walk provides a “big tent” that can hold a variety of artistic, social and design intentions.

The hand drawn final rendering in landscape architecture has evolved into refined computer generated two and three dimensional images and models. The sketch as a fixed exercise with in a linear trajectory towards the production of a final piece, be it a design or in the case of the artist, an art piece, is used less and less. Still, sketching and drawing remain an importance practice. Observation, familiarity with drawing media, the development of speed and visual communication are embodied skills that initiate and mimic the design process. Walking through a space, using all senses to orient, perceive and remember is the process used to cognitively determine or fix place in our minds.

Academic programs, regardless of their focus or tradition, grapple with a broad charge; the formation and development of a professional Steward of the Land. Stewardship of the land is a global endeavor that has no borders physically or intellectually, which is to say that the very nature of landscape architecture; encompassing, a bit vague, phenomenological and cartographic, artistic and scientific, executes its work in a cognitive and physical framework, wrought with dilemmas, conflicts, debates and contradictions.

In conclusion, the components of the sketch walk; Location, Movement and Record, provide a flexible framework for the use of sketching as an outdoor activity to explore place. The primary activities described in this paper are 6 to 8 hour events for professional landscape architects, but the process of selecting a location (Place), determining movement (wandering or sequential) and a way of documenting (sketching) can be applied to more broad explorations for students and non-designers by including other ways of moving and documenting space. The flexibility and fluidity of choice within this framework can be adapted to explore and stimulate other forms of experiencing and documenting neighborhoods, streets, parks, landmarks and other urban spaces. Karen O’Rourke’s “*Walking and Mapping: Artists as Cartographer”* (O’Rourke, 2013), describes a variety of methods used by artists, cartographers and designers that can be helpful in structuring sketch walks that engage student and instructor. And the possibility of combining a series of sketch walks in one or many places, with multiple organizational structures over the course of a semester, with a review of literature on the many ways to experience, describe, document, discuss, intervene-in and design landscapes could lead students to multiple ways of understanding place as well as provide instructors with new forms of analysis, representation and engagement.

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CONTEXTUALIZING DATA WITH LANDSCAPE REPRESENTATION TOOLS: ADDING MEANING FOR PUBLIC EVALUATION

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1 ABSTRACT

In educating the public, different disciplines rely on different tools for visual communication. At the transdisciplinary Louisiana State University Coastal Sustainability Studio (CSS), we find that data-rich graphs and charts used by scientists and engineers often fall short of communicating the significance of a relationship or process to the public. Visually communicating this meaning is an interpretive step that is necessary for meaningful public engagement. In Louisiana, the coastal land loss crisis impacts communities, industry, and ecological systems at a massive scale and rapid rate. Responding to this crisis requires broad public support and funding. To achieve this, organizations must find a way to present complex concepts to the public in a way that is meaningful, convincing, and moving, in order to inspire the will to act among the public and political leaders.

Drawing inspiration from writings on climate change and the work of landscape designers, the CSS has developed a visualization approach that builds on the framework of ecological understanding developed in Hill et al. (2002). Using three examples, this paper shows how to relate coastal data to human perspectives by contextualizing the data in a scene using three visualization strategies: visual cues for multiple senses, visual cues for process, and narrative. Testing the efficacy of the graphics produced through this method through focus groups would be a valuable next step.

1.1 Keywords

Visual communication, ecological understanding, public

2 INTRODUCTION

In working across disciplines with the shared goal of educating the public, it becomes evident that different disciplines rely on different tools for visual communication. At the trans-disciplinary Louisiana State University Coastal Sustainability Studio (CSS), we work with scientists, engineers, and designers to envision, design, and communicate sustainable communities, environments, and coupled systems on Louisiana's coast. In our visual communications work, we find that our scientist colleagues, trained in abstract thinking and familiar with the mechanisms of a particular process, often use graphs and charts to convey meaning. When communicating with the general public, however, we believe these communication tools often fall short, at most communicating that something happens, without explaining how and why it happens, nor its broader significance. If the goal is to meaningfully engage the public in civic discourse and participation, then we propose for visualizations to go beyond traditional science communication techniques to generate a greater sense of what the data mean for different user groups.

In Louisiana, informed engagement in civic discourse regarding coastal land loss is critical and urgent. Since 1932, coastal Louisiana has lost 1,883 square miles, one quarter of the 1932 land area (Couvillon et.al., 2011). This is approximately 300 more square miles than the entire state of Rhode Island. For the past 30 years the rate of land loss has averaged just over 16 square miles per year, which, if distributed evenly, would be equivalent to the area of a football field of coastal land lost every hour. This land loss has impacts that range from local to global, effecting communities, habitats, fisheries, oil and gas, shipping, and carbon sequestration.

In order to address this rapid and far-reaching problem, the citizens of Louisiana and the larger United States need to be informed and understand the urgency of the situation in order to take action in a timely manner. Several organizations have been and continue producing material to educate the public, including non-profit and governmental organizations; however, misinformation, counter-narratives, and conflicting interests hinder consensus-building at the scale needed for large-scale action.

One organization, the State of Louisiana's Coastal Protection and Restoration Authority (CPRA), a group that integrates the expertise and resources of the Department of Natural Resources, the Department of Transportation and Development, and other state agencies, is charged with developing a Master Plan for Louisiana's coast. This Master Plan, which is revised every five years, proposes a range of projects to restore large-scale systems across the coast (Coastal Protection & Restoration Authority, 2012). The investment and coordination needed to accomplish the goals of the Master Plan require broad public support and funding. To achieve this, CPRA must find a way to present complex concepts to the public in a way that is meaningful, convincing, and moving, in order to inspire the will to act among the public and political leaders.

The CSS has been commissioned by the CPRA as well as by local and national NGO's including the National Wildlife Federation (NWF) and the Coalition to Restore Coastal Louisiana (CRCL) to develop visual material to convey the complex processes and relationships underpinning the need for coastal protection and restoration and the specific projects being proposed. We have observed that there are many graphs, charts, and infographics that display data about coastal land loss, but there is a link that seems to be missing that would help the average person understand the significance of the data, and how the information relates to their lived experience. Our goal at the CSS is to inform and engage the public, preparing them to make informed decisions and bolster political will to take collective action regarding coastal land building strategies. We want people to understand how the data impact them and the systems they depend upon. Developing this understanding is important, not only for our context in coastal Louisiana, but also for those working on communicating other environmental trends, such as the impacts of climate change or the overharvesting of resources.

Drawing inspiration from writings on climate change and the work of landscape designers, the CSS has developed a visualization approach that bridges the specificity of data analytics and science communication with an aesthetic tradition germane to landscape architecture.

One source of inspiration has been Kristina Hill's work discussing what landscape architects can do to engage themselves and the larger public in responding to climate change. Her work has helped us clarify our strategy of using aesthetics to enhance ecological understanding. In her lecture at Coastal Sustainability Studio, Hill discussed the role of aesthetic performance to inspire in the public the courage to invest, a sense of shared resourcefulness, and the expansion of public compassion (2013). She gave examples of public infrastructure projects that engaged with aesthetic performance as an additional layer to an engineering solution in order to achieve these goals.

From Hill, the CSS has incorporated the value of engaging an observer's imagination by designing with beauty and narrative in our communication and education graphics. We do this by showing more than the basics of a flow diagram—we engage with beauty, narrative, and perspectives to engage the imagination of the viewer. In this way, we intend for our work to promote the public's existing ecological understanding of Louisiana's coastal crisis—helping them understand the web of interrelated relationships that tie changes in ecological and geological processes to impacts in human communities, economies, and ways of life (Hill et. al., 2002). By empathizing with the human in the landscape in these images, we engage the viewer's imagination foster an understanding for the need for state led restoration that leads to project support and informed decision making.

A second source of inspiration has been the work of other designers communicating landscape narratives through two-dimensional graphics. Previous examples by designers integrating data with the experience of a place include Corner's Taking Measure Across the American Landscape (1996), Mathur and de Cunha's Mississippi Floods (2001), Misrach and Orff's Petrochemical America (2014), and Seibert's Dredge Research Collaborative work with the CSS (Milligan, 2015). These precedents tested methods of layering data and collaging human experience. These resources contain beautiful, data rich images that are best studied in large print or book form. In contrast, the work presented in this paper is primarily intended to be delivered in a presentation, on a screen, or in a mass-produced hand out. The images must work quickly in this forum to communicate broadly about not only the need for restoration but the stake that most Louisiana citizens have in it.

3 METHODS

In our images we try to show how coastal data relate to human perspectives and use of the landscape by contextualizing the data in a place or scene. To contextualize the data in a scene, we use three visualization strategies: *visual cues for multiple senses, visual cues for process*, and *narrative.*

The use of visual cues for multiple senses means that in our two-dimensional imagery we use visual cues to convey triggers of multisensory perception. This visualization strategy relates to visualization techniques developed in landscape architecture: representations of ephemerality and ambience. Empherality is an experience of space that is important to represent because a landscape architect will have considered how a place changes through the seasons, through the years, and through the various perspectives of a person moving through the space. These considerations of change over time are often represented with semi-transparent elements. Trees, for example, are often shown as semi-transparent because they are only temporary visual barriers, both temporally (through the seasons and years as they change shape) and spatially (along the course of a person's path). Seeing trees represented semi-transparently in a static image relates to a person's experience of change and movement through a landscape.

Representations of ambience are yet another technique used by landscape architects. Ambience can be represented in many ways to convey many qualities about a space. Wind can be shown with white caps or blowing hair; muggy air can be shown with haze and the quality of light. Details such as these can trigger a sense of what the air of a place might feel or even smell like. Cues that trigger multisensory perception can help the viewer's imagination enter the scene and increase interest in the embedded information.

The second strategy, use of *visual cues for process* means that we incorporate the principles underlying and guiding the work of landscape processes. We refer to the principles underlying and guiding landscape processes as a "landscape aesthetic," building on an existing definition of *aesthetic*, "a set of principles underlying the work of a particular artist or artistic movement" (Oxford University Press, 2016). An example of showing visual cues for process (landscape aesthetic) would be drawing a sediment plume at the mouth of a river to indicate that the river is carrying sediment out into a larger body of water. In this case, the landscape process would be sediment deposition and the principles underlying it would be that the river carries it to an open body of water. While the river could be accurately drawn without the sediment plume, the plume's addition conveys a landscape aesthetic, or underlying process.

The third strategy, use of *narrative*, means that in our graphics we incorporate elements that suggest a story, characters, or action. Narrative can be deployed both in sequence images and in stand-alone images. In sequence images, progress through time and/or space can tell a narrative story of relationships, history, and experience. In a stand-alone image, narrative can be incorporated into a scene by showing characters in action or by showing a path that crosses through varying environmental conditions.

By using the representation strategies of visual cues for multiple senses, visual cues for process, and narrative to augment data, we at the CSS have created visuals that try to communicate processes, an experience of place, and relationships in data that will make the information about coastal land loss meaningful to the public.

4 EXAMPLES

4.1 The Growth of Louisiana's Delta

Our first instructive example that integrates data and human perspectives is a series called *The Growth of Louisiana's Delta* (Figures 1a-1c). In these images we show current geological theory of where the Mississippi River deposited sediment over 6500 years. The intention is to highlight the relationship between the river changing course and land building along the new route, and land eroding along the old route no longer supported by river inputs. This message highlights the dynamic and impermanent nature of deltaic land, which is an important foundation for understanding why Louisiana is experiencing a land-loss crisis today.

The data conveyed in *The Growth of Louisiana's Delta* are the river courses and lobe names, extents, time frames, and area built. The information about river courses was simplified from a 1944 geological investigation of the Mississippi River stream courses (Office of the President, 1944). This information accompanied a 170-page document that has formed the foundation of how geologists understand the age and development of the delta through a sequence of lobes (Fisk, 1944). Subsequent work simplified the lobe sequence into between 5-7 major divisions (Frazier, 1967, Morgan, 1977). Land area was based on McLindon's presentation of Frazier's work (McLindon, 2015). In our drawing, we simplified the graph and removed numbers on the y-axis to focus the viewer's attention on trends and relationships.

Using these resources, we made the information more meaningful to viewers by introducing visual cues for multiple senses, visual cues for process, and narrative. To do this, we added details that suggest materials, processes, and time that help reinforce the underlying coastal principles at work. Visual cues for multiple senses include colors and patterns that suggest material quality of land, water, and sediment. These are simple additions to a geology drawing that helps reclaim the specificity of the subject. The viewer can see the materials that are moving over time rather than abstract lines. Visual cues for process include textures for sediment and decay. We used sediment plumes to show an active river depositing sediment and showed lobes in decay with a tattered look to the land. These details help give the drawing signs of life and change, reinforcing the message objective of a dynamic coast. Narrative is incorporated into this series by showing how the coast changes, allowing the viewer to see the consistent relationship between river path, sediment deposition, and land erosion as the image changes. (Figure 1a-c.)

By integrating data into a scene using the three visualization strategies in The Growth of Louisiana's Delta, we strive to reconnect the experience of a landscape—the tactile materials and flows—with the abstract representations of the geologic history of the site. This strategy engages both the logics of scientific knowledge and the logics of perception. In doing so, the explanation of how the landscape evolved over time carries a more nuanced message than the geology drawings while simultaneously being more readily understood by viewers. By understanding the history and processes that led to the development of Louisiana's delta, the public will be better equipped to build on that knowledge to understand how river management practices have affected the land building and land decay processes inherent to the system.

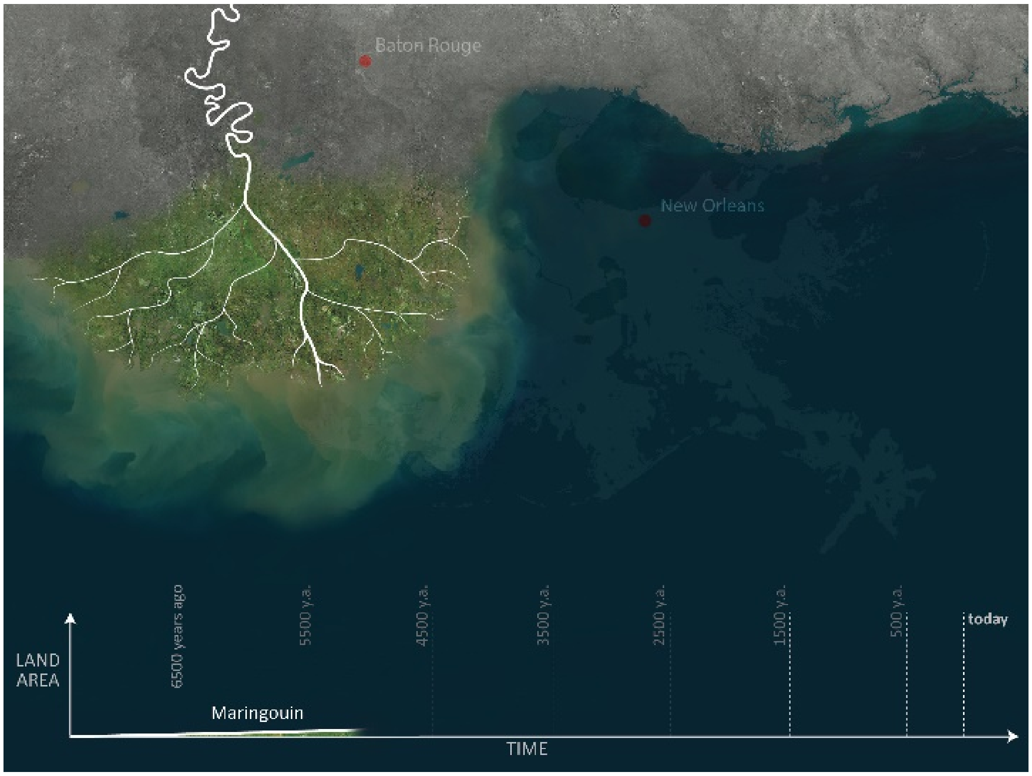

Figure 1a.

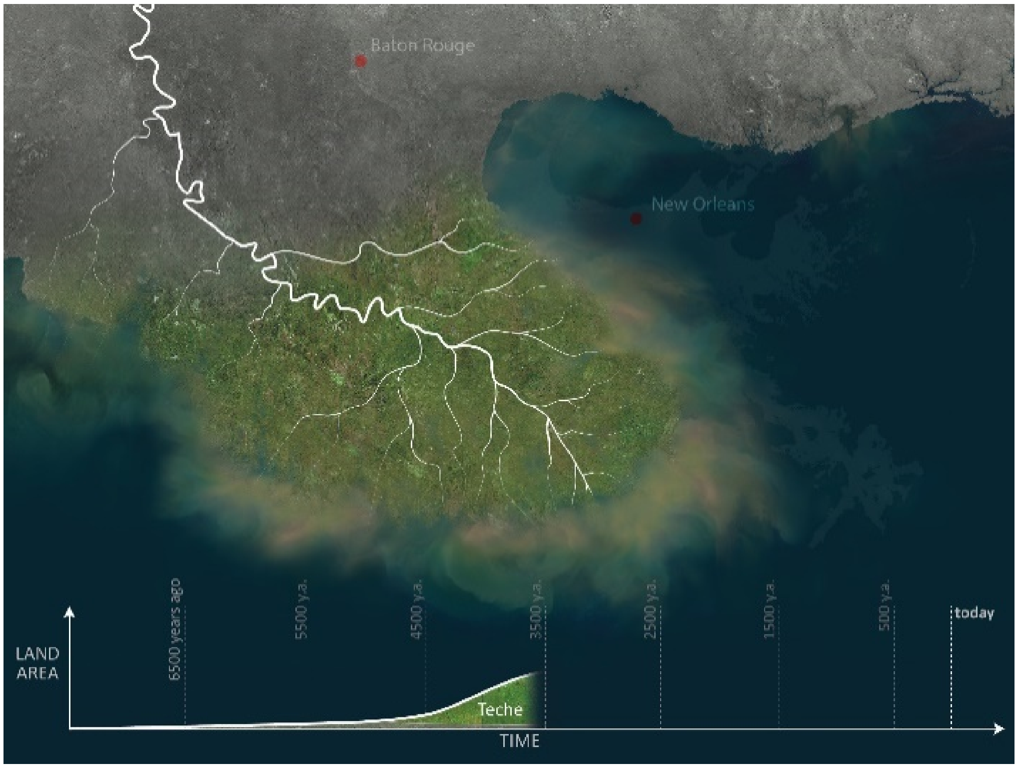

Figure 1b.

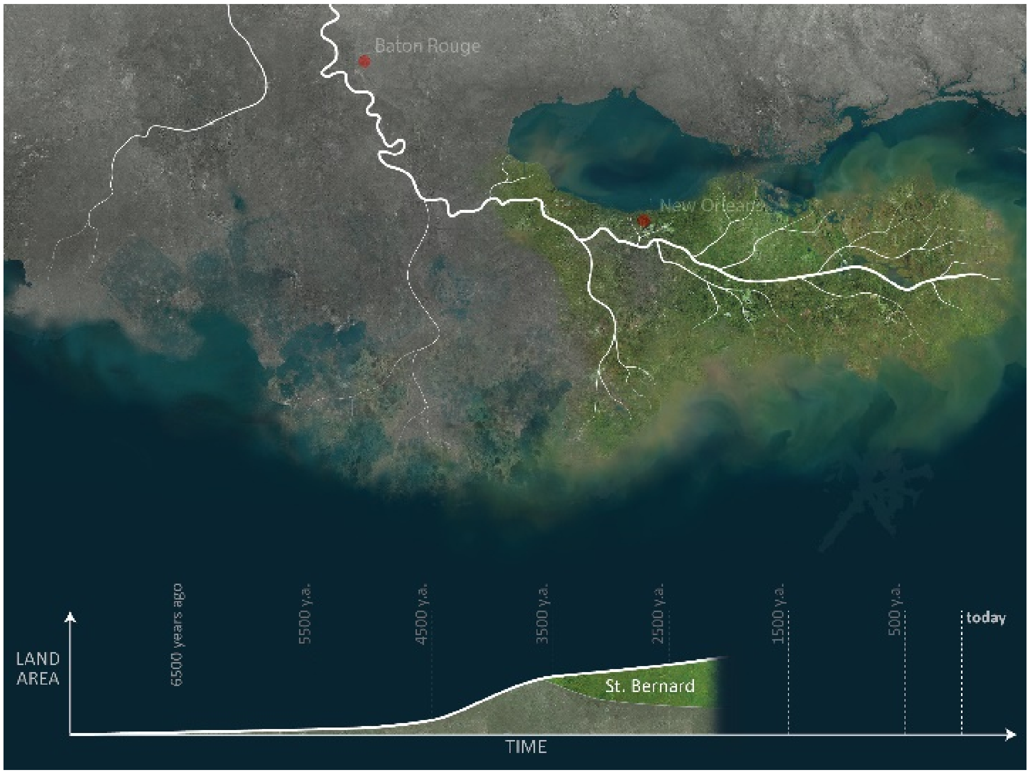

Figure 1c.

Figures 1a-c. *The Building of the Louisiana Delta* sequence showing the use of visual cues for multiple senses, visual cues for process, and narrative. Visualization by LSU Coastal Sustainability Studio.

4.2 The Shrimp Eye View

Our second example, Shrimp Eye View, shows the life cycle of a shrimp from the perspective of a shrimp travelling from a low salinity environment full of food, shelter, and predators as it returns to the gulf to spawn (Figure 2). The intention is to contextualize life cycle information while also relating the ideas of shrimp as an environmental variable with shrimp as a resource. By relating these two ideas, we embed information that shows connection between freshwater marsh habitat and an economic resource while showing the basic elements of the shrimp life cycle. (Figure 2.)

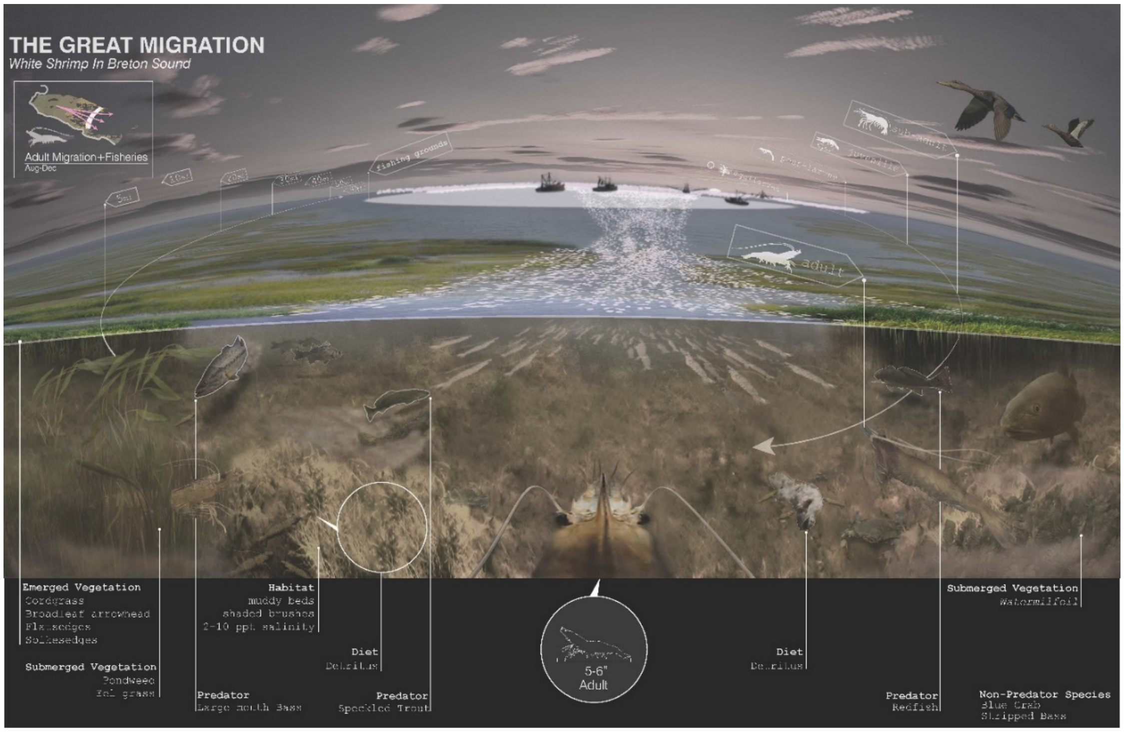

Figure 2. ***Shrimp Eye View*** **showing the use of visual cues for multiple senses and narrative. Visualization by LSU Coastal Sustainability Studio.**

In this drawing, the data conveyed are the life cycle of shrimp as they move through waters of different salinities and dangers, and habitat elements like food, predators, and shelter. The information about life cycle and habitat is from Louisiana Sea Grant and U.S. Fish and Wildlife service (Louisiana Sea Grant, n.d., Muncy, 1984). Currently, a common visual guide for showing how shrimp move through an estuary during its life cycle is a Louisiana State University Sea Grant poster, shows images of shrimp life stages superimposed on a simple plan-view map (Louisiana Sea Grant, n.d.).

Taking these resources, we added additional elements that take the abstract information of where shrimp are during different life stages and make it more visceral and meaningful to human systems using the visualization strategies. In *Shrimp Eye View*, visual cues for multiple senses include the realistic colors, textures, and scale of elements in the habitat scene such as the decaying detritus, murky water, and aquatic vegetation bending in the current. These elements help the viewer intuit relationships between elements that are reinforced through annotation.

Narrative is also employed in this image and is facilitated by the section cutaway, the unusual perspective, and the character elements. The section cutaway shows an active habitat scene with predators, shelter, and food, contextualizing the shrimp's environment, imbuing the image with signs of life, ambience, and relationships between elements. The unusual perspective, from that of a shrimp, also supports a narrative by priming the viewer to look for novel relationships in the image and draws the viewer's attention in to the world of the shrimp and its journey to the Gulf of Mexico. The character elements in *Shrimp Eye View* are the protagonist shrimp in the foreground, the cohort of shrimp migrating to the Gulf along a path, and the fishermen in the background (implied by the boats). These character elements, along with the perspective of the image helped us create a narrative of a journey, highlighting the distance and dangers with the foreshadowing of a dramatic scene at the end.

Through both using visual cues for multiple senses and supporting a narrative in the image, this drawing helps the viewer develop an intimate awareness of the needs and challenges of non-human living things in the system. This awareness of other perspectives within the shared system is intended to increase the ecological understanding of viewers, enhancing their ability to make informed assessments about coastal management practices, which have the potential to cause unintended effects on the system.

By applying aesthetic qualities to ecological information, this visualization explores the intersection of ecological and human systems. It juxtaposes two perspectives of Louisiana shrimp: the ecosystem where white shrimp develop into adulthood and their harvest by fishermen for consumption and sale. This drawing helps to bridge conversations in coastal Louisiana between those advocating for the environment and fishing industry; both have a common interest in the shrimp, but view the species from different perspectives. By seeing the shrimp both as a creature that requires particular habitat conditions to grow and as a resource for human use, we can help expand the conversations of how aquatic resources are managed to better achieve sustainability goals.

4.3 Coastwide Reference Monitoring System Stations in Barataria Basin

The third drawing, *Coastwide Reference Monitoring System Stations in Barataria Basin*, uses a landscape scene to explain how Louisiana's Coastwide Reference Monitoring System Stations are used to collect a wide range of measurements about how the coast is changing. (Figure 3.) This drawing is intended to inform the public about data collection methods used by the CPRA to monitor long-term changes in soil, water, and vegetation across the Louisiana coast. The image provides context for the public to interpret the CPRA's data and also demonstrates the rigor the CPRA employs in monitoring and responding to issues facing the coast.

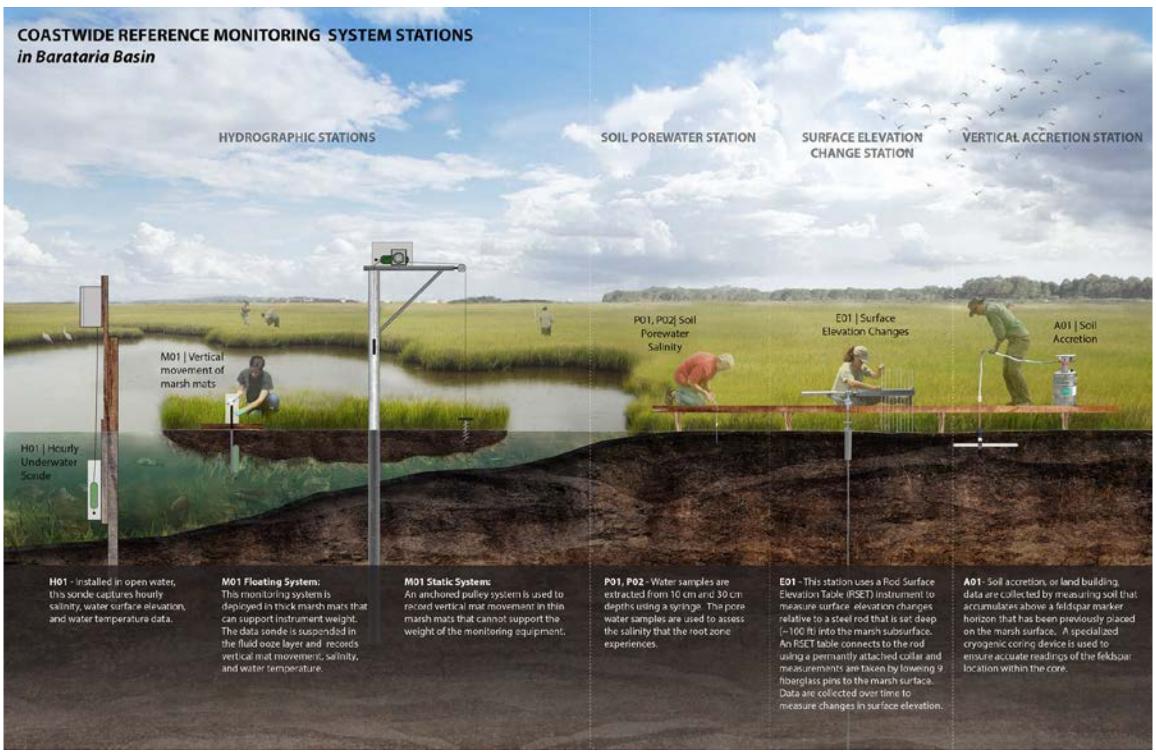

Figure 3. *Coastwide Reference Monitoring System Stations in Barataria Basin* showing the use of visual cues for multiple senses and narrative. Visualization by LSU Coastal Sustainability Studio.

The science conveyed in this drawing are the tools used to assess how the coast is changing, what the tools monitor, which data are collected, and what the data are used for. Existing resources for this information are the CRMS Fact Sheet (Steyer, 2010) and the CRMS website which provides data access (*Coastwide Reference Monitoring System*, n.d.). Visual explanations of how these tools work together to tell the story of coastal changes are limited to photos of individual data collection sites and maps showing how the stations are arranged.

Using these resources, we added aesthetic qualities that give the information meaning by using the visualization strategies of using visual cues for multiple senses and narrative. In *Coastwide*, the visual cues for multiple senses include the light quality, clouds, and still water surface that suggest a warm, still-weather, sunny day. Additionally, the material quality of the section showing sediment textures and underwater life add context for the tools allowing us to show the relationships between each tool and what it monitors in the environment. By showing in section what is otherwise unseen, we are able to improve the viewer's understanding of elements in the environment that are changing and how the CPRA's tools monitor that change. This understanding is intended to add meaning to the data that come from the monitoring tools.

Narrative is the second visualization strategy used in *Coastwide*, and it is integrated into the image both by compressing space and showing people in mid-action. In our drawing we show all of the station elements together in one scene, as if they are side-by-side. In reality, they are hundreds of feet apart. This compression of space allows us to better tell a narrative featuring the elements of coastal monitoring, highlighting the places where monitoring action occurs. We further amplify this narrative quality by showing people using the monitoring tools, giving the drawing signs of life and demonstrating that these tools are valuable to people.

5. CONCLUSION

What we have demonstrated in *The Growth of Louisiana's Delta, Shrimp Eye View,* and *Coastwide Reference Monitoring System Stations in Barataria Basin* are strategies for integrating visualizations of aesthetic experience with ecological and geological data. By incorporating visual cues for multiple senses, visual cues for process, and narrative we can convey relationships and engage the viewer's imagination. In doing this, we believe we can improve the public's ecological understanding of the science, data, and processes related to Louisiana's coastal land loss. Visually communicating this meaning is an interpretive step that we think is necessary for meaningful public engagement.

Testing the efficacy of the graphics produced through this method through focus groups would be a valuable next step. Specifically, input about the legibility, credibility, and impression of the work from people of different backgrounds would be important feedback into the design process as images are developed. Engaging the public in this way would help ensure that the intended message is understood, even if there are differences of agreement about the message. Often materials intended to engage the public are only reviewed by peers of those who produce the work, but the intended audience might not readily understand certain terminology, critical context, or graphic devices used in the presentation materials. A review would help ensure that the material makes sense to the intended audience. Additionally, a review would help designers learn what the viewers take away from the graphics, what issues are important to the viewers but not shown in the images, and what is inadvertently communicated that is off message. This research would help future development of visualization materials not only for coastal land loss in Louisiana, but for other large-scale environmental trends that require personal and political will to affect change.

In *Shifting Sites*, Kristina Hill writes, "sites are where the sciences and humanities meet" (Hill, 2005). This is what we are trying to show—how these systems are intertwined in coastal Louisiana in a way that relates to people's experience and inspires them to act.

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Landscape Research Record No. 5

DESIGN EDUCATION AND PEDAGOGY

Edited by Matthew Powers & Ashley Steffens

DIGITAL STORYTELLING: EFFECTIVENESS ON STUDY ABROAD EXPERIENTIAL LEARNING

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1 ABSTRACT

Digital storytelling is a short digital media production that allows ones to share their life story. It has gained popularity in higher education since the late 1990s in the US due to a great extent that media production techniques, hardware and software are becoming much more accessible and affordable. The purpose of the study was to assess the effectiveness of digital storytelling as a reflection technique in the study abroad setting. In this paper, we introduced the process, result and evaluation of the application of digital storytelling on a course taught abroad. In summer 2015, a group of Texas A&M University undergraduate students went to Germany to learn about sustainable communities. Students were required to submit their individual digital storytelling videos in which they must reflect on their five-week learning and evaluated their perceived benefits of different learning and assessment tools near the end of the program. The results show that digital storytelling was rated the most effective one among four other assessment tools in terms of their perceived effectiveness in reflecting the abroad experience. In summary, digital storytelling is a promising tool for reflecting study abroad experiences and is a suitable assessment tool in a study abroad setting, particularly for programs that are based on experiential learning strategies. We also found that current college students seem very capable of learning digital storytelling in a meaningful way and within a short period. We provided recommendations to landscape architecture educators on how and when to use digital storytelling to facilitate deep learning in landscape architecture courses.

1.1 Keywords

Digital storytelling, reflection, study abroad, assessment, global education, experiential learning

2 INTRODUCTION

Digital storytelling is a short digital media production that allows ones to share their life story. It utilizes low-cost digital cameras, non-linear editing software and laptop computers to create short, multimedia stories (Meadows 2003). Started by Joe Lambert and the late Dana Atchley in the late 1980s, digital storytelling “allows computer users to become creative storytellers through the traditional processes of selecting a topic, conducting some research, writing a script, and developing an interesting story” (Robin 2008, p.222). Also defined by Davis (2004), a digital story is “a form of short narrative, usually a personal narrative told in the first person, presented as a short movie for display on a television or computer monitor or projected onto a screen.” Digital storytelling has gained popularity in higher education since the late 1990s in the US due to a great extent that media production techniques, hardware and software becoming much more accessible and affordable (McLellan 2007; Center for Digital Storytelling 2015).

In recent years, digital storytelling has been used to archive study abroad records and experiences in higher education. Such adoption of digital storytelling as a means for enhancing experiential learning may continue and become stronger because current higher education seeks for high-impact learning methods. According to Kuh (2008), study abroad is considered one of the high-impact educational practices in higher education because it brings the benefits of cultural exchange, global vision, diversity and so on. Also because study abroad takes place in a setting different from a typical classroom, assessment tools such as homework, exam and test may not be ideal. Hence, digital storytelling is gaining attention for documenting study abroad experiences and is used as an assessment tool, as well as for performance measurement. Presently, some colleges and universities have published digital stories about study abroad online, including Beloit College, George Washington University, University of Colorado Denver, University of Minnesota, and University of Wisconsin-Madison. Materials presented on these universities’ websites remain up-to-date and organized. The University of Colorado Denver even offers a graduate certificate in digital storytelling.

Reflection is important to high impact learning and can be performed in various formats such as discussion, term paper or presentation. Donald Schön’s 1987 book entitled *Educating the Reflective Practitioner* literally focused on how reflection, or “reflection-in-action” in his words, facilitates learning, particularly for architectural professional education. According to Schön (1987), reflection on the past experiences or trials sets the stage for the next trials, by which new things are learned. Clarke and Adam (1987) surveyed students in the arts and humanities disciplines and reported that although a study abroad experience can open a student’s mind and ignite one’s curiosity in learning about other cultures, it is through reflection that studying abroad can be explored more deeply. Sharma et al. (2011) also confirmed the importance of reflection from their examination of pre-service teachers who participated in a 5-week summer program in Honduras. They found that a critical reflection approach further promoted pre-service teachers’ multi-cultural competence. Because most college students have not had any abroad experience, many new things are to be learned if they have the chance to study abroad. Therefore, using reflection as one of the teaching techniques specifically in an abroad setting is a worthy experiment, and research of its effects on learning is needed.

Although digital storytelling is gaining much traction in higher education, research on its effectiveness in reflecting study abroad experiences appears to be less visible. In the 2015 EDUCAUSE Learning Initiative annual conference, Melody Buckner (2015) of the University of Arizona presented a poster of a study titled “Digital Storytelling: As An Assessment Practice in Study Abroad Programs.” Buckner surveyed college students of different disciplines and collected their digital story artifacts to investigate two questions: 1) what effect does digital storytelling have on the learning experience of students and 2) what impact does digital storytelling have on demonstrating expected learning outcomes. Buckner (2015) concluded that digital storytelling is a good assessment for personal reflection but is light in academic rigor. While Buckner believed that digital storytelling’s reflective process enhances the learning experience, it cannot completely replace traditional assessment tools but is a good compliment. Todd (2013) investigated how well digital storytelling helped nursing students return to their program after their study abroad experience. She found that reflection during study abroad re-entry is critical to ensuring learning outcomes, and digital storytelling is an effective medium for reflection. Todd (2013) suggested that critical reflection during re-entry would be more effective if it is incorporated into a course. Overall, digital storytelling has been evaluated on its effect on student learning outcomes. For example, Sadik (2008) evaluated Egyptian teachers in their application of digital storytelling in teaching and assess whether students were engaged in authentic learning tasks using digital storytelling. Sadik (2008) found that the digital storytelling projects could enhance students’ understanding of curricular content and teachers were willing to modify their pedagogy and curriculum to adopt digital storytelling. Similarly Smeda et al. (2014) investigated the pedagogical aspects of digital storytelling and the impact of digital storytelling on student learning in classrooms in an Australian school and found that digital storytelling is a powerful tool to integrate instructions with learning activities to stimulate more engaging and exciting learning environments.

The purpose of the study was to assess the effectiveness of digital storytelling as an assessment tool with a reflection component in a study abroad setting. The effectiveness was evaluated by comparing digital storytelling among other assessment tools typically used in classroom teaching. In this paper, we introduced the process, result and evaluation of the application of digital storytelling on courses taught abroad. Because study abroad is an important or even required component in many landscape architecture programs, we concluded by recommending to landscape architecture educators on how and when to use digital storytelling to facilitate deep learning in landscape architecture courses as well as internships.

3 PROCESS AND METHODS

3.1 Participants

In summer 2015, 13 Texas A&M University (TAMU) undergraduate junior and senior students went to Germany to take credit-bearing courses about sustainable communities. Twelve out of the 13 students were in the general studies program with a concentration in architecture. One student was from the business major. For the general studies students, study abroad is required in their curriculum. Seven students were male; six female. Their age ranged from 20 to 22. None of the students have participated in study abroad learning before.

3.2 Study Abroad Arrangement

The staff of the Academy for International Education (AIB) based in Bonn handled logistics, arranged tours/conference registration, and invited guest speakers while TAMU faculty delivered lectures in classroom and participated in all arranged activities by AIB. All students stayed with host families during the program. Only two were together with the same family; others were individually attended by host families. The AIB study center is located near the city center of Bonn. Each day students took public transportation (bus or train) from their host family's residence to the AIB study center. The commute time varied between 15 to 40 minutes. The entire program lasted five weeks. The first four weeks were in Bonn; the last in Berlin. When the entire group moved to Berlin, they stayed together in a hotel that week. During the regular work week, formal activities occurred from Monday to Thursday. Friday through Sunday were weekend. The program was relatively heavy on field trips in order to witness and experience sustainable practices in communities, in comparison to the time spent in the classroom at AIB.

3.3 Learning Methods

In a study abroad setting, learning is typically not limited to the arranged activities in a classroom. The list below summaries the various learning opportunities, intended and unintended, in the five-week program. For the purpose of this paper, we use them for discussion.

- Host family setting (casual, spontaneous, life-related, experiential)
- In-class educational lectures/discussion (purposeful)
- Guided outdoor field trips such as gardens, biking, canoeing, hiking, cities, etc. (purposeful, experiential)
- Guided indoor field trips such as museums, heating plant, waste management, etc. (purposeful, experiential)
- Attending a conference (2015 Resilient Cities, purposeful, experiential)
- Interaction with classmates (casual or formal)

In addition, four assignments designed to facilitate learning about sustainable communities were given to students. They are explained in the next section.

3.4 Assignments

Assignment 1: sustainable host family. Students perform a sustainability assessment for the residence of the host family and create a narrative with illustrations, diagrams, photos of the systems in place. Students should interview the host family about how the five systems work, including transportation, energy, food, water and recycling. Students are to describe actions on a daily, weekly or monthly basis that demonstrate an attitude towards sustainable living in their host family's house. Expected length of this assignment is 5-7 pages with illustrations and 900-1,200 words.

Assignment 2: sustainable transportation. In this assignment, students document and map/illustrate the network of transportation methods that they can utilize to get from their host family home to AIB. Students should communicate the network of connections (by foot, by bicycle, by bus, tram, etc.) in which they move and compare with the single mode of movement that most of them utilize in Texas. Same expected length and format as Assignment 1.

Assignment 3: visual diary of social and physical components of sustainable practices. In this assignment, students should document AIB-arranged and any of their personal tours in a diary using a slide template. The template lists six categories to facilitate organization: urban agriculture, low impact development, walkable & bikeable communities, renewable energy, public and social places, and other sustainable practices.

Assignment 4: reflective digital storytelling video. In this assignment, each student creates a 3-minute video in which they must reflect on their learning before, during and after the 5-week living in Germany, and tell stories using their voice.

Prior to the trip, students were instructed to bring a laptop computer with video editing capabilities for the trip. After arriving Germany, students learned about digital storytelling, collected photos and video clips, and wrote a script for the video during the course period. At the end of the 4th week, students presented their rough cuts. After completing the program and returning to the US, students submitted their final videos. Required components of the video include:

- Still images (photos, sketches, screenshots, etc.)
- Motion pictures (recorded footages, borrowed films, animation, walk through animation, etc.)
- Narrative voiceover by the student (music is optional)
- Cite at least two of the assigned readings
- A page that lists all readings cited
- Credit and acknowledge page

During the video preparation stage, students used a storyboard to develop their video. Draft storyboards were submitted for instructor's review and comments. Students also wrote scripts for their stories and submitted drafts for review and comments.

3.5 Survey and Data Collection

Students were surveyed at the end of the 4th week after rough cuts were screened to the entire group. Participants' background information such as gender, video production experience, and understanding of digital storytelling was collected. Questionnaire of the survey included rating video-related tasks in terms of how helpful they were for reflecting the Germany experience, comparing digital storytelling with other assessment tools, and ranking different learning methods and assignments. Students could also provide comments on the overall learning experience.

4 RESULTS

4.1 Effectiveness of Digital Storytelling

Students rated various video-related preparation tasks on their effectiveness in helping them reflect the Germany experience. With the scale of 1 being very useful, 3 neutral and 5 not at all, all tasks were perceived helpful because the average scores were all less than 3 (neutral) (see Table 1). The most helpful task was reviewing visual materials such as photographs and videos students took during the trip, followed by draft storyboard and reviewing rough cuts with the group. Students appear to perceive reading the script they wrote less effective than any other tasks. Interestingly, students tend to prefer visual materials over writing and reading for reflecting the study abroad experience.

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Table 1. Average rankings of video-related tasks in terms of how helpful they were for reflecting the Germany experience**.**

Tasks	**Average Score (SD)* (N = 13)**
Reviewing the photos/videos taken during the trip	1.54 (1.13)
Storyboard (1st draft)	2.00 (1.22)
Reviewing classmates' rough cuts	2.00 (1.25)
Relating the actual experience to assigned readings	2.36 (1.21)
Writing the script	2.46 (0.97)
Storyboard (final)	2.54 (1.51)
Reading the script (voice over)	2.64 (0.67)

*: 1-very helpful, 3-neutral, 5-not at all

Students were asked about other assessment methods' effectiveness in reflecting the Germany experience, including writing a paper, taking an exam, making a 10-minute final presentation or working on a team project followed by a final report. None of them was rated more effective than digital storytelling for such reflection (see Table 2). Among all other assessment methods, taking an exam was the least favorite by students.

Table 2. Average scores of comparison between digital storytelling and other assessment methods in terms of their perceived effectiveness in reflecting the Germany experience**.**

Assessment Methods	**Average Score (SD)* (N = 13)**
Making a 10-min final presentation	2.25 (0.62)
Doing a team project and turning in a final report	2.45 (0.52)
Writing a paper	2.45 (0.69)
Taking an exam	2.64 (0.81)

*: 1-better, 2-same, 3-worse

4.2 Comparison of Learning Methods and Assignments

Among the seven learning methods presented in Table 3, guided outdoor field trips (M=2.69, SD=1.89), host family (M=2.85, SD=1.99) and guided indoor field trips (M=3.54, SD=2.11) were rated the most effective ones for understanding sustainable communities, followed by in-class lectures (M=5.62, SD=3.07), attending a conference (M=6.69, SD=3.22) and interaction with classmates (M=6.92, SD=3.20). The result is reasonable because German families have lived more sustainably than contemporary Americans for a longer period of time. Our students living with them had the opportunity of witnessing the lifestyle and practiced it in person. Guided field trips (indoor or outdoor) were led by experts in respective subject areas and evidently have done a good job in delivering the sustainability message to the students.

Assignments were rated low, compared with the seven learning methods for understanding sustainable communities. Among the four assignments, Assignments 3 and 4 were rated lower than Assignments 1 and 2 (Table 3). This result confirms a known fact, that is, students do not like to be evaluated or “judged.” Because assignments are an assessment tool, students rated them low, in comparison with the seven learning methods that are all delivery tool. The result of the assignment rating could be attributed to the fact that Assignments 1 and 2 were simpler and due in just one week. Assignments 3 and 4 were comprehensive and had to cover the entire 5 weeks, which is much harder to complete.

Table 3. Average rankings of seven learning methods and four assignments in terms of how helpful they were for understanding sustainable communities.

Methods or Assignments	Average Ranking*	SD	Range	
			Highest	**Lowest**
Methods				
Guided outdoor field trips	2.69	1.89	1	7
Host family	2.85	1.99	1	6
Guided indoor field trips	3.54	2.11	1	8
In-class educational lectures/discussion	5.62	3.07	1	10
International resilient cities conference	6.69	3.22	2	11
Interaction with classmates	6.92	3.20	3	11
Personal tours during weekends	7.54	3.28	2	11
Assignments				
Assignment 1 (host family summary)	5.92	2.27	2	10
Assignment 2 (sustainable transportation)	6.85	2.34	3	10
Assignment 4 (digital storytelling video)	8.23	1.83	5	11
Assignment 3 (digital diary)	8.33	1.87	5	11

*: 1 represents the most helpful method; the larger the value, the lesser the helpfulness

4.3 Participants’ Digital Literacy

All students brought a laptop computer to the trip and used them to complete the assignments. All but one student had video editing software installed in their computer. Five out of 13 students have never produced a video before the trip. For learning how to produce a video, two never learned; the other 11 students self-taught themselves. In terms of digital storytelling, eight students have heard of them before and only three have done digital storytelling before the trip. We provided light instruction on video editing and production in the beginning of the five weeks. All students were able to produce a video as required for Assignment 4. No one complained about learning video editing and production.

4.4 Written Comments Related to Digital Storytelling

Overall, all students were satisfied with the courses. Excerpts of comments that are related to digital storytelling are listed below.

“*I think that by doing a visual diary and a video, I can remember what occurred in my time here. I think that this is the most valuable way for us to record and remember.*”

“*So far I have enjoyed the projects. They made me aware of the local life. The papers and especially the video, I can watch in later in life and remember parts of the trip I might have forgotten.*”

“*I would not make the class do the PowerPoint project, have them put all energy in the video diary. I think this was the most reflective and educational project.*”

5 CONCLUSIONS AND RECOMMENDATIONS

This paper presents the result of the effectiveness of digital storytelling as a reflection technique in five-week study abroad teaching. The paper also includes the comparison result of learning methods and assignments for helping students understand an intended subject matter. Conclusions of the study include:

- Digital storytelling is a promising tool for reflecting an experiential learning experience in an abroad setting.
- Digital storytelling may facilitate deeper study abroad learning than traditional assessment tools such as writing a paper, taking an exam, making a final presentation or working on a team project with a required final report.
- Reviewing visual materials help reflect on abroad experiences.Host family and guided field trips help students understand the sustainable practices the best.
- Current college student's digital literacy appears at a level ready or near ready for producing a short video.

These conclusions provide some guidance to landscape architecture educators because many landscape architecture programs embrace or require a study abroad experience. Moreover, the studio pedagogy deeply employed in landscape architecture education can benefit from what is learned from the experiment of digital storytelling used in this study. Our recommendations are an extension from the findings of the study beyond the study abroad setting:

- Integrate digital storytelling as a required component in courses that include experiential field learning. For example, service learning projects can be considered.
- Use experts to deliver lectures or guide field trips. If possible, require students to reflect on these activities using digital storytelling.
- Consider using digital storytelling for reflecting internship experiences. Internship has similar high-impact learning experiences as study abroad. Digital storytelling may be an effective tool for such reflection.

Finally, we encourage landscape architecture educators to experiment with digital storytelling in their teaching because, as Ohler (2006, p.47) stated, "creating a digital story taps skills and talents – in art, media production, storytelling, project development, and so on – that might otherwise lie dormant within many students but that will serve them well in school, at work, and in expressing themselves personally." We believe that the use of digital storytelling intensifies the power of reflection on a field trip-based study abroad program because the experiences can be more vividly represented through visual and auditory recordings.

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INTERPRETIVE LANDSCAPE DESIGN, RACE, AND PUBLIC HISTORY

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1 ABSTRACT

Ethnic and racial conflict perennially surface in local and national news, yet solutions remain elusive. This may be due, in part, to discomfort in direct discussion of ethnicity, difference, and social change. How can a design studio integrate focused discussions on such social issues while also addressing design process and product? This paper presents a case study in which students in the St. Croix Praxis studio at Rutgers collaborated with the National Park Service (NPS), St. Croix, USVI, to develop alternative interpretive landscape plans for the Christiansted National Historic Site. The site is associated with the archeological remains and standing architecture of a slave market and its administrative function. The slave market site is the largest, most complete structural remains of the mercantilism associated with the Trans-Atlantic Slave Trade. Few traces of this important history remain, yet the overwhelming majority of the local population can trace its genesis to this site.

To more purposefully address issues of ethnicity and identity in design, the studio included fieldwork and interviews in St. Croix, followed by a series of structured conceptual exercises, guided self-reflection, and visits to mainland NPS sites upon return to New Jersey. As student feedback reveals, the studio process enabled students to explore their own stories relative to culture, history and ethnicity and, as a result, they more flexibly interpreted a public history site.

1.1 Keywords

community-based design; ethnicity and design; race and class; cultural place-making

2 INTRODUCTION

"Narrative allows us to communicate the emotional content of our values. Narrative is not talking "about" values; rather, narrative embodies and communicates those values." (Ganz 2011)

Current events this year, such as the deaths of Michael Brown in Ferguson, Missouri and Tamir Rice in Cleveland, Ohio, have revealed unresolved racial and ethnic issues in America. Given landscape architecture's vision to "[lead] the design and stewardship of land and communities," as promoted by the ASLA, we need to ask ourselves what we are doing as a profession and discipline to acknowledge the role of race, class, and ethnicity in people's relationship to their environments. As noted by Terry Clements, only a small fraction (less than 11%) of CELA pedagogy research concerns social/cultural issues (Clements 2010). Although many academics have written about community-based design studios working in complex cultural contexts, few write about student experience addressing cultural, race, and class difference (Forsyth, Lu, & McGirr, 1999) (Lawson, Spanierman, Poteat, & Beer, 2011). Jennifer Britten's self-reflective practicum provides a starting point to enable students to evaluate their roles as "interpreters and synthesizers of place" through the cultural landscape (Britten 2014); we include overt studio attention to issues of ethnicity and identity in order for students to better interpret the cultural landscape and to tell public history through landscape design. Particularly in the context of a community-based studio, the opportunity to engage design education with cultural learning requires rethinking the prominence of the design product and engaging students with varied exercises that promote reflection and discussion, often outside the traditional bounds of what is design and planning discourse.

This paper presents a case study in which students in the St. Croix Praxis studio, in collaboration with the National Park Service (NPS), St. Croix, USVI, developed conceptual designs for the former slave market located at Christiansted National Historic Site. The studio, third in a string of collaborations with the NPS on the island, was intended to draw out new ways of thinking about historic interpretation in preparation for a competition to design the site. The 2015 studio was co-taught by Holly Nelson, practitioner, and Dr. Anita Bakshi, who studies urban memory. Juniors, seniors, and second-year graduate students opted to take this studio.

The remains of the slave market site sit currently under a central lawn and a main street through downtown. Much of this important history is invisible at the site, yet the overwhelming majority of the local population can trace their heritage through this exact location. The complex delimited by the Christiansted National Historic Site served as the single entry and transshipment point in the Americas for 200,000 Africans transported by merchants sailing under the Danish flag from 1733-1803. The majority of the people brought to St. Croix by the Danes left from a handful of slaving sites along the West African Coast, the largest being Christiansborg, in what is now Accra, Ghana. It remains one of a handful of intact slave trade sites in the Americas, and is the most complete slave-trading complex in the United States. Additionally, its archive and associated documentary evidence is likely the most complete available for documenting the horrors of the Trans-Atlantic Slave Trade. These documents include shipping manifests, taxation records, and records of sale that are jointly held in the National Archives of Denmark and the United States as well as original and facsimile documents held in the United States Virgin Islands.

To more purposefully address issues of ethnicity and identity in design, the instructors led the class through a series of conceptual exercises intended to encourage self-reflection and shake students out of their social comfort zones in preparation for site design. Outfitted with a real site for a real client (NPS), slavery provided the studio with an overt focus on ethnicity and identity issues. In addition to researching slave trade influences on the Christiansted landscape, we believe this studio created the space for students to explore their own stories relative to culture, history and ethnicity and, as a result, they more flexibly interpreted a public history site. As Marshall Ganz, social science professor at Harvard, says: "In the end you will be asked to link your story of self, story of us, and story of now to a single public narrative" (Ganz 2013).

3 METHODS

3.1 Background

Prior to visiting the island and meeting the community, students read the book *August Freedom*, by Liz Carson Rosas, to learn about an important slave rebellion on St. Croix in 1848 through vivid 'characters' and important places in their lives. By introducing them to historical figures and locations through a compelling narrative before they set foot upon the island, students began to develop a personal connection to the island's history of the formerly enslaved.

Students then immersed themselves in St. Croix's past and present through a weeklong site visit to the island. During this visit, students sought to understand a broader history and context for the project; students spent little time at the actual site they were to work on and instead toured the island's two major cities, Christiansted and Frederiksted, as well as other historic sites. Their walking tours were led by local guides, often followed by lengthy discussions over meals. One such tour, conducted by local historian "Miss V", was of the Free Gut neighborhood where freed blacks lived during the 16th-19th centuries. The guides also encouraged students to talk with people, introducing them to local residents, schoolteachers, students from local schools, and college students from the St. Croix campus of the University of the Virgin Islands. As is typical for a studio, students mapped and sketched in their journals. Having absorbed quite a bit of information during their visit, the studio was asked to present what they learned to residents at a community meeting, thereby allowing students to get additional refined and nuanced feedback. Students conveyed what they heard through cited quotes from people they spoke with and through diagrams and drawings they developed during their tours. The community meeting also provided an opportunity to explain the project that the students would work on for the rest of the semester.

3.2 Conceptual Exercises

Back in studio, students were assigned weekly conceptual exercises. Each assignment required a synthesis of readings, class discussion, and focused creative exploration. Approximately one third of the semester was spent on these four investigations so that students better understood the cultural history of the site. Hour-long discussions related to readings jumpstarted these creative responses. Each week ended with a pinup accompanied by rich discussion that grew more focused on the lives of the formerly enslaved.

We began with "Walking With The Past":

Exercise 1: Walking With The Past

Incorporate the following readings:

1: (fiction): *August Freedom*
2 (history): *Owning Memory: How a Caribbean Community Lost its Archives and Found its History*
3:(drawing): "On and Off the Map", in *Lure of the Local: Senses of Place in a Multicentered Society*

During our time in St. Croix we visited some of the sites described in the fictional treatment of the island in *August Freedom*, including the fort at Christiansted and several other places. As you walk, sketch what you see, take photographs, and collect artifacts from the site. During the walk with Miss V, take photographs of the sites pointed out by the Storyteller, and take notes about the stories associated with the landscape.

Create a drawing/ map/ collage that incorporates text from written sources, photographs, archival photographs, maps, and oral history excerpts from the walk with a storyteller. The merging of the new and old imagery should convey the experience you had during the walk, and the manner in which your interpretation was affected / influenced by what you read. Think about documenting your journey in time, as well as in space. Think about drawing cinematographically, showing the progression of your movements. Think about how you can layer or weave together the past and the present. Recall the drawing "verbs" that Richard Serra spoke about: *to mix, to knot, to hook, of entropy, to bundle, of grouping, of layering, to join, to bond, to weave, to repair.* These drawings constitute a form of research and applied knowledge. They provide a means to enter into relationship with a place, and to get to know it better.

This exercise combined experiential site discovery with cultural and historical readings relative to change, sensory experiences and a journey through time, using concepts related to: mixing, weaving, repairing, joining and weaving. Projects included a textural collage created from a wall photographed in Christiansted with cutouts highlighting culture and celebrations, overlaid with collaged archival photographs, revealed to the viewer upon closer inspection. (Figure 1).

Figure 1a.-c.: Chelsea Beisswanger, The lasting imprint of African culture and slave history; Detail—Bottom; Detail—Top.

A second project, inspired by a tale in *August Freedom* about how a family wove its history into a basket design, depicts the weaving of stories about the history of slavery on St. Croix. Playing with weaving and the 640'x 640' plantation grid on St. Croix, the student made an interactive version of the 1767 gridded plantation map of the island. When you pull at its warp and weave, he cleverly reveals cultural and historical events and images. (Figure 2).

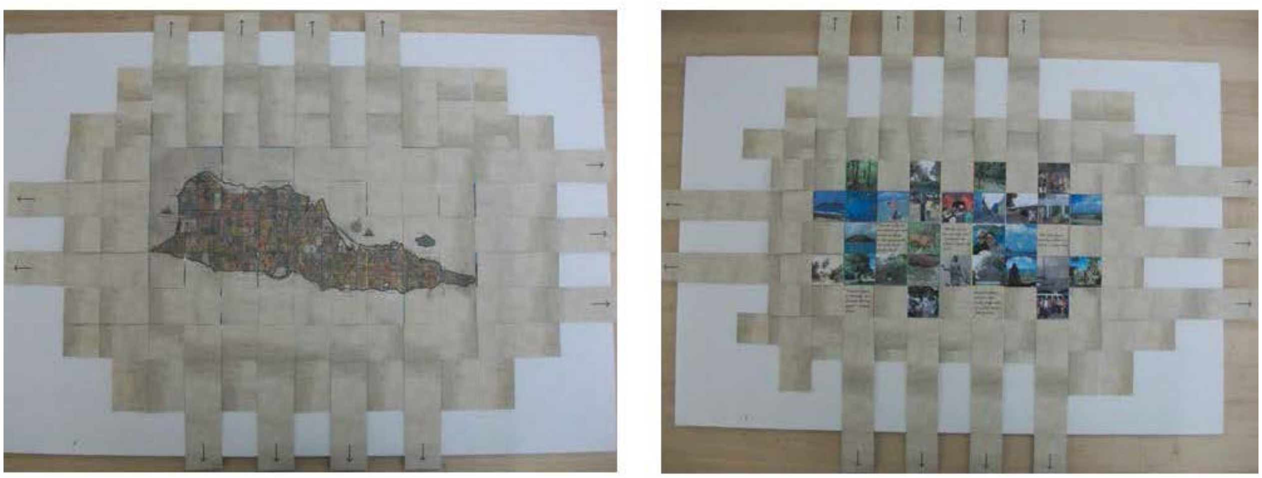

Figure 2: Mark Lacey, The weaving of stories into the life of St. Croix

Students revealed history and archeology with the sculpting exercise “Digging and Archeology” to depict the historical context of the site:

Exercise 2: Digging and Archeology
We will discuss the following readings:
1: (history): *The New Berlin – The Gestapo Terrain: Landscape, Digging, Open Wounds*
2: (archeology): *Resistance and Compliance: CRM and the Archaeology of the African Diaspora*

A mahogany tree stump on Hospital Street, adjacent to the Customs House, had to be removed, and since it was the boundary of the original Danish West India and Guinea Company yard that was central to the sale of enslaved Africans from 1749 to 1803 and the Danish sugar trade, NPS archaeologists performed controlled excavations.

Create a designed landscape through excavation and digging. For this exercise you will create a model by carving in a piece rigid model foam. Look closely at the photographs that you took during the dig, and think about the textures that you experienced on the island. How are / how can layers of history be revealed? Think about how to tie the readings (the importance of the act of digging at the Gestapo terrain site; the critiques of the Cultural Resource Management (CRM) approach to African-American archeology) to St. Croix’s slave market. Can you address any of these issues in your model? In addition to working with the foam, you can also incorporate rubbings, artifacts, or photos. Use them to texture to your model, or embed them in the foam and selectively hide and reveal them.

This modeling exercise required students to create through extraction and removal, paralleling the archeological dig at the site that occurred just prior to our visit. Results ranged from an abstraction of the coral reefs surrounding the island that represented the layering and building up of St. Croix’s history to a chipboard model of the Danish Fort upended and forced into the rigid foam that illustrates the impact of the Danish “footprint” on the island’s history to a model of the texture of sun/shade under the Tamarind tree where the formerly enslaved gathered to tell stories. (Figure 3 a, 3b & 3c).



Figure 3a: Chelsea Beisswanger, Layered Coral History; Figure 3b: Austin Scott, Ft. Christiansvaern’s Imprint; Figure 3c: Sarah Korapati, Telling History Under the Tamarind Tree

The next exercise, “Personal Remembrance”, was accompanied by very personal discussions about race and ancestries (Assyrian, Armenian, African American, Peruvian, Scottish, English, amongst others):

Exercise 3: Personal Remembrances
Discussion of the following readings:
1: (memoire): *False Papers: Essays on Exile and Memory,*
2: (preservation & tourism): *Facing the Slave Past: Historic Sites Grapple with America’s Greatest Shame*

Design a site for personal remembrances. Create a drawing and collage with personal photographs or images. This could be a space that acts as a memorial to someone important to you, or that commemorates an important personal moment / achievement. Or this might be a space that honors your personal group of affiliation (this could be based on your community of interest, ethnicity, gender, political orientation, race, sexual orientation, etc.).

Has there been a time when someone else has told your story? This is your chance to now represent your story in your own words, as you would like to do. Imagine how you would want visitors and tourists to engage with this site. Create a drawing and collage using personal photographs and show quick perspective vignettes of people interacting with the site.

This exercise marked a turning point as discussion about ethnicity became overt. Sharing personal stories, students opened up to one another. Race was openly discussed relative to the readings and also in terms of current events and lived lives, but the sharing of personal history was deemed of highest importance since not every student was completely comfortable with an open discussion of ethnicity. In “The Personal Remembrance Body Image Book”, you peer through a body cutout on the booklet cover to discover different aspects of wrangling with an eating disorder. As you turn the pages, the book portrays different exterior forces that gave shape to this empty body. Although this personal story was without overt relationship to ethnicity, the project shared a deeply personal story of one very quiet student’s struggles.

The last exercise, a group project, “A Process of Transformation”, asked students to dig into the hybrid history of the Caribbean, creating multiples pieces:

Exercise 4: **A Process of Transformation**
Discussions of the following readings:
1 (history): *1493: Uncovering the New World Columbus Created*
2: (nature): *Don’t Judge Species on Their Origins*

Think about some of the issues presented in the readings, including: the importance of resistance and the creation of a Creole culture. ‘Creolization’ is the process through which contact between different peoples led to the development of new cultures. The social scientist Robin Cohen has referred to Creolization as the process through which "the formation of new identities and inherited culture evolve to become different from those they possessed in the original cultures…" In this exercise you will try to express the diversity of cultures of origin and the diversity of mixed communities in the New World (both of people and of plants). Think about the hybrid practices that led to these developments.

Create a collage that shows the importance of African resistance to change and that illustrates the processes of creolization that occurred in the New World. This drawing could focus on some of the following:

- illustrating diversity and hybridity
- showing the geographic spread of people and plants from Africa to the new world
- illustrating the transition of African objects, environments, and practices over time
- illustrating the hybrid communities that developed in the new world

This drawing should include several layers of information – use sheets of vellum, mylar, and acrylic - and can include drawings and photographs of people, plants, and maps.

The group project below depicts the interwoven history of the people who arrived to populate St. Croix after Columbus—sometimes a vortex; sometimes a tapestry (woven roof of the model); sometimes a web of intermingling. The graphic portrays the abrupt drop in the native Tai’no population through slavery and extermination in relationship to the African enslaved populations that followed. ((Figure 4a,b,c).

Figures 4a, b, c: Sarah Korapati, Michelle Lim. Nanxing Zheng: Creolization on St. Croix

A second project, the collaged Women of St. Croix, depicts the different power represented by race and gender on St. Croix. Whereas the Danish and African women are depicted quite clearly, Tai'no women in the collage are out of focus since they are so seldom depicted or recognized in island history due to the extermination of the Tai'ino. This collage led directly to the student's final project, a museum dedicated to enslaved women. Located offsite at a slave village at Cane Garden, a former plantation on the south side of the island, the project makes a physical connection between the slave market and a plantation where the enslaved lived and worked. Shaped like a birth canal, the rammed earth museum is covered with medicinal plants, including those related to the abortion and infanticide common amongst the enslaved. Gashes in the building (symbolizing rape and abuse) become skylights to daylight the artwork. (Figure 5).

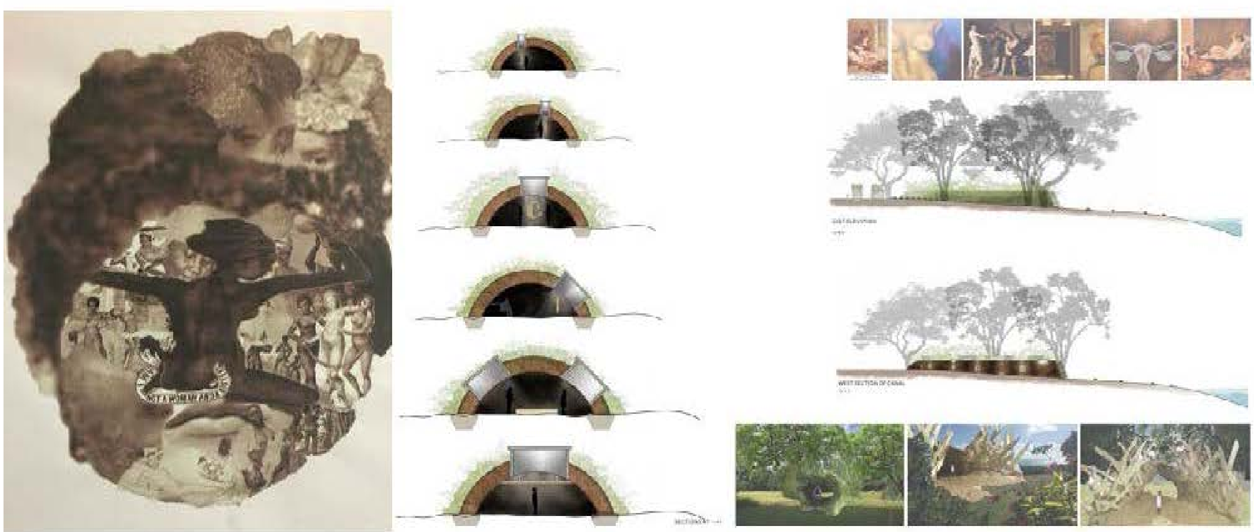

Figure 5: Stacy Martinez, Women of St. Croix; Museum Dedicated to Enslaved Women

4 RESULTS AND DISCUSSION

This studio created a unique opportunity to learn more about the slave trade-- to think about its implications and to apply these findings to a design problem. Discussion and critique of the conceptual exercises provided students with a space to talk about race and identity relative to their projects and also on a personal level. Student reflections upon the semester demonstrate the sometimes-intense discussions about class and ethnicity that surfaced through guided sharing of the stories behind the exercises. Although it is not unusual for studios to incorporate self-reflection exercises to encourage meaningful learning, this studio's focus on interpretation of a slave market demanded a different type of reflection due to the sensitive nature of the design:

> *"I took this studio with an open mind, understanding that I would learn something about a different culture. I never expected to learn so much about myself, my classmates, the Cruzan people and the lives of all those slaves who have been forgotten….it brought my attention to those who gave their lives to building and making America and other countries what they are today."*

In reflecting upon studio outcomes, there is no doubt that the optional nature of this studio was extremely important to its outcome. Students self-selected to study ethnicity issues, and presumably they were more open to cultural history, the cultural landscape, and to this type of discussion. Final reflections revealed that even quieter students who were less comfortable in joining the class discussions in the beginning had derived benefit from the open discussions related to the exercises. While the Personal Remembrance Body Image Book, described earlier, had skirted issues of ethnicity, the student's final reflection deals directly with the subject:

> *"I grew up in a very diverse part of New Jersey…I had friends of all races and treated them as equals. Although we were taught in school about how unequal certain races were treated in the past, it still came as a surprise to me when I started to realize that racial prejudice still existed. One day, simply taking a stranger's parking spot at the mall by accident meant being told to "go back to my own country" and that I "don't even belong here". And although America is my own country, being born and raised here, it solidified my view on just how hurtful racism could be….we still have much to do and understand about racial prejudice as a whole."*

Over the course of the semester, several students learned from their families about African American relatives whom they had been unaware of before:

> *"This led to the discovery of my great grandmother being a person of color and my great grandfather being light skinned with blue eyes."*

This student, who grew up in New Jersey, did not initially recognize his heritage as being other than Hispanic, despite having lived with extended family in Puerto Rico for a year as a teenager. Similarly, another student claimed her Dominican ancestry but not her African roots:

> *"I had always categorized myself as Latina, a Latin woman and a proud one…the very beginning of my junior year was when it finally hit me. That I… was a person of color, that I was a black Latin woman in America….St. Croix Praxis Studio started conversations, conversations about things that not many want to discuss, on color and race and discrimination and where we all come from."*

Perhaps the experiences associated with this studio assisted these students in self-identifying as black. On the other hand, other students struggled with the innate, previously unconscious white privilege.

The focus of the class upon a specific site design problem helped to release intensely personal discussion, yet keep it within confines related to the project. Teaching this studio was invigorating and sometimes terrifying because we plunged into painful subjects. Sometimes we didn't know what to say. To the students' credit, they used their discoveries related to identity to empathize more fully, as is demonstrated by the site design (described earlier) focused on enslaved women:

> *"This studio not only taught me about the history of the island but of myself as well. I saw through my own personal remembrance the difficulty of expressing my past to individuals who know nothing of me. Revealing secrets that have been enclosed and put away for some time. Knowing my secrets in comparison to those of the island, I understood the delicacy of this project and the importance of history and space."*

Students produced a lot of work for this studio, from the conceptual exercises to case studies of other memorials to an interpretive site design. A traditional design studio would assign more time to the site design, particularly because it had a real client. It is a valid criticism of this studio approach that it did not produce fully developed site design proposals. As a studio, we positioned ourselves to ask questions, learn as much as possible, and to test possibilities through design propositions to enable our community partners in their long-term work and ongoing conversations about a proposed slave market proposal. The NPS St. Croix received thirteen conceptual interpretive site design approaches that “started a conversation” about what to consider in an interpretation of not only the slave market site, but also the complicated history of slavery on the island and current economic and social considerations. As previously mentioned, some student designs are site-specific while others reach out into the town of Christiansted, and one extends even further by locating a commemoration site on a plantation to connect the memorial more closely with the slaves’ daily lives. In some cases, the conceptual exercises outlined in this paper contributed directly to the final projects; other students were captivated by the explorations but failed to directly apply these investigations to their site design. Because our clients and collaborators on St. Croix supported the students’ exploration of cultural meaning and memory, we could consider issues of identity in greater depth. Sonia Dow, Executive Director of the St. Croix Landmarks Society, best described this attitude when she stated:

> *“What I wish for the Rutgers students is the same as what I wish for everyone that we engage with-- that they leave with a better sense of who they are. Even if they don’t have roots on St. Croix, the fact that we share who we are as a people hopefully will get them curious about who they are.”*

5 CONCLUSION

Landscape architecture is not a diverse profession. We have been slow to respond to changing demographics in terms of issues of race, gender, and ethnicity, but we can begin to address this in school, an entry point into the profession, hoping that greater sensitivity to different identities and cultural roots will lead to more inclusive design solutions. As one student reflected on the St. Croix studio:

> *“It is important that architects, landscape architects, and planners have designs that are empowered by the history and of the livelihood of the people who live there. There is a lot of power in what a space can translate to, and the Saint Croix studio has taught our classmates how to walk across that bridge as designers. My wish for the future memorial in Christiansted is for it to be honest and transparent about the actions taken place on the soil in the past, no matter how dark, shameful, and damaged it is.”*

Our studio focused equally upon understanding issues of ethnicity and identity as well as upon an actual interpretive site design. In so doing, less time was left for iterative design development; however, educating empathetic practitioners who consider issues of race/ethnicity in design will be increasingly important as the American population becomes increasingly diverse—practitioners who are conscious about ethnicity and whose designs are more inclusive of multiple viewpoints.

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Landscape Research Record No. 5

HISTORY, THEORY & CULTURE

Edited by Judith Wasserman & Kelly Cook

READING THE CULTURAL SPECEFICITIES OF THE IRAQI MARSH ARABS FROM THEIR LANDSCAPE

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1 ABSTRACT

Iraqi marshlands are irregular clusters of small islands constructed by alternating layers of reed mats and layers of mud that dredged from the marsh bottom to constitute one of the most fascinating regions of the world. Marshlands in Iraq are intriguing environments for scholars because of their long history dating back to the Sumerian civilization. My goal in this paper is to examine how the socio-organization and the landscapes of the marshlands fashioned certain cultural specific knowledge of the Marsh Arabs in a sustainable manner. The objective is to contribute to a better understanding of the built environment of Iraqi marshlands and its relationship to the space in creating a place for Marsh Arabs. It also provides a comprehensive image about the society of the marshlands which sustains its continuity and adapts to its habitat to establish awareness about the cultural landscape of Iraqi Marshes. Until 1992, Iraqi marshes remained relatively unknown to the general public but widely known to archeologists and scholars of Mesopotamia. The Iraqi marshlands have captured the attention of the international community from their depletion by the dictator Saddam Hussein in 1991 as retribution to the inhabitants who opposed his government. The draining of the swamps led to severe environmental, social, and economic consequences for local residents which drained away their organizational way of life that is organically inseparable from the environment. The marshland is a woven society in reeds, a place where people and nature are closely bound together in symbiotic sustainable relationships.

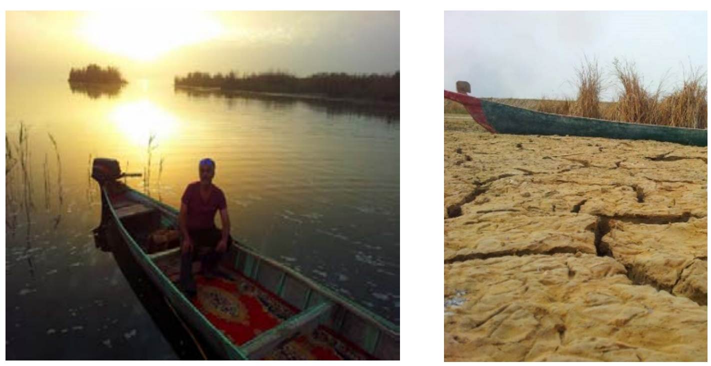
1.1 Keywords

Iraqi marshlands, Marsh Arabs, landscape settlements, cultural specificity.

2 INTRODUCTION

The Iraqi marshlands are irregular clusters of small islands constructed by alternating layers of reed mats and layers of mud that dredged from the marsh bottom to constitute one of the most strange and fascinating regions of the world. Marshlands in Iraq are one of the most intriguing environments for scholars because of their long history dating back to the Sumerian civilization[1]. Until 1992, Iraqi marshes remained relatively unknown to the general public but widely known to archeologists and scholars of Mesopotamia. The marshlands are one of the most ancient centers of dwelling in Iraqi's history, and scholars like Sam Kubba and Abbas Jamali suggest they are the cradle of Sumerian civilization (Kubba & Jamali, 2011, p. 2). However ancient history is not what brought the region to public discourses involving the environment in recent years. Iraqi marshlands have captured the attention of the international community from their depletion by the dictator Saddam Hussein in 1992 as retribution to the inhabitants who he thought opposed his government. The draining of the swamps led to severe environmental, social, and economic consequences for local residents. According to a UN report, from 4 December 1991 to 18 January 1992, the Iraqi military attacked the Marsh Arabs, killing hundreds of them. In addition, an enormous number of animals, birds and buffalo were killed. (Figure 1). Indubitably, we cannot forget the marsh water, which filled with toxic chemicals as a result of the oppressive campaign (Nicholson & Clark, 2002, p. 74). Sam Kubba and Abbas Jamali (2011) wrote:

> Most ecological scientists agree that the destruction of the marshes was a catastrophe of global significance and certainly one of the most grievous ecological crimes of the twentieth century. Saddam Hussein deliberately and methodically managed to drain, reportedly poison with herbicides and desiccate the lush wetlands that were home to over 450,000 Marsh Arabs, as well as a crucial stopover for birds migrating from Europe to Africa. The marshlands also served a critical function to the entire Arabian Gulf filtering out toxins while contributing organic matters to fish breading in the region. (p.15)



Left: Before the draining by Saddam in 1992. Right: After the draining.

Figure 1. Shows the Iraqi marshes before and after draining, one of many of Saddam Hussein's crimes that has led to an ecological, cultural, and humanitarian disaster in one of the oldest natural environments in the world. Photo by Ahmed Neema.

[1] According to Ochsenschlager's *Iraq's Marsh Arabs in the Garden of Eden*, the archaeological record shows that by the middle of the 4th millennium BC, Sumerians occupied this area and built the oldest cities in the world. By the end of 3rd millennium BC, this land knew the first empire in history, the Akkadians. Then, in chronological order, in the following two thousand years the empires of Babylonians, Assyrians, Persians, Greeks, and Parthians controlled this region. Many scholars made geographical attempts to discover the location of the "Garden of Eden," or the earthly paradise where Adam and Eve are thought to have lived, and those scholars have a tendency to consider the site of Sumer civilization as Eden. That's because the word "Eden" is derived from the Sumerian word "edinu" which referred to field, plain, or depression.

From the observations of Kubba and Jamali, it is not an over-statement to suggest that Saddam Hussein drained away the organizational way of life for the inhabitants of the marshlands that is organically inseparable from the environment. The marshland is a woven society in reeds, a place where people and nature are closely bound together. The houses and crafts of the inhabitants of the Marshlands are evidence of how the people and their environment maintain symbiotic sustainable relationships the architectural tectonics of the people as "woven societies in reeds".

My goal in this paper is to examine how the socio-organization and the landscapes of the marshlands fashioned certain cultural specific knowledge of the Marsh Arabs in a sustainable manner. To that effect I explore three related questions which are as follows:

1. The Context/Setting and the People: How is the concept of landscape used in this essay to explain the cultural specificity(ies) of the inhabitants of the Iraqi Marshlands?
2. Landscape, Settlement Patterns, and Dwellings: How did the landscape influence the settlement patterns and the dwellings of the Marsh Arabs?
3. Landscape, Economic Activities, and Social Organization: How does landscape support sustainable economic activities and social organizations of the Marsh Arabs?

It is understood that these questions have cultural, social, economic, political and environmental implications. The complexity of the questions requires fleshing out the diverse related meanings of landscape and how it is used in this context.

3 COMPREHENSIVENESS OF THE RESEARCH FIELD

Depending on the interdisciplinary approach to analyze and determine the cultural landscape of Iraqi Marshland and its context/setting, the settlement pattern and dwelling, the socio- organization of the Marsh Arabs, the interrelationship between the built environment of Iraqi marshes and people activities (especially economic activity) which has led to this sustainable ecosystems. It is important to identify the cultural elements (tangible and intangible) that have attached to the Iraqi marshlands which have spiritual and symbolic value to the inhabitants. Many ancient cultures have symbiotic relationship with the environment and socio-cultural traditions. So, their traditional settlements have not only designed according to the technique and material aspects, but also determined by the social kinship and cultural experience of specific community (Tyrrell, 2003, p. 87). Alexandru Calcatinge, in his book The Need for A Cultural Landscape Theory: An Architect's Approach, refers to professor Alexandru Sandu's writing about cultural specificity in architecture and urbanism saying that "national specificity is revealed by its own nature first of all, by something particular to the human community making the nation and its response to the environment in a given situation. Nevertheless the author considers that it [national specificity] is an outcome of social and historic conditions" (Calcatinge, 2012, p. 61).

4 RATIONAL AND SIGNIFICANCE

There are two reasons why I am interested in investigating the Iraqi marshlands and their Marsh Arab inhabitants through the perspective of landscape: 1) The draining of the Iraqi marshes by the dictator Saddam Hussein in the 1991 which also shattered the organizational way of life of the Marsh Arabs which can be best understood metaphorically through a careful study of the marshlands' architectural and spatial underpinnings of a woven society in reeds, and in which, man and nature were closely bound together. 2) It is more important than ever to learn about the Iraqi marshes and life of the Marsh Arabs since being listed as a UNESCO World Heritage site, the site is ripe for a rapid transformation due to possible economic revival in the near future that would potentially affect the unique Iraqi heritage and socio-cultural way of life of the inhabitants and by implication their built environment.

5 OBJECTIVE OF THE STUDY

The objective of this study is to examine the relationship between the landscape of the Iraqi marshlands and the society of Marsh Arabs who have inhabited this area for generations. In this context, the study would be through: 1) the natural environment; 2) the construction practices of villages and houses; 3) the built environment and its relationship to the social organization of space. This research would therefore establish a base knowledge about the habitat of the Iraqi marshlands through the prism of the people of Marsh Arabs, built environment of urban settlements, and architecture. It is important to focus on investing a cultural landscape to address the issue of housing in terms of its features, modes of construction and adaptation to the natural environment and local materials.

6 METHODOLOGY

In this study of the Iraqi marshland and its inhabitants of Marsh Arabs, the landscape of the region would be the target according to the practices of its community and the sustainable way of life that they have adopted. The research seeks to analyze and diagnose:

1. The physical context and setting of the built environment of the Iraqi marshes including natural environment, urban pattern and settlements, and woven reed architecture.
2. The social organization of the Marsh Arab people including their names, rituals, hierarchy and kinship of the clan; in addition to address the relation between space and society
3. The economic activities in the marshlands including crop and animal productions, local industries, people's skills and handcrafts.

In this sense, the environmental, socio-cultural, and economic fields in the Iraqi marshlands are strongly linked to the landscape. In this research, I will follow Amos Rapoport's approach about Environment-Behavior Studies (EBS) which focuses on the meaning and built environment that Rapoport describes it as the unself - conscious translations of culture's values, attitudes, needs and traditions into physical form which result in a rich and varied environment. This approach elucidates the socio-cultural forces that build forms convey meanings, where these meanings personalize the environment by the inhabitant. Thus, multifaceted and multidisciplinary approaches have been adopted to construct the research and structure the topic of Iraqi Marshlands. The interdisciplinary nature of the research is fundamental to analyze the Iraqi marshes and clarify the interactions between people and their landscape through exposition of texts, photos, and written analyses documentations before and after the drainage to build the comprehensive image.

7 THE CONTEXT/ SETTING AND THE PEOPLE

How is the concept of landscape used in this essay to explore the cultural specificity(ies) of the inhabitants of the Iraqi marshlands? There are three related parts to the first question. It inquires about the setting/landscape, the people, and the cultural specific ways by which we know the inhabitants of the area. It is difficult to write about the landscape without considering the people, and likewise we cannot write about the people without considering the landscape where they dwell. I will begin with the setting that is often identified in history as Mesopotamia.

The Mesopotamian Marshland, which is located in south of Iraq, is one of the largest wetlands in the world. It is where the cradle of Sumerian civilization began more than 5,000 years ago, and it is known as "The Garden of Eden" (Kubba & Jamali, 2011, Foreword). The Iraqi Marshlands have many areas such as Al-Chibayish Marsh which is part of Central Marshes, Al-Hammar Marsh, and Al-Huawyiza Marsh. Al-Chibayish Marsh is considered one of the biggest marshlands in the south of Iraq and it has an area of about 2,600 square kilometers. The word *chibayish* refers to the heap of reeds. The reed houses that are built on *chibayish* are known as *sarifa*. All these formulate the remains of civilization that floats on water (Ibrahim, 2009).

If we want to understand the people and their settlements in the Iraqi Marshes, certain words that are frequently used to describe them and their lands should be explained. We will begin with the most commonly used term, Marsh. The word *Marsh* generally refers to a type of low-lying land that receives frequent or continuous flooding. The word *wetlands* can refer to both marshes and swamps. But there are subtle differences between marshes and swamps. Marshes tend to be shallower, have less open water, and have herbaceous plants, especially grasses, reeds and sedges. Swamps, on the other hand, tend to be deeper, have greater areas of open water, trees and shrubs are the dominant vegetation (Al-Mawrid Dictionary, 2010, p. 561). While the word *Hawr* is the Arabic term for marsh, which is commonly used in Iraq to refer to a wide shallow lake that has abundant reeds, rushes and vegetation (Susa, 1983, pp. 405-407). The term *hawr* (singular of ahwaar) is not modern; it has been traced to the Sumerian times when it was mentioned in the ancient stories of the Flood (Ryan & Pitman, 1998, p. 240). Because of this, *hawr* is thought to predate the use of Arabic in the area. Moreover, Arabic dictionaries give more than one definition of the term, including flooding and receding lake of reedy waters and thickets (Thuainy, 2004).

I would like to now examine who the people living in the Iraqi marshlands are. It is believed that the civilization of the Marsh can be traced to the period of Gilgamesh who mentioned the Marshlands in his Epic during his search for the secret herb that can extend life to eternity. Sumerians, followed by the Akkadians, Babylonians, Persians, Nabataeans, Romans and Arabs, have settled in the same area (Kubba & Jamali, 2011, p. 8). There is a diversity of religions and ethnicities in Iraq in general and in the marshlands in particular from the past until the present time. The main religious groups are Muslims, Sabians and Jews. The existence of many shrines from diverse religious is the evidence that the Marsh Arabs community lived in harmony with different ethnicities and religions in this area. From the 90s till now, the number of Jews and Sabians has dwindled as a result of the political and social situation in Iraq generally, and in the marshlands in particular (Al-Khayoun, 2003, pp. 36, 104; Kubba, 2011, pp. 34-35).

However, the predominant race in the marshes has been the Arabs. Some of the Arab tribes came to the region prior to the Islamic conquest, and some during and after it. In the 1950s, anthropologists who studying in al-Chubayish, one of the Iraqi marshes, identified two main racial and cultural influences among the marsh dwellers: The Eastern Group and the Western Group (Salim, 1962, p. 8). The Eastern Group includes the Ma'dan, Albu Muhammad and other tribes in the Tigris marshes; they had links with their eastern neighbors, the inhabitants of Iran, through migration and intermarriage. The Western Group comprises the non-Ma'dan Euphrates Marsh Arabs, and they had links with the Bedouin tribes of the Arabian Peninsula in the way of immigration and intermarriage (Al-Jubouri, 2011). In general, there are three names used in describing the inhabitants of Iraqi marshlands: *Ma'dan*, *Marsh Arabs*, and *marsh dwellers*.

The word *Ma'dan* has conflicting meanings. The Marsh Arabs believe that the word '*Ma'dan*' is derived from "Ma'aidi" which means opponent (opposition), and another opinion suggests that it derives from "Mou'adat" which is the Arabic word for hostility and antagonism. Those who support the latter theory believe that British forces promoted the use of this word to demean the marshlands people who fiercely opposed them when they arrived to occupy Iraq in the early twentieth century (Salim, 1962, p. 9). The other interpretation of the term Ma'dan describes people of the marshes who depend on breeding water buffalo and selling its products in their livelihoods. The *Ma'dan's* women sell the animal products in the markets and they enjoy almost freedom of movement, in contrast to other Arab tribes that prohibit their women from going out to sell or buy things in the market. This is one of the great distinctions between the *Ma'dan* and other groups. Also, *Ma'dan* never settled in one place; they moved constantly within the boundaries of their tribes and the artificial islands (Mustafa, 2008, pp. 18-20).

Marsh Arabs defines the people who live in the marshland. Their natural surroundings influence their social, cultural and economic activities like Desert Arabs due to the migration from the Arabian Peninsula to the marshlands. Their customs, traditions, and values differentiate them from other societies and shape their way of life. Their economic activities are based on cutting and processing reed, fishing, and bird hunting. Moreover, the term 'Marsh Arabs' is used specifically to describe tribes that do not breed buffalo and do not give their women the freedom of movement, in contrast to the *Ma'dan* who do that (Mustafa, 2008, pp. 18-20).

Marsh Dwellers refers to the population who live in the marshlands; they have their own social values, habits, and traditions. This term is used interchangeably with the term *Marsh Arabs*, but it has more geographical and environmental connotations to indicate the natural, social and cultural impact on the inhabitants of marshes (Mustafa, 2008, p. 20).

8 THE LANDSCAPE, SETTLEMENT PATTERNS, AND DWELLING OF MARSH AREAS

One of the questions this article adresses is how does the landscape influence the settlement patterns and the social organization of the society of the Marsh Arabs?There are different types of settlements in the Iraqi Marshlands depending on the nature of the marshes such as the surface, weather conditions, types of vegetation and water quality. In addition, some sections flood and ebb seasonally, creating another variable to habitation. The first type is **Settlements on the Edges of the Marshes**. They are built on areas of high ground at the edges of the marshes and called *salaf* or villages, while they are called *nazl* in the Euphrates marshes. (Figure 2). Each village consists of between 100 and 300 small huts, depending on the location and the density of population. Villages are found close to the banks of rivers. Each village has one or more guest houses (*mudhif*) from which the clan's affairs are run. The settlements on the edges of the marshes tend to be larger in size than other types of settlement in the marshes. In these settings, the homes are almost made of mud and brick, due to their proximity to urban areas (Salim, 1962, pp. 23-24).

Figure 2. Settlement on the edge of the marshes (2015). Photo by the author.

The second category is **Settlements on Natural Islands** where marshes become a number of islands in water areas. The people who live on natural islands tend to breed water buffalo, and marsh Arabs call these islands *ishan*. These islands sit about 3m above the water level, and they are apparent during dry season, while some of them are flooded during the wet season. (Figure 3). The small islands consist of 30-40 huts made of reed or rushes, while larger islands could reach 500 huts (Jadran, 2010, pp. 36-37).

Figure 3. Settlements on Natural Islands (2014). Photo by Ahmed Neema

A third distinction, **Settlements on Permanent Artificial Islands**, consists of small man-made islands which float on the surface of the water and on which marsh dwellers build their homes. They are created because of the lack of dry land especially during the wet season, and due to the flooding of natural islands. Artificial islands are called *Chibasha* and consist of several layers of reeds and rushes, interspersed with layers of mud. Then, the islands are compressed together and stabilized with stakes. This process is continued until an adequate height is reached and the artificial island becomes solid. Homes on *Chibasha* are made from reeds and rushes, and each *Chibasha* has between 15 and 25 houses (Jadran, 2010, pp. 36-37). (Figure 4).

Figure 4. Settlement on permanent artificial Island (2015). Photo by the author.

Mobile Artificial Island Settlements which are called *dibin* or *dubun*. They consist of a base of reeds, rushes, and soil that form floating platforms like rafts. Each one of them holds one hut and several water buffalo. They are used by water buffalo breeders as temporary homes which can be pushed from one place to another (Jadran, 2010, p. 37).

The varieties of dwellings types in the marshes differ according to the construction material, location of the houses, and their purpose. In general, most dwellings are made of reed. Types of marsh dwellings include:

1. Sarifa

It is considered to be one of the oldest and most common types of dwelling and is constructed from reeds and rushes. Each *Sarifa* has the same structure and appearance: a rectangular shape with a curved roof, covering an area of about 25 m² (Al-Safi,n.d.).

2. Hut

It is similar to the sara'if, but its walls are made of mud rather than reed. It is considered to be one of the simplest types of dwelling in the marshes, and it has a rectangular or square shape with a curved roof. Huts are not built in the marsh. They are found on riverbanks and at the edges of the marshes where flooding is less common (Al-Safi,n.d.).

3. Sitra

It is the third type which is used to describe a house that is made of reeds and mud to keep animals. It is generally found next to family's house, and sometimes there is no separating wall between the two (Al-Safi,n.d.). (Figure 5).

Sarifa Hut Sitra

Figure 5. Varieties of dwellings types in the marshes (2015). Photos by the author.

4. Al-mudhif

The most famous and important type is the guesthouse, or Al-mudhif. It is one of the major cultural and social phenomena of the marshes. It cannot be considered just a house; rather it is a place used to receive guests and hold meetings. Al-mudhif belongs to the tribe's leader, who is known (sheikh), and the whole village is responsible for the building process (Abu Suhair, 2013). The sheikh's guest house (mudhif) in the marshland is an arched building made of reeds, built higher and more detailed than the other dwellings in the area to display the architectural creativity and building skills that go back more than six thousand years (Alwan, 2005, pp. 107-111). (Figure 6).

The exterior of al-mudhif

The interior of al-mudhif

Figure 6. Exterior and interior of al-mudhif (2014), Photo by Ahmed Neema.

All the preceding discussions on the settlements and dwellings of the Marsh Arabs are related to what Rapoport mentions about the physical arrangement of setting which guides, facilitates, and modifies social interaction. Also it is related to Rapoport's explanation that physical elements in the landscape can be indicators of social characteristics and behavior (Rapoport, 1982, p. 98).

Carl Sauer, founder of the Berkeley School of Geography, declared that landscape is the cultural expression that includes the cultural changes and development of each society as an exposition of human experiences. Included in his statements is the merger of culture and time in landscape results in various forms of population, housing structures, land usage, and ways of communication (Thurston, 2001, p. 29). According to Tina Thurston that there are scholars who describe landscape as the physical interpretation of human needs to use and defend lands; others saw landscape as the symbolic interpretation of construction of cultural specificity. Correspondingly, landscape expresses cultural specificity of both people and their built environment (Thurston, 2001, p. 40). From this point of view, the dialectic relationship between human and landscape (people and places) is not just physical, but it is spatial, social, and political characteristics of people's life that gives power to their place and built environment. People and places shape a continuous collaborative relationship (Thurston, 2001, p. 31).

Jeremy Foster refers to Tim Ingold's recognition of landscape as material phenomenon that reflects the impact of practice and activity over time. He also distinguishes between landscape as visual impression and landscape as a form of continuous lived experience through participation and cooperation (Foster, 2008, p. 84). Landscape is the linkage between nation and nature that has figurative and literal meaning and stems from the connection between the character of the culture of particular people and character of particular area that people inhabit (Darby, 2000). Landscaping becomes a marker that indicates special areas of social importance, interaction, and meeting, that physically defines the most important public space in the urban fabric (Rapoport,1982, p. 121).

John L. Motloch (2001) states in his book *Introduction to Landscape Design*, that "landscapes are experienced through space and time and express the history of ecological and cultural processes that created them" (p. 123). Also Motloch (2001) defines cultural landscapes as "systematically bound through culturally significant, nonverbal communication with a high degree of association meaning to native people. So, they are records of people, who they are and who they aspire to be." (p. 345) Motloch also explained about ten different perspectives of landscape. These perspectives are worthy of examination here because each category defines an aspect of the Marsh Arab environment that was drained: 1) Landscape as nature: This is the first definition provided by Motloch and it advocates preserving human nature without intervention. However this view isolates people from nature, and it is the exact opposite of Saddam's punitive handwork in the Marshlands. Saddam's draining of the region waged war against nature with the express purpose of destroying the habitat that sustained the people. 2) Landscape as habitat: This view explains landscape as a home for people; it is a place where interaction and work on the land increases its productivity and sustains the environment. This view connects people to the environment. 3) Landscape as artifact: This view looks at landscape as man-made-land that comprehensively either enhances or dominates nature. This view has many problems because its implementation can cause conflicts when people claim the landscape. 4) Landscape as system: There is the view that landscape consists of subsystems and elements that express and integrate with the whole system. This view engages humans with the ecological system to promote long term well-being and productivity, this perspective is the contrast of landscape as artifact. 5) Landscape as problem: There is the view point that landscape situations should be corrected due to environmental pollution, crowded urban areas, spreading slums and so on. This view requires functional, infrastructural, and behavioral interventions to solve the problem through effective landscape design. 6) Landscape as wealth studies land as a territory owned by people and has economic value that can be measured by the market. This view represents capitalism which adapts materialistic opinion and exploits the environment. 7) Landscape as ideology interprets landscape as the physical expression of the culture that integrates values, symbols, beliefs, and dreams which people are capable of encoding and decoding its meaning. 8) Landscape as history examines the cumulative historical record of nature and people's activities that signifies the meaning and gestures for many generations in the contexts. It is the spatial temporal mosaic that connects people with land. 9) Landscape as place focuses on the gestalt view rather than on the elements that give the place the association to be remembered over time. This view concentrates on the integration of people and environment to give the multiple expressions and influences. 10) Landscape as aesthetic focuses on the visual aspects of landscape in favor of reflective aspects rather experiential because it looks to landscape as an object isolated from human behavior.

Motloch's ten definitions agree with Rapoport's proposition that "cultural landscapes are the result of many artifacts grouped together in particular relationship, and also the result of individual's decisions, which suggests the presence of shared schemata among particular groups. So, this landscape conveys meaning in term of various forms that can be read" (Rapoport, 1982, p. 137). Correspondingly, landscape is not only the geographical meaning of the physical surroundings, but also the whole image of social, material, cultural, and symbolic issues.

9 Landscape, Economic Activities, and Social Organization

How does landscape support sustainable economic activities and social organizations of the Marsh Arabs? We took time to explain the ecology of the Marshes in the beginning of this paper. The ecology of the marshlands affects all aspects of activities of Marsh Arabs, especially, economic activities and social organizations. Economic activities include crop production, animal husbandry, bird hunting, and local industries: weaving of reed mats (Ibrahim, 2007). In the agricultural field, Crop Production is the main activity for a high percentage of Marsh Arabs. They plant rice around the Tigris and Euphrates rivers, in addition to other crops like corn, wheat and barley. Also, watermelons, melons and cucumbers, tomatoes are also grown, as are dates (Kubba, 2011, pp. 91-92).

Animal Husbandry constitutes the main source of income for the Marsh Arabs. Animal production can be varied depending on the type of activity practiced: water buffalo breeding is the most common activity in the marshes, and it was one of the principle activities since the Sumerian. And the Marsh Arabs who breed buffalo are called Ma'dan. Water buffalo provide the marsh dwellers with milk and its derivatives, as well as meat. Fishing and Bird Hunting are important contributors to the economic well-being of the Marshlands. The environment protects the birds during their migrating from northern Europe, Central Asia, and the Russian when they are escaping the cold during the winter. So, the reeds and brushes provide good nesting grounds for those birds (Alwan, 2005).

Local Industries in the marshes are based on manual labor that dependents on the raw materials found in this environment while some of the industries need mechanical methods at certain stages of production. Local industries can be categorized as: Reed Cutting, Mat Weaving and Boat-Building from reeds known as (*mash-huf*) which is the most important form of transportation in the marshes. *Al-mash-huf* is small canoe that can easily be maneuvered through the reeds. It is made of wood and coated with bitumen on the outside. The boats are multifunctional: they are used for transporting people, goods, and also for hunting and selling products (Kubban, 2001, pp. 54-61).

10 Landscape as a Mnemonic: A Cultural Specific Social Organizing Medium in Al-Mudhif

There are a lot of connections between landscape and cultural specificity due to the concept that all societies shape their landscape and subsequently the people are characterized by their landscape. People and landscape are reflections of each other. All these factors integrate with traditions, believes, values and culture that have been expressed in the ways of belonging to that society, community, or tribe (Benson & Maggie, 2000, p. 66).

The mnemonic function of environment is to evoke appropriate behaviors, emotions and interpretations that are constituted by contexts. Thus, environment plays the role of the mnemonic which reminds people of appropriate behavior within space and time. (Figure 7). The information can be encoded by environment, and then needs to be decoded. So, the environment has to be culturally specific to let information be decoded easily (Rapoport, 1982, p. 80). In addition, Rapoport (1982) writes "culture-specific system assumes that there is analogy between kinesic behavior and language. So, nonverbal behavior may be as culture bound as linguistic behavior" (p. 101). Culture specific is similar to emblem which has a precise meaning understood by all members of a group (residents) which is used for messages like the symbolic gestures have specific verbal translations. So, different groups have different culture specificities which are part of individual lexicon (Rapoport, 1982, pp. 103-104).

Al-Mudhif, the most important house type in the Iraqi Marshlands, has social role that should be understood in its cultural specificity**.** The door of *al-mudhif* is always open, as a symbol of generosity and welcome. There is a spiritual and emotional connection between marsh Arabs and al-mudhif. Marsh Arabs are invited to *al-mudhif* through the sound made by the striking of coffee beans in the mortar. This ringing sound alerts the people who are nearby the guesthouse to come and serve them the coffee. It is also an indication that a case needs to be solved or a particular event requires discussion. Inside *al-mudhif*, everyone has to behave politely, use proper words, and be honest, because lies will not be permitted. The men of the marshes go into the guesthouse with their formal costume, which includes the abaya, with the kaffiyah and headband on their head (Abu Suhair, 2013). So, the context influences social interaction, and the social context plays an important role in interpersonal interaction (Rapoport, 1982, p. 100). There is a clear system of seating inside *al-mudhif* according to the social position of each person. So, people of high status and prestigious people, such as the sheikh, sit in the prime position in the guesthouse, which is distinguished with luxury rugs and pillows. In the winter, this place is located in the middle of *al-mudhif*, in front of the fireplace where the coffee is prepared. In the summer, this place is located near one of the side walls. Because of this system, one can infer the importance and the social position of any man in the clan according to his place inside al-mudhif (Abu Suhair, 2013).

According to Rapaport (1982), the setting of the environment has an important role in the process of enculturation, especially the impact of marshlands on their inhabitants (p. 66). He says "The environment imposes an order, a way of classification, the learning of certain systems, behavior, and acceptance of social demands. Then we would expect different enculturation processes and results."(p. 67) So, in the marshlands, people in the communities learn the norms and traditions of tribal laws and obey them. Rapoport describes "the environment as the teaching medium, once learned, it becomes a mnemonic device reminding one of appropriate behavior" (p. 67). So, here the whole landscape plays an effective role to encode meaning in traditional societies in order to represent ethnicity and cultural specificity for a group of people and put them in social space which depends on the cultural context (p. 71). The uniqueness of this particular geography is that it not only 'reminds' one of appropriate behavior, but in some cases it dictates or enforces it.

Space Time = Travel Meaning

Figure 7. Shows how meaning of the space is derived from what happens in the space that is according to Rapoport persoective, whenever we are designing an environment, we are organizing, four elements, namely: space, time, communication, and meaning (2014). Photo by Ahmed Neema

11 CONCLUSION

The marshes that once covered up to 20,000 square kilometers in the 1960s shrank to less than 2,000 square kilometers and reduced to one-tenth of their 1960 size after Saddam waged war in. The draining almost took away the lives and livelihoods of people (Yuan, 2013). Maggie H. Roe agrees with Hutton, that the destruction of social cohesion for any society could result in marginalization, deprivation, and exclusion to be exploited by the ruling majority or the government. All that leads to economic, social, and environmental crises (Benson & Maggie, 2000, pp. 52-54).

After the fall of Saddam's regime in 2003, the marshlands have been restored through the efforts of many local and global experts and organizations. Azzam Alwash, an Iraqi-American engineer who has a decade of service to the marshlands and the founder of the nonprofit organization ***Nature Iraq,*** works with a team of global experts and local marsh dwellers to break Saddam's dykes and canals in order to restore the Marshlands. Roughly, 10,000 of the marsh Arabs, who fled during Saddam's oppressive regime have returned to live in their native marshland. Azzam Alwash writes "Strangely enough, this is one of the few cases where war has resulted in environmental healing. The re-creation of the marshes is literally like the rising of a phoenix from the ashes of destruction. In a sense, it is a symbol of the restoration of Iraq as a whole." (Yuan, 2013).

Landscape is the cultural product of any given society; it embodies their perspective and evokes the way of their life as part of the built environment that synchronizes space and time (Thurston, 2001, pp. 16-17). It is important to study the meanings of environment within cultural systems, and how different environments can communicate to people and how to use or behave in a particular setting. For that reason, Rapoport (1982) states that the setting of environment has important role in the process of enculturation. So lifestyles encode information that is culturally learned to symbolize various meanings and values (p. 66).

In aquatic areas like the marshlands, water is the main component of their built environment and their roads are waterways. So, if they want to go anywhere or even visit their neighbor, the canoe (*mash-huf*) is the only form of transportation. Their children learn how to swim in the same time they learn how to walk; and most of the kids know how to catch the oar as it is one of their hands or feet (Al-Ahmed, 2013).

Maggie H. Roe agrees with Thayer that "it is important to look at sustainable landscape in terms of the nature and the degree of social change they imply" (Benson & Maggie, 2000, pp. 52-54). Thayer explains that we need to be collaborative between social structure and cultural values to support sustainable landscape (Benson & Maggie, 2000, p. 54). Sustainability from a social perspective can be addressed in two ways: one is the social structure that Marsh Arabs have presented through their hierarchical and collaborative way of life. The second is the social learning which Marsh Arabs have passed down from generation to generation in order to adapt to the environment of the marshes and conserve its resources and crafts (Benson & Maggie, 2000, p. 52). James Morris, director of the Baruch Institute for Marine and Coastal Science and the university's expert on Iraqi marsh restoration, says "The culture there, the Marsh Arabs, were an example of the most sustainable society that I know of, in that they were a more or less self-contained community that lived off of the resources they had available and didn't need a lot of external resources; they depended on those reeds." (Malek, 2014).

Depending on the interdisciplinary approach in addition to Amos Rapoport's method which focuses on the meaning and built environment, the research examines the socio-organization and the landscapes of the marshlands which fashioned cultural specific knowledge of the Marsh Arabs in a sustainable manner throught analyzing the cultural landscape of Iraqi Marshland. So, the research establishes a base knowledge about context/setting of Iraqi marshes, the settlement pattern and dwelling, the socio-organization of the Marsh Arabs, interrelationship between the built environment of the marshes and people activities (especially economic activity) which has led to this sustainable ecosystems where man and nature are bound together. In the built environment of Iraqi marshes, people translate their culture's values, attitudes, needs and traditions into physical forms that convey meanings, where these meanings personalize the environment by the inhabitants.

Meredith Vinez and Sarah Leonard, the authors of *The Iraq Marshlands: the Loss of the Garden of Eden and its People*, state "The preservation of the Ma'dan people's culture should not be abandoned in favor of developing agriculture or drilling for oil. The international community, despite its history of overlooking the marsh people, should be called upon to restore the homeland of the Ma'dan and the historical heritage site that exists in this region." (Vinez & Leaard, 2010, p. 16). So, the development of the Mesopotamian territory needs strong relationships between nature, culture, and human aspects to restore the whole ecosystem by bringing back the water and protect the social space.

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WHEATFIELD—A CONFRONTATION: THE WORK OF AGNES DENES

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1 ABSTRACT

This paper explores the work of conceptual and land artist Agnes Denes with particular emphasis regarding her seminal work Wheatfield - A Confrontation. The narrative situates the work of Denes in the larger canon of Environmental Land Art, specifically the work of Alan Sonfist, Mel Chin, and the art critic Lucy Lippard. Although Denes is little known outside the art world, her body of work has recently gained greater attention, thanks in part to a Guggenheim Fellowship she received in 2015 (Hoban, 2015).

This paper argues that Denes' work differentiates itself from other Land Art in some very important and innovative ways. First and foremost, the installation uses living material that is dependent on the geology, hydrology, biota and climatological conditions inherent on the given site. As a result, the soil conditions, existing pollutants, weather, and other factors affect the growth of the wheat and the resulting harvest. Denes' work is imbued with special significance by the act of preparing soil, sowing seed, and harvesting the crop. The deployment of the work at the urban edge is a strategic decision that allows Denes to mine the political, geographic, and cultural history inherent on the site.

Denes' work deserves reexamination by landscape architects for its continued potency and its impact on the way we think about site, the manipulation of earth and the environment, the haptic qualities of inhabitation, the fluidity of site, the connectivity of urban and rural conditions, the appreciation and understanding of natural processes, and the value of the temporal.

1.1 Keywords

Land Art, Environmental Art, Conceptual Art, Narration, Culture

2 INTRODUCTION

Over thirty years ago, while I was a sophomore at Kalamazoo College, a small liberal arts college in Western Michigan, I had the opportunity to participate in the New York Arts Program through the Great Lakes Colleges Association. As such, a group of students from small mid-western colleges were housed in a brownstone in Hell's Kitchen, and for the semester we all worked in the arts. When we first arrived in New York, we were all sent out on interviews to various working artists to determine with whom we would work for the semester. My very first interview was in SoHo in the loft occupied by Agnes Denes, a space that served as her residence and her art studio. I was a young Midwesterner who had been raised in a farming community with 500 people, so the city itself was overwhelming. Meeting with Ms. Denes proved to be terrifying.

As I entered the studio, I was confronted with her conceptual piece, *Human Dust*, 1969. On a small pedestal sat a large glass bowl that held the calcareous human remains of a fellow artist who had passed. Above this vitrine was text that described in excruciating detail data regarding his food consumption, bowel movements, sex life, health, dreams and disappointments. Agnes hovered behind me noting how uncomfortable I was and in a seemingly disembodied voice exclaimed, “Most people think the text is a real person, but the real person is in the vitrine.” For me, this was an unnerving start to a profoundly difficult interview.

During the interview, Agnes had the opportunity to describe her recently completed work, *Wheatfield-A Confrontation*. She was clearly excited about the work and it was also evident that it had provided a new trajectory for her life's journey. While I ultimately did not accept an internship with Agnes, the interview, while only an hour in the span of my life, left an indelible mark in my memory.

This past summer, I was sitting at my kitchen table on a Sunday morning pouring over the New York Times. As I was casually flipping through the *T Magazine*, I happened across an article on older female artists whose careers were being rediscovered and reexamined. An accompanying photograph sent a chill down my spine. I recognized the loft in which my memorable interview with Agnes Denes had taken place over thirty years ago. It was startlingly unchanged, as if the studio itself had been encased in a time capsule.

When I read the article, I was excited to learn that she had recently been awarded a Guggenheim Fellowship and I was also encouraged to learn that she had installed *Wheatfield -A Confrontation* as a new installation at the outskirts of Milan, Italy this past summer. It felt both odd and comforting that event, over thirty years ago, would again circle back to have an impact on my life. As a result, I have reconnected with Agnes after a span of thirty years and have had the opportunity to interview her regarding her work. This reconnection with Agnes has reinvigorated my own personal practice and reaffirmed my belief in interdisciplinary work that bridges among science, art, architecture and landscape architecture. This paper, about Denes, her work, and specifically *Wheatfield* is a result of that coincidence.

3 MODERNISM/LAND ART/ENVIRONMENTAL ART

Land Art and Environmental Art, I would argue, have their genesis in modernism, with its reaction against representation and its tenet of questioning the boundaries of art and site. Perhaps the best examples of this trajectory are the sculptural works of Brancusi. In her seminal essay *Sculpture in the Expanded Field*, Rosalind Krauss writes, “The modernist period of sculptural production…operates in relation to this loss of site, producing the monument as abstraction, the monument as pure marker or base, functionally placeless and largely self-referential”(Krauss, 1979). In regards to Brancusi's work, she continues, “Through its fetishization of the base, the sculpture reaches downward to absorb the pedestal into itself and away from the actual place; and through the representation of its own materials or process of its construction, the sculpture depicts its own autonomy. Brancusi's art is an extraordinary instance of the way this happens.”(Krauss, 1979)

While modernism began to question representation, site, plinth and the autonomy of art, the Conceptual Art Movement of the 1960's further expanded the breadth of art and sculpture to include the temporal: it set the stage for the legitimacy of Land and Environmental Art. Lucy Lippard in her essay, *the dematerialization of art*, remarked on the evolution of art from an object-based proposition to one of obsolescence. She was championing conceptual art during a time when critics denounced the movement for not giving the viewer ‘enough to look at’ or for not giving the viewer what they were accustomed to looking for. In the essay Lippard cited two reasons for its value. First, she states that works of conceptual art "demand more participation from the viewer, despite their apparent hostility. More time must be spent in experience of a detail-less work, for the viewer is used to focusing on details and absorbing an impression of the piece with the help of these details" (Lippard, 1968). In addition, she qualifies conceptual work as a temporal operation and states "the time spent looking at an 'empty' work, or one with a minimum of action, seems infinitely longer than action-and-detail-filled time" (Lippard, 1968).

It is this transition in paradigm from a static object to a temporal condition that allowed for the birth of Land and Environmental Art as well as a host of other conceptual artwork in the 60's and 70's.

4 AGNES DENES

Agnes Denes is one of the first females to be recognized within the canon of Land Art that includes such luminaries as Robert Smithson, Michael Heizer, Alan Sonfist, and Mel Chin. While these men were making heroic works of art that were static, immutable and made mostly of inorganic materials, Denes was making equally heroic work out of living material that grows, changes form, is affected by geology and hydrology, is ephemeral, and eventually reproduces and dies.

Smithson and Heizer boldly moved earth and rock to create works that defied containment within a gallery system they despised and were further free from mainstream museums and commerce. The powerful works they created were static pieces made of inorganic material that were site specific, carved from the local earth and resistant to the ravages of time. While the works themselves succumb to erosion, rising water levels, and other forces, they are imagined as static boundless pieces in remote locations that exist mainly as photographic artifacts. Again, Denes' work differentiates itself though it's short duration, seasonal ties, living material, planting, and harvest.

While Mel Chin does indeed use living material in his works, those installations are not necessarily concerned with an idea of planting, sowing, and harvest, but are rather a comment on our vanishing forests and the damaged environments we have inherited from our industrial past. Chin's seminal work, *Revival Field,* exists in an isolated site at Pig's Eye Landfill, a superfund site in St. Paul Minnesota. The installation is a hybrid between science and art and exists more as a testing field for hyper-accumulating plants than a commentary on dwindling resources or a dissertation on the urban-rural condition.

Perhaps out of all the land and environmental artists who evolved out of the 60's and 70's, the work of Alan Sonfist most closely parallels that of Agnes Denes. His most important work, *Time Landscape (1965-1978-Present)*, consists of a dense planting of native species on a 25-foot by 40-foot rectangular plot of land in lower Manhattan. The plant material chosen was native to the island prior to colonization by Europeans and is meant as a time capsule. While this work is sympathetic to Denes' and is located within the urban core, Denes gains greater potency by placing *Wheatfield* at the threshold of the urban-rural condition and by virtue of soil preparation, planting and harvesting.

Like most Land and Environmental Art, Agnes' work has a political and philosophical edge, yet is easily accessible to the general public. In most places, particularly in the ubiquitous fields of the High Plains and Midwest, crops in and of themselves carry no political polarization. It is Denes' insistence on installing her work at the interstitial space of the urban-rural divide that gives a potency to the art- an act of planting that would otherwise be absent in a traditional agrarian setting.

5 THE GENESIS OF WHEATFIELD

Denes' *Wheatfield* has its genesis in a much earlier work, *Rice-Tree-Burial* that was first realized in 1968 in Sullivan County, New York. Denes stated, "It was a symbolic *event* and announced my commitment to environmental issues and human concerns. It was also the first exercise in eco-logic" (Hartz and Denes, 1992).

This particular work signaled a new beginning for Denes in that it was tied to the nascent conceptual art movement, yet still manifested itself in the visual realm. As such it was composed of three very distinct components: a buried piece of poetry, a group of chained trees, and a field of planted rice. The buried haiku poetry was "an act of renunciation...a pledge of rebirth and a new lifetime commitment as an artist dedicated to the future wellbeing of the ecological, social, and cultural life on the Planet" (Mills and Heartney, 2003). The chained group of trees embodied the idea of human interference, control of nature and the creative spirit of the human mind.

The third component, the rice field, had perhaps the most potency in its simplicity and acted as a precursor to her seminal work, *Wheatfield - A Confrontation.* In *Rice-Tree-Burial*, the planting of the rice in fallow land symbolized a universal substance of sustenance that had to be planted and nurtured. The ritual of preparing and sowing becomes an important component of the work. In *Rice-Tree-Burial*, the seed itself symbolizes the genesis of the idea. It holds the initial life-giving element that through the act of germination and growth sets a process into motion.

It is this act of preparing the ground, sowing the seed, watching the grain grow, and ultimately its harvest that differentiates Denes' work from much of the other land art of the last century. Of those land artists who do use organic material, they often are either not planting the material as a component of their process, are only using a portion of the living material, or are working in remote locations.

This reassessment of her life's work by virtue of preparing the land, sowing the seed, and nurturing the grain in *Rice-Tree-Burial*, became the qualifying factor in determining the trajectory of her life in art. Her decision to plant a wheat field in Manhattan instead of designing normative sculpture was a call to expose our misplaced priorities and deteriorating human values.

6 WHEATFIELD IN MANHATTAN

The thirty-three square miles of land that compose Manhattan are some of the richest, most culturally powerful and most valuable parcels of land in the world. The conscious effort to plant, sustain and harvest wheat at the edge of this most urban condition was a powerful paradox that questioned existing expectations of a use for that valuable real estate.

For Denes, "*Wheatfield,* was a symbol, a universal concept. It represented food, energy, commerce, world trade, and economics. It referred to mismanagement, waste, world hunger, and ecological concerns. It was an intrusion into the Citadel, a confrontation of high civilization. Then again, it was also a Shangri-La, a small paradise, one's childhood, a hot summer afternoon in the country, peace, forgotten values, simple pleasures" (Denes, 2015)

The two acres of wheat were planted in the Summer of 1982 at the foot of the World Trade Center only a block from Wall Street- the economic center of the world- facing the Statue of Liberty- a symbol of the country's commitment to life, liberty and the justice for all.

Wheatfield – A Confrontation, situates itself in a much broader context that adds additional efficacy to its meaning. *Wheatfield* was unusual in that it wasn't located in the rich fertile farmland of the Midwest or the Plains, but rather in a post-industrial landfill bursting with trash.

Implicit in this installation is the act preparing the land and sowing the seed as a precursor to growth. In March 1982 over two hundred truckloads of landfill were dumped onto the site and then flattened with cultivating equipment. Following that initial preparation, an additional eighty truckloads of soil were dumped and flattened to provide the necessary topsoil for the germination and growth of the wheat. Denes stated, "We maintained the field for four months, set up an irrigation system, weeded, cleared out wheat smut (a disease that had affected the entire field and wheat everywhere in the country). We put down fertilizers, cleared off rocks, boulders, and wires by hand, and sprayed against mildew fungus" (Denes, 2015)

Once the field was prepared, Denes and her two assistants began the work of planting the two acres of wheat in the shadow of the World Trade Center and Wall Street. This exercise in planting consisted of digging the furrows by hand, clearing any remaining rocks and garbage, and then sowing the seed by hand and covering the furrows with soil.

After the original incarnation of *Wheatfield: A Confrontation* in Battery Park, the project was repeatedly installed at other sites. Agnes readily admits, "there were small copies that had nothing to do with the original *Wheatfield,* with its size and placement that created a powerful paradox and the calling to account, but they honored the intent" (Denes, 2015)

7 WHEATFIELD IN MILAN

While Agnes is appropriately critical of the copies created over the years, her installation in Milan, Italy in the summer of 2015 regains the potency of her original installation in Battery Park over thirty years ago and solidifies the importance of context in the manifestation and significance of the work. From March to October 2015, The Foundazione Riccardo Catella, in partnership with the Foundazione Nicola Trussardi and Confagricoltura, presented the installation of *Wheatfield- A Confrontation.* In March the field was prepared and the seed sown in downtown Milan: more specifically in the Porta Nuova district. This area of Milan is an architecturally significant area of urban renewal that has reshaped the city skyline. This installation of *Wheatfield* is significantly similar to the original installation in Battery Park and was planted at a heroic scale. Over 12 acres of land were planted as an agrarian installation in an area that will subsequently house a public park. In my interview with Denes she stated, “The Wheatfield of 12 acres this summer in Milan, Italy was calling attention to the misuse of land endangering animal habitats, world hunger, etc. etc. These fields call attention to so many issues that I am grateful when they let me create them” (Denes, 2015)

8 REFELECTIONS AND CONCLUSIONS

Since its creation for the first time in 1982, *Wheatfield* has endured in public memory as one of the most famous earthworks of all time, a masterpiece imbued with symbolism and confrontational power. In it, nature reclaims the city through a simple, yet compellingly ecological image: a wheat field grows in the heart of New York City and again in the heart of Milan, Italy. Both installations existed in the shadow of the city skyscrapers and both were powerful images in the daily lives of New Yorkers and the Milanese.

In my interview with Denes, she repeatedly commented on how thankful she is for the many people that have been supportive of her installations, have helped in their construction, preparation, and manifestation. Her work brings together a collective that binds people to a commitment that is much larger than the work itself. At the end of the interview, she alluded to additional work she intends to initiate as she nears the zenith of her career. She commented, “I have designed a forest for New York City on the last open space and hope they won’t stand in the way of it becoming a reality. It would be a magnificent addition to the city” (Denes, 2015)

As landscape architecture makes a pendulum swing towards landscape urbanism, Denes’ work situates itself at the urban-rural edge and reminds us that landscape is neither rural nor urban, but rather a continuum based on context. The land art and environmental art movement at the latter half of the twentieth century has had a profound impact on landscape architecture and the way in which we think about site, the manipulation of earth and the environment as well as the haptic and temporal qualities of inhabitation. Several landscape architects including George Hargreaves, Michael Van Valkenburgh, and Julie Bargmann all owe a debt of gratitude to this movement for expanding our consciousness regarding the fluidity of site, the connectivity of urban and rural conditions, the appreciation and understanding of natural processes and the value of the temporal.

It is for this reason that the work of Agnes Denes deserves to be reexamined in the contemporary context of landscape architecture and landscape urbanism.

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OF MUDDY WATERS AND PRESIDENTIAL MEMORIALS: EROSION AND SEDIMENTATION IN THE POTOMAC RIVER WATERSHED

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1 ABSTRACT

This paper tells two paired stories of erosion and sedimentation in the Potomac River basin in the nineteenth century. It describes deforestation and erosion due to iron production in the Shenandoah Valley, the largest area of cleared land in the watershed, and it chronicles the resultant build-up of sediment downstream in Washington, impacting navigation and commerce in the capital. George Perkins Marsh's Man and Nature identified these conditions as part of a long, historical pattern of human impact on the environment, and it galvanized the public, leading to significant conservation of forestlands. Less documented is the response to the sediment that built up in many cities and ports downstream. Tying the two stories together illuminates a larger story about human impact and agency in the environment, showing environmental impacts of human settlement but also showing positive consequences of focused stewardship and design.

1.1 Keywords

Forest history, erosion, sedimentation, Potomac River, Theodore Roosevelt Memorial, George Washington National Forest.

. 2 INTRODUCTION

In December of 1901, just three months after becoming president in the wake of William McKinley's assassination, Theodore Roosevelt submitted a proposal to Congress for a new national forest in the southern Appalachian Mountains. (Roosevelt, 1902; Morris, 2001) There were no federal lands in the east that he could simply designate as a forest reserve, so he sought Congressional approval to purchase privately owned lands and create the first eastern national forest. Just two weeks earlier in his first Annual Message to Congress, the equivalent of today's State of the Union address, he had outlined a bold new conservation agenda, and this forest proposal was among his first tangible steps toward implementing it. (Morris, 2001) Creating a national forest would protect the southern Appalachians from destructive logging, and equally important, would prevent severe erosion of the steep mountainsides and damage to the rivers downstream due to excessive sedimentation.

A month after submitting that proposal, the President and First Lady Edith Roosevelt made their way across the White House lawn to the newly-built Corcoran Museum and reviewed the Senate Park Commission's proposal for "The Improvement of the Park System of the District of Columbia," more commonly known as the McMillan Commission Plan. (Morris, 2001; Senate Park Commission, 1902) The plan established a new vision for the various parks and landscapes of the capital, but its highlight was a bold design for the National Mall extending well beyond the Washington Monument to the newly reconfigured shoreline of the river. This new larger mall would include land that had recently been created by dredging the main channel of the river and filling in mudflats that had formed in the broad shallows at the foot of the Washington Monument. According to the plan, the mall would culminate at its western end in a classical memorial to Abraham Lincoln with a site for a second memorial across the new Tidal Basin that in time would become the Jefferson Memorial. Both these sites had been under water when Pierre L'Enfant first laid out the streets and avenues of the capital city.

These two seemingly unrelated events early in Roosevelt's presidency are tied to one another at a sedimentary level, literally, since each can be seen as a response to a heavy build-up of sediment in the Potomac River over the course of the nineteenth century. Each ultimately led also to the cultivation of a commemorative presidential forest, an indication of the changing role of forests in the American imagination. Roosevelt's call for a national forest inspired numerous national forests in the East, including the George Washington National Forest, which was instrumental in reforesting the headwaters of the Potomac River and mitigating erosion. Downstream, the accumulated sediment in Washington, DC would come to influence the design and ecology of a future memorial to Theodore Roosevelt himself, a forested island in the Potomac, wild in character and in notable contrast to its classically inspired brethren on the National Mall. The Senate Park Commissioners did not propose the island as a site for a presidential memorial, but they did envision it as one of a pair of natural forested islands in the river, a foil to the formal geometry of the Mall. Each of these islands was formed in whole or in part by sediment building up in the river.

This paper examines the history of deforestation, erosion and sedimentation in the Potomac River basin by telling the stories of two specific sites within the watershed: Catherine Furnace in the headwaters of the Shenandoah River and the shallows of the Potomac Flats in the heart of Washington. Grounding the combined problems of deforestation, erosion and sedimentation in specific geographic locations shows how specific actions impacted and degraded the environment, but it also shows the positive and ameliorative impacts of other actions such as reforestation and re-forming the accumulated sediment. It is too easy to condemn humans as the source of environmental harm without also recognizing the positive impacts of human agency in response to environmental damage. Pairing these two specific stories allows for the negative and positive impacts of human agency to be paired as well.

The stories themselves are not new, and this paper draws upon previous histories as a means of identifying sources of erosion, which need to be gleaned from the previous accounts. The paper draws upon histories of the Shenandoah Valley focused on clearing and settlement as well as other documentary and geographic evidence (surveys, maps and photographs) that tie those stories to specific sites. It also combines history of the sedimentation of the Potomac River with detailed maps showing contours of the river bottom to give geographic specificity to the story of the sediment. Retelling and combining these two stories with a focus on these two sites allows the land itself to be an active player in the stories, if not a willing agent, and allows the story of the soil to come to the surface. Furthermore, linking the stories along the gradient of the watershed allows for a different reading, a larger story that shows the connection between actions upstream and downstream and shows the role of human agency in the changing role of forests within the watershed and the nation.

3 EROSION IN THE SHENANDOAH VALLEY

The Potomac is not a particularly large river, but in three hundred miles upstream from Washington, it flows from its source at Fairfax Stone, West Virginia through all the major geologic provinces of the Appalachian region. (Stanton, 1992) As a result, its watershed is surprisingly complex. As early colonists settled in this diverse territory, they cleared the forests, even on mountainous terrain, and much of the soil on that land eroded into the region's rivers and streams, eventually flowing downstream and settling as mudflats in the heart of the capital.

It is difficult to find direct evidence of erosion, even though it was likely ubiquitous when lands were newly cleared, because erosion rarely attracts attention unless it leads to mudslides, sink holes or other dramatic loss of soil. Therefore, constructing a history of erosion is largely a matter of reading between and across scant pieces of evidence, in this case, existing histories of settlement and land use, land surveys, and photographs.

Much of Washington's sediment probably eroded from the rolling lands immediately upriver of the capital in the piedmont district of Maryland and Virginia because there were fewer places where it could settle out before it reached Washington. (Chappell, 1973) However, the greatest amount of cleared land in the watershed was farther upstream in the Shenandoah Valley of Virginia and its less famous counterpart, the Cumberland Valley of Pennsylvania and Maryland. Being more renowned, the Shenandoah has attracted more attention from historians and offers more clues to past sources of erosion.

The Shenandoah Valley had a robust and diversified economy that developed during the eighteenth and nineteenth centuries, but its primary cash crop was wheat. With fertile limestone soils and with rivers and railroads linking it to Washington and other mid-Atlantic cities, wheat farming prospered in the valley, earning its Civil War era moniker "The Breadbasket of the Confederacy." (Koons and Hofstra, 2000) Clearing the extensive forests for farmland and steep stream banks for mill sites would have led to substantial soil loss across much of the terrain, though little of that is directly documented in histories of settlement. (Koons and Hofstra, 2000) More notable at the time was the erosion of mountainsides that were logged for timber, fuel wood, and especially for iron mining and charcoal production.

In addition to wheat farming, the Shenandoah Valley was an important iron-producing region through the early decades of the nineteenth century and again during the Civil War. Iron production was less widespread than farming, but it devastated the forests and mountainsides surrounding the numerous iron furnaces, and this led to remarkable erosion. The combination of heavy impacts to the forests, steep mountains, and steady flowing streams in narrow valleys was a recipe for substantial loss of soil and increased sediment load in the rivers.

A well-documented example is Catherine Furnace on Cub Run in the Massanutten range, a fifty-mile long set of parallel ridges that rise up in the center of the valley and split the Shenandoah River into its North and South Forks. *(Rappleye, 1981)* At its southern end, the ridges are tightly spaced yet broken by enough gaps that Cub Run weaves several parallel valleys into a collective watershed before emerging from a small gap in First Mountain and flowing into the South Fork of the Shenandoah. Catherine Furnace was located right in that gap.

Iron making required several key resources: iron ore, limestone, a steady flow of water, and extensive forests to make charcoal, and these were all readily available in the Cub Run watershed. (U.S. Dept of Agriculture, Forest Service, n.d.; Rappleye, 1981) Like many of the mountains that define the Shenandoah Valley, Massanutten is comprised of ridges of folded bedrock with different strata meeting the surface at different elevations. At various locations in the mountains, layers of iron ore were at or near the surface, and these were the quest of iron speculators, who cleared the forests, stripped the overburden, and sent the soil and surface rock down the slope in an initial erosive act. The ore itself was strip mined and carted downhill to the furnace for smelting. (U.S. Dept of Agriculture, Forest Service, n.d., Cooper, 1991)

Iron ore was smelted in a stone furnace adjacent to Cub Run, the waters of which powered the bellows to stoke the fire. The heat source was charcoal which consumed tremendous quantities of wood but had advantages within the local economy. Compared to coal, which was being used in England, charcoal made a more malleable iron with fewer impurities, and this made it more easily worked by local blacksmiths so it fit well within the decentralized rural economy of the Shenandoah Valley. (Williams, 1989) But charcoal production devastated the forested mountains because many thousands of acres of trees were needed to create enough charcoal to support a single furnace.

Making charcoal involved tending a controlled fire that charred tightly stacked wood without actually burning it up. The skill of the charcoal maker, or collier, was in stacking wood into a dense mass and limiting the supply of oxygen. Too much oxygen would make a "live" fire and consume the wood, but too little would put it out entirely. Colliers packed four-foot logs vertically in three tiers to make a broad shallow dome of nearly solid wood, and the whole structure, except for a narrow central chimney, was covered with dirt and leaves to prevent air from infiltrating the mass of wood. (U.S.D.A., Forest Service, n.d.) Green wood was needed so it wouldn't too burn too quickly, and although some trees made better charcoal than others, colliers and iron masters weren't picky. Woodchoppers cut every living tree in tracts of up to 1000 acres, leaving only deadwood, brush, and trees too small to harvest. It took twenty to twenty-five years for the forest to regenerate and be ready to be cut again, and therefore about 20,000 acres of forest were needed to support a single iron furnace. (U.S.D.A., Forest Service, n.d., Cooper, 1991)

Although mining the ore took a heavy toll on the mountainsides, making charcoal destroyed far more of the forests and their soils. Fires were especially destructive, sweeping the mountainsides in the wake of clearing, sometimes escaping from the charcoal hearth itself. With just dead wood and brush remaining, fires spread rapidly, destroying whatever was left of the forest and stifling its ability to regenerate. The effect of all this mining, cutting and fire devastated the land.

> The mountains were criss-crossed with roads, covered with test-pits and mining operations. Repeatedly wildfires occurred from the charcoal operations, repeatedly burning the young forest. The roads were left to erode and wash away. Conservation was unheard of at that time. Even before the decline of the charcoal iron industry [after the Civil War], a growing population was making demands on the timber, water, and wildlife resources of the forest. By the early 1900s, the forest was in poor condition from overuse and misuse." (U.S.D.A., Forest Service, n.d., p. 13-14)

Catherine Furnace was developed in 1837 at the height of iron production in the valley but shut down in the 1850s along with many other furnaces because the lack of good rail connections to bigger markets crippled production. The outbreak of the Civil War provided a new market, and Joseph Anderson of Tredaker Ironworks in Richmond encouraged all the furnaces to go back into production to supply the Confederacy with iron for rails, cannons, and other wartime needs. (Rappleye, 1981) By the late 1870s, the furnace was closed again when Jedediah Hotchkiss, an engineer from the Board of Immigration, surveyed the whole iron plantation to assess its viability as a place to direct new residents.

> The location of the furnace is an excellent one in reference to raw materials, for iron ore, limestone, and charcoal can all come to it by gravity; the outcrops of the ore and limestone begin within a hundred yards of the furnace mouth, and a dozen square miles of the forest lands of tract "A" are readily accessible, largely by roads already constructed through the numerous parallel and transverse valleys that have their natural outlet by way of this furnace. … The timber resources of this tract are ample to supply perpetually a large charcoal furnace and forges." (as cited in Rappleye, 1981, p. 34)

Since Hodgkiss surveyed the land forty years after iron production began, it is surprising that his assessment of the forest is so positive. Perhaps the intermittent history of iron production had allowed forests to recover enough to resist fires, or that he was exaggerating the case for reopening it. A second survey by foresters in 1912, more than three decades later, described very different conditions. (Clark and Volkmar, 1912) No mention is made of specific additional cutting or degradation of the land in the interim, but they do acknowledge that fifteen to twenty years earlier "the mountains supported a fair stand of timber" which suggests that not all the damage to the forest was due to mining and charcoal production directly. In any case, according to their report the forests were devastated, erosion was rampant, and the land seemed to be in continued decline rather than recovering. And all of this had severe impacts on Cub Run as well.

> At present … there is practically no mature timber left, except a very few culled patches of 5 or 10 acres, or less, where for one reason or another, a clear cutting was not made. This timber has at present little commercial value, and serves only to show the character of the original forest. Mature trees, which are either defective or of inferior species, are scattered widely over the entire tract. The best stands of second growth are found in the coves and on the lower slopes. The ridges are

> often bare of tree growth. … Through overcutting, slopes and ridges have been left bare, and no attempt has been made to dispose of the brush. Fires have inevitably followed the cutting, and have swept over the slopes and ridges, killing most of the young growth. Bare rock and thin soil have as a consequence, been left exposed. …
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> The removal of the timber and the repeated burnings have materially affected the stream flow. Farmers living near the tract say that during the wet seasons the streams are much higher, and floods are more numerous than they were fifteen to twenty years ago, when the mountains supported a fair stand of timber. Logging roads through the gaps, have been washed so badly by floods, that they are will nigh impassable. In the dry seasons of summer and early fall, springs and wells of the vicinity, which never failed before the timber was removed, now go dry. (Clark and Volkmar, 1912, pp. 5-7)

4 SEDIMENTATION IN WASHINGTON, DC

Regardless of whether soil loss originated from subtle but persistent erosion off of farmland or the dramatic loss of mountainsides, all the eroded soil in the upper watershed had to go somewhere, and the inevitable collecting point for much of it was Washington, DC. Like other cities of the mid-Atlantic, Washington straddles the threshold between two geological provinces, the Piedmont and the Coastal Plain. As the Potomac flows out of the rolling uplands of the Piedmont and onto the flat Coastal Plain, it changes from a relatively narrow and fast moving river to a broad, shallow tidal river, a brackish mix of fresh and salt water. That geologic boundary may not be as sharp as a line on a map, but the threshold is surprisingly evident when the river reaches Georgetown, the area's original port city and the oldest part of Washington. Just upstream, the fresh water of the upper Potomac tumbles over its last set of rapids and joins the tidal ebbs and flows of the Chesapeake estuary. For early settlers, this was the point where fresh, drinkable water met tidal, navigable water, and it was an ideal place to settle, as others had also found in Philadelphia, Baltimore, Richmond, and numerous smaller settlements of the mid-Atlantic. (Spirn, 1984)

But the same conditions that made for good settlement also made for lots of sediment. As eroded soil from farms and mountainsides tumbled down the rapids of the Potomac, the speed of the river kept it moving until it reached the Coastal Plain. At Georgetown the river turned sharply, divided into two channels around Mason's Island, and then broadened to nearly a mile wide, slowing down tremendously and dropping its sediment in the shallow, slower-moving water and gradually accumulating as mudflats that blocked navigation. (Chappell, 1973)

Although erosion in the upper watershed may have gone largely unnoticed and elicited little comment, the buildup of sediment in Washington occurred in plain view, filling up the broad shallows of the Potomac River right at the foot of the Washington Monument. From day to day, the river would not have been noticeably different, but engineers and ship captains were aware of changes in the depth and navigability of the river. All of this weighed on engineers, planners and lawmakers who needed to address the sediment and its impacts on commercial shipping in the capital. (Chappell, 1973)

The accumulation of sediment happened slowly over decades, but the changes are evident in a series of maps of the city that show the channels of the river and the shallower waters between them. (Miller, 2002). As early as 1791, when Pierre L'Enfant proposed his plan for the central mall and radiating avenues of the new capital, sediment evidently was already building up in the river. Andrew Ellicott's modified version of L'Enfant's plan indicates the Potomac's three prominent channels and gives evidence of changes in their flow. (Figure 1) The Virginia channel is shown flowing down the west side of Mason's Island (also known as Analostan Island) and then hugging the Virginia shoreline; the Georgetown channel flows down the east side of the island and then down the center of the river; and the Washington channel flows right along the edge of the city itself, continually scouring at the banks of the new capital and making a good deep harbor along its southwest waterfront. (Chappell, 1973) All three channels converge by the time they reached the southern tip of the city where they are joined by the waters of the Anacostia River flowing in from the east. The current in these channels kept them open for navigation, but between the channels are shallows, perhaps already filling with sediment since settlers upstream were already clearing the forests upstream for agriculture, mills, mining and charcoal production.

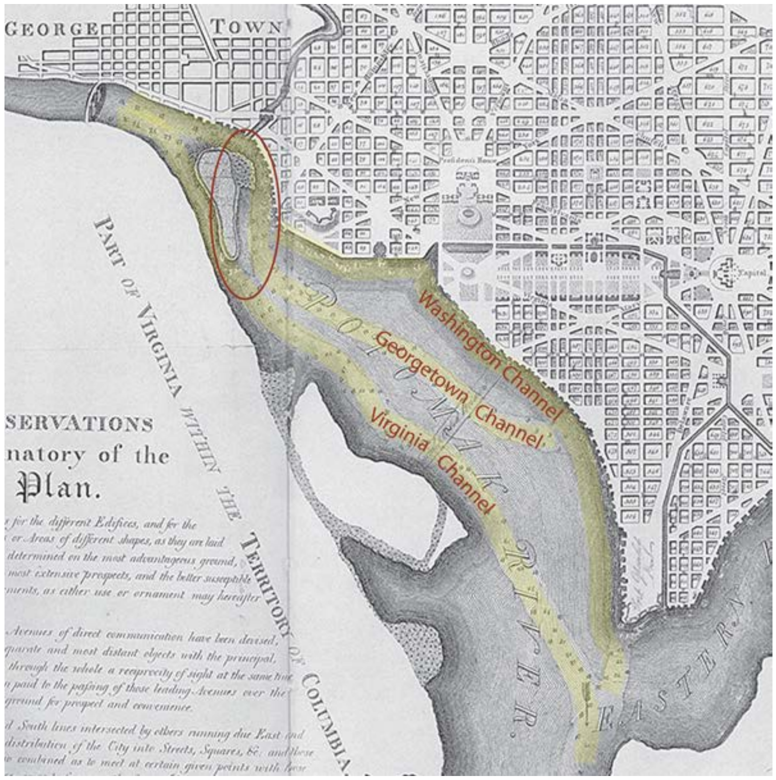

**Figure 1. Andrew Ellicott, Plan of the City of Washington (1792), detail.
Colorized by author to show three original channels and sediment on Mason's Island.
Public domain map, Library of Congress, Geography and Map Division, G3850 1792.L4 Vault**

In Ellicott's engraving two details at Mason's Island hint at changing conditions of the river. Swampy lowland has established on its northeast shoulder, and immediately adjacent to it downstream, tidal mudflats are visible along the eastern side of the island. This suggests that sediment was already building up even before the city was planned, and it also shows that the island cast a shadow of slower current allowing extra sediment to collect along its eastern edge.

By the early 1800s more sediment was building up below Mason's Island, so engineers constructed a dam connecting the island's northwest corner to the Virginia shoreline. This forced all the water to the east side of the island in the hope that the added current would keep the upper Georgetown channel open and retain access to the Georgetown wharves. (Chappell, 1973) The dam is visible in William James Stone's 1841 map of the "Head of Navigation of the Potomac River," and also visible is a long mudflat along the eastern side of the island. (Figure 2) A second, equally large mud bar has formed along the opposite shore, cutting off the head of the Washington Channel. Each of these mud bars is labeled "Dry at Low Water," but each is just a tip of a larger mud bar below the surface of the river and extending farther downstream. The lower part of the Georgetown Channel had nearly filled in by 1840, and even the lower Virginia channel appears less navigable than in Ellicott's map.

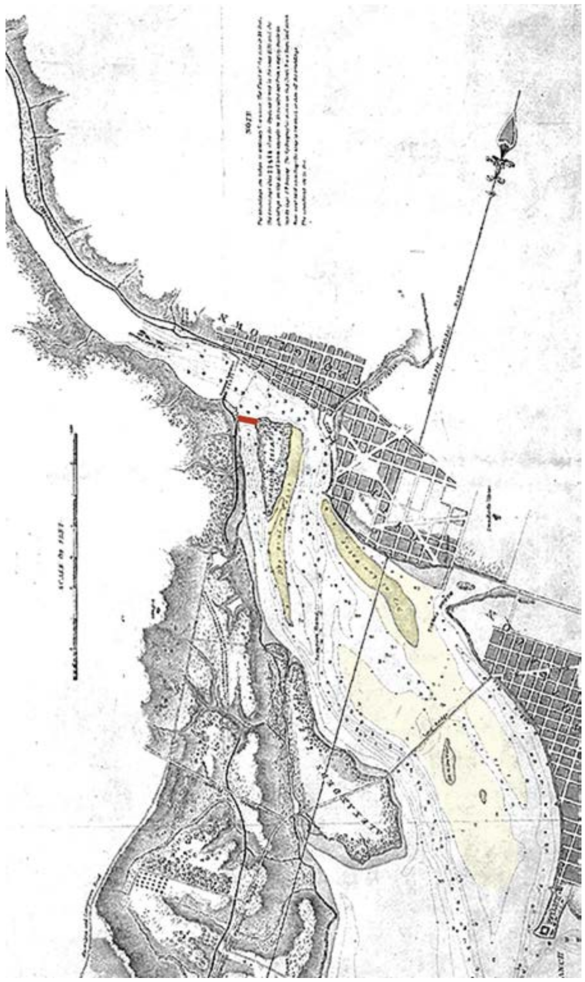

Figure 2. William James Stone, Chart of the Head of Navigation of the Potomac River (1841), detail. Colorized by author to showing new mudflats and dam at northwest corner of Mason's Island. Public domain map, Library of Congress, Geography and Map Division, G3851 P55 1838 .S7

By the start of the Civil War, the entire center of the river was less than four feet deep, and ship captains could no longer navigate directly from the Washington waterfront to Georgetown without sailing downriver first and then returning upstream via the other channel. (Chappell, 1973) This is visible in A. Boeschke's 1861 "Topographical Map of the District of Columbia" which shows an enormous tongue of sediment filling the entire middle of the river with depths marked as shallow as one foot deep. (Figure 3) Major Nathaniel Michler of the U.S. Army Engineer Bureau described the condition of the resultant mudflats.

> At low water the soil is entirely uncovered and has become so firm as to support the weight of a man. This development, unless effected by high freshets or other strong natural causes, will continue more rapidly from year to year; the vegetable matter becoming more firmly rooted, will materially aid in checking any floating matter, and cause the material to be deposited in the river. (as cited in Chappell, 1973, p. 15)

Michler proposed dredging the main channel along the Virginia side to keep it open all the way to Georgetown and also dredging the Washington channel to maintain access to its wharves. He proposed using the dredged material to fill the newly formed "Potomac Flats" so it wouldn't wash back into the deeper water.

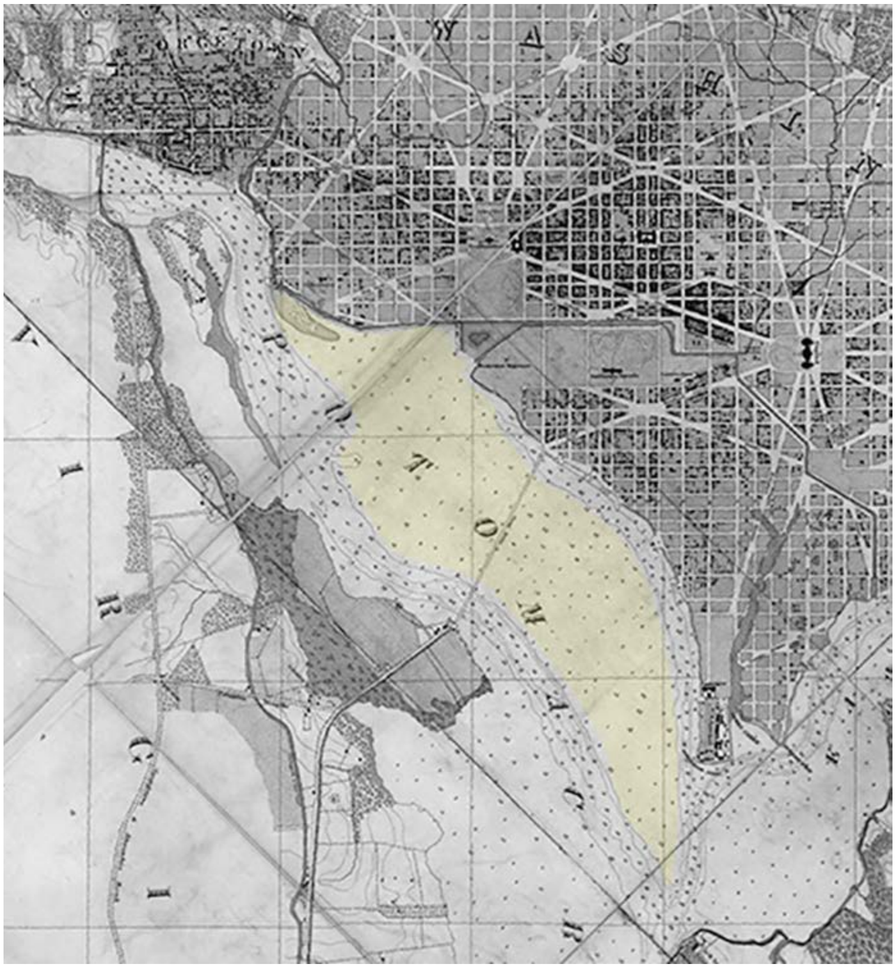

Figure 3. A. Boschke, Topographical Map of the District of Columbia (1861), detail. Colorized by author to show tongue of sediment filling the center of the river. Public domain map, Library of Congress, Geography and Map Division, G3850 1861 .B6 Vault

> In this way the water would be confined to the main channel; the flats, now so detrimental to the city, would be reclaimed, and the material taken out could be employed to some useful purpose, instead of being deposited in the river, as had hitherto been the case, to one side or the other, only to be washed back by the current in some succeeding freshet. (as cited in Chappell, 1973, p. 16)

Michler's proposal was not adopted, and instead the Virginia and Washington channels were conventionally dredged in 1874 and 1875 with the dredged material simply moved to the side where it could wash back into the channel. Just two years later in 1877, the largest flood up to that date deposited up to six feet of new sediment and "undid virtually all of the work that had been done to improve navigation on the river." (Chappell, 1973, p. 19)

The flood of 1877 made it necessary to dredge again, immediately, but it also made it clear that a definitive plan for the river was needed. In addition to Michler, several engineers had proposed plans for the river, and in 1882 an Army Corps of Engineers commission approved a composite of several of them. (Figure 4) The plan proposed filling in the eastern half of the river, giving it a new shoreline with a long, gentle 'S' curve, culminating in a long peninsula along the flats that would keep the Washington Channel open. The peninsula would protect the channel from new sedimentation, and a tidal basin at its head would wash it clean with every change of tide. (Chappell, 1973) As the tide rose, water would fill the basin through its southern gate, dropping its sediment in the basin's still waters, and then as the tide fell, clear water would flow out the eastern gate to keep the channel clear and navigable.

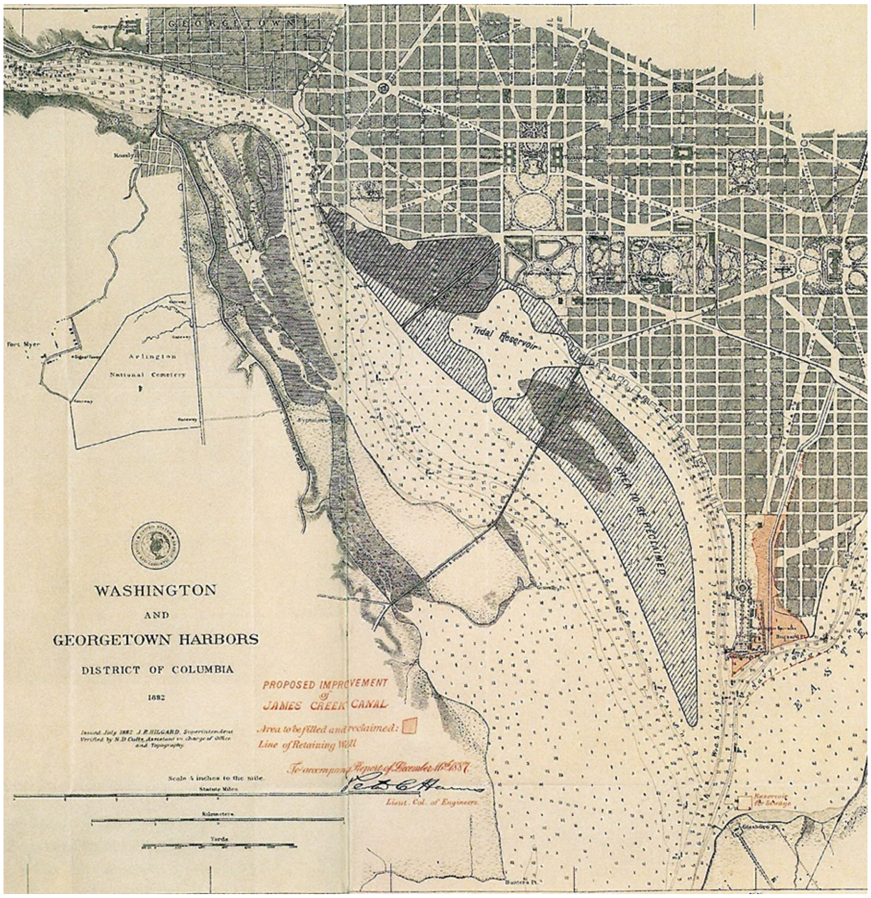

Figure 4. J. E. Hilgard, Washington and Georgetown Harbors, District of Columbia (1861), detail. Proposed areas to be filled with dredged material, original coloration. Courtesy of The George Washington University Museum, Washington DC, AS 551, The Albert H. Small Washingtoniana Collection

Of course lines on a map do not instantly translate into firm ground under foot, and it would take nearly thirty years before the river was dredged and the new land had been completely filled as shown in the plan. At first, contractors used clamshell dredges that would take a bite out of the bottom of the river, place it on a waiting barge that would dump it next to a newly built railroad trestle. From there, it would be dredged again and put into a railroad car that hauled it to the fill zone. This was slow and expensive, so contractors developed a new system of hydraulic dredging that was much quicker and cheaper. A huge vacuum-like hose could suck up soil and water from the bottom of the river and pump it directly to where they wanted to place it. The outflow was mostly water, so riprap walls were built to contain it while the water drained off and the mud settled. The whole process was quicker and cheaper, and the suction left a smoother river bottom. (Chappell, 1973)

The contractors filled above the high tide point, achieving a rough draft of the new waterfront, but the question remained of how high to build the land. At the start of dredging, the plan was to fill to a level three feet higher than the flood of 1877, but in 1889 the largest flood on record elevated the river three feet higher than in 1877 so the final elevation of the filled lands was raised yet another three feet. New sea walls were constructed along the earlier riprap ones, and this gave a more formal, vertical edge to the river. All of this refinement took much longer than the initial dredging, and twenty-one years later in 1911 the long peninsula along the Washington Channel, the last piece of dry, solid land to be finished, was turned over to the Office of Public Buildings and Grounds. (Chappell, 1973)

5 A WIDER ENVIRONMENTAL PROBLEM

Deforestation of the upper watershed and the build-up of sediment in Washington were not unique to the Potomac River or even to modern times. George Perkins Marsh's best-selling book of 1864, *Man and Nature, Or Physical Geography as Modified by Human Action,* described this as a recurring phenomenon throughout the newly settled regions of the United States and with precedents dating back to classical times. (Marsh, 1864; Lowenthal, 2000a) A native Vermonter, Marsh witnessed the clearing of his home state's forests during his childhood in the early 1800s and the resulting erosion of soil into the region's rivers. Later, as a foreign minister in Turkey, Greece, and Italy in the mid-1800s, he found the same problem had beset cities in the eastern Mediterranean after ancient Greeks and Romans had cleared their mountains of forests. Rivers silted in, and cities struggled to keep their harbors open. (Lowenthal, 2000a)

In *Man and Nature,* Marsh synthesized his personal observations in Vermont with historical information from the eastern Mediterranean and contemporary scientific research, and he identified and articulated the link between deforestation, erosion and sedimentation.

> With the disappearance of the forest, all is changed. The face of the earth is no longer a sponge, but a dust heap, and the floods which the waters of the sky pour over it, hurry swiftly along its slopes, carrying in suspension vast quantities of earthy particles which increase the abrading power and mechanical force of the current, and, augmented by the sand and gravel of falling banks, fill the beds of the streams, divert them into new channels and obstruct their outlets. The rivulets, wanting their former regularity of supply and deprived of the protective shade of the woods, are heated, evaporated, and thus reduced in their summer currents, but swollen to raging torrents in the autumn and in spring. From these causes, there is a constant degradation of the uplands, and a consequent elevation of the beds of watercourses ... The channels of great rivers become unnavigable, their estuaries are choked up, and harbors which once sheltered large navies are shoaled by dangerous sandbars. (Marsh, 1864, 186-7)

Marsh's warnings were not abstract ideas observable only in distant places or in past time periods but were very evident in the immediate landscape. Farmers downstream from Catherine Furnace complained of dangerous floods and their wells running dry after the forest had been destroyed on Massanutten, and in Washington the problem of sedimentation clogging the harbors was plainly evident. The record setting floods of 1877 and 1889 occurred when the watershed was at the peak of deforestation and not long after Marsh's book was reprinted, and the immediacy of such events probably contributed to the success and impact of the book. Like Rachel Carson's *Silent Spring,* published ninety-nine years later, it galvanized the population, and combatting deforestation became the leading environmental cause of the late nineteenth century. (Lowenthal, 2000a) As stated in the beginning of this paper, Theodore Roosevelt's proposal for a national forest in the southern Appalachians and the Senate Park Commission plan for the park system of Washington are direct responses to the environmental consequences of deforestation in the watershed and sedimentation in Washington.

Roosevelt's national forest proposal was clearly influenced by Marsh's writing. To make the link between deforestation, erosion, flooding and sedimentation, it paired images of erosion on steep deforested mountainsides with images of rivers and farms severely damaged by flooding and sedimentation. With language reminiscent of *Man and Nature* the report plainly described these conditions in the accompanying text.

> The soil, once denuded of its forests and swept by torrential rains, rapidly loses first its humus, then its rich upper strata, and finally is washed in enormous volume into the streams, to bury such of the fertile lowlands as are not eroded by the floods, to obstruct the rivers and to fill up the harbors on the coast. More good soil is now washed from these cleared mountain-side fields during a single heavy rain than during centuries under forest cover." (Roosevelt, 1902, p. 4)

The southern Appalachians were the likeliest location for a new eastern national forest. They are the largest mountainous region in the east and are blanketed with the most substantial deciduous forests in the nation, forests that were still largely pristine and unlogged when Roosevelt took office. The combination of steep mountains, narrow valleys and heavy rainfall made them particularly susceptible to devastating erosion if logged irresponsibly, and the devastation would be especially severe in the agricultural valleys downriver from the mountains and all the way to the harbors at the mouths of the rivers. (Roosevelt, 1902)

Roosevelt's proposal, drafted by Secretary of Agriculture James Wilson and his assistant Gifford Pinchot, aimed to protect the forests and mountains from the uncontrolled industrial logging that was encroaching upon the region. In keeping with Marsh's argument, it stressed that deforestation would devastate the rivers flowing out of the mountains, as well as the adjacent farmland and the harbors downstream. As Roosevelt made clear in his introduction, the relationships between mountains, forests, rivers and farmland pointed to "the necessity of protecting through wise use a mountain region whose influence flows far beyond its borders with the rivers to which it gives rise." (Roosevelt, 1902, p. 3)

For all of the strength of its argument, Roosevelt's proposal was not adopted during his presidency, however ten years later Congress passed the Weeks Act in 1911 authorizing the purchase of lands within designated boundaries from willing sellers for the creation of numerous eastern national forests. (Satterthwaite, 1991) Part of one such proposed forest, the Shenandoah National Forest, were the lands of the Massanutten range, and in 1912 one of the very first purchases of eastern forest land was a 17,000 acre property near the southern end of Massanutten, land that had been devastated by iron mining and charcoal production for Catherine Furnace. (Satterthwaite, 1991)

Simply purchasing the land was not enough to protect the forest and restore the watershed, however. As evidenced in the Forest Service's 1912 survey of the property, the forests and mountainsides were not regenerating, and appeared to be in further decline thirty-five years after iron production stopped. (Clark and Volkmar, 1912) It would take significant effort to restore forests on the eroded mountainsides. After purchasing the property, the Forest Service implemented a series of management practices that amounted to continuous acts of cultivation of the forest, including fire suppression, erosion abatement, and planting of seedlings. Massanutten was the pioneer district with regard to several key management and restoration practices. It was the first district to receive fire towers to spot fires and aid in suppressing them, and during Franklin Roosevelt's presidency, the first camp of the Civilian Conservation Corps was established on Massanutten, appropriately named Camp Roosevelt. Its workers constructed erosion control structures and planted seedlings across the newly acquired Forest Service lands. (Satterthwaite, 1991) Due in large part to these efforts, Massanutten is blanketed with forest today, and its soils no longer erode dramatically into the Shenandoah River and down the Potomac to Washington.

Roosevelt's national forest proposal was a direct response to the erosion in the Potomac watershed and others like it along the eastern seaboard. The Senate Park Commission plan for the park system of Washington is a less obvious response to the erosion, but it was motivated at least in part by the need to decide what to do with the newly filled land in the heart of the city. While the land's fate as part of the National Mall seems inevitable from today's perspective, it was far less obvious in the late 1800s as dredging was still creating the new waterfront of the capital. Railroad companies wanted the land for new rail yards, developers wanted to expand the city's core, and President Grover Cleveland thought it would be good for use as vegetable farms to grow food for the city's residents. But in the end he signed Congressional legislation to make it parkland. (Chappell, 1973)

Architect Daniel Burnham and landscape architect Frederick Law Olmsted, Jr., were the lead planners on the commission, reprising the role played by Burnham and Olmsted, Sr. in the design of Chicago's World's Columbian Exposition in 1893. The baroque grandness and neo-classical architecture of that exposition were an important influence on the proposal for the mall with its white limestone museums and monuments, but so was the presence of another feature of the Chicago fair. In the midst of all the architectural splendor of the fairgrounds, Olmsted, Sr. had included a small forested island, the Wooded Isle, as a natural respite in the heart of the fairgrounds. The island became the site of the Japanese pavilion, which fit traditional Japanese architecture among the trees and still served as a respite in clear distinction from the neo-classic architecture of the rest of the constructed lagoon. (Howett, 1993)

While the fair was in full swing and attracting thousands to the "White City," and while dredgers were filling the future grounds of the national mall, Mason's Island, now called Analostan Island, was gradually accumulating sediment along its eastern side and also downstream in the quieter water protected by the island. In the Senate Park Commission plan, Olmsted, Jr. proposed Analostan Island to be a forested island in contrast to the neo-baroque splendor of the mall, much like his father had proposed the Wooded Isle at the Chicago World's Columbian Exposition. In the plan, a second island, separated by a narrow channel and created entirely through sedimentation, extends Analostan Island downstream, so that it would form the backdrop to views of the Lincoln Memorial and the National Mall. (Figure 5)

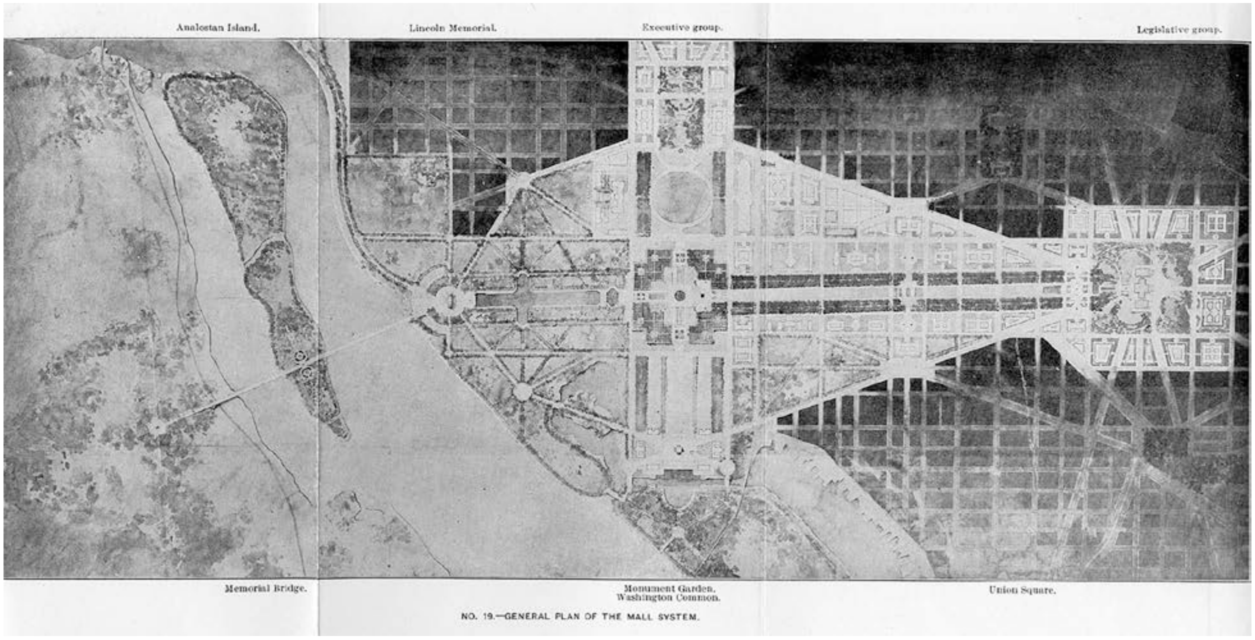

Figure 5. Senate Park Commission, General Plan of the Mall System, (1902). Showing Analostan Island enlarged and extended with sediment. Public domain map courtesy of U.S. Commission of Fine Arts.

As with the forest on Massanutten, the woods of Analostan Island needed cultivation. The island had once been a plantation and summer home of George Mason IV, the son of a founding father, who used the island to help develop suitable agricultural plants for the new nation. Mason abandoned the island in 1833, and afterward it had been used for a variety of purposes, including military training for African American troops in the Civil War, and its vegetation had apparently been frequently and variously disturbed throughout the nineteenth century. (National Park Service, 2010) Simply put, the vegetation was not a rich forest as depicted in the Senate Park Commission's plan.

In 1932 the island was rechristened Theodore Roosevelt Island as a living memorial to the former president known for his conservation agenda and his various exploits in the wild lands of the Adirondacks, the Dakotas and beyond. Frederick Olmsted, Jr. developed a plan for reforestation that included removal of undesirable vegetation and planting of species that would grow into a typical forest of the mid-Atlantic coastal plain and piedmont. His plan included an open lawn on the southern end of the island with a low retaining wall acting as a plinth to the forest itself. The wall's proposed inscription identified the island as a memorial to Roosevelt: "This island is given to the people as a living memorial to Theodore Roosevelt President of the United States Lover of Nature Leader of Men." (Olmsted Brothers, 1947) Although Olmsted's full design was not built, during the 1930s workers from the Civilian Conservation Corps cleared and planted the island following his plan, redirecting its path of succession. Other disturbances, including frequent flooding of the lowlands, construction of an interstate highway bridge across the island, and construction of an architectural monument to Roosevelt in the middle of it, have continued to alter the vegetation, yet the trees still have established and grown into a surprisingly diverse forest overall. Mature upland woods grow on the original high ground, and floodplain forest and open marshland cover the sedimented lowlands. And it does indeed serve as a bit of a respite from the city as envisioned by Olmsted, Jr. (National Park Service, 2010)

That same year, 1932, was George Washington's 200th birthday, and as one of the many acts of commemoration, the Shenandoah National Forest was renamed the George Washington National Forest, in part to distinguish it from the newly created Shenandoah National Park along the adjoining Blue Ridge. The name change was also likely seen as a fitting commemoration of Washington, whose associations with trees and forests were being celebrated as part of his bicentennial. Working with the George Washington Bicentennial Commission, the American Tree Association called upon Americans to plant ten million trees in Washington's honor and included detailed instructions on the selection and planting of trees to commemorate Washington.

> The most fitting of all memorials is a living one – a tree. Every individual can plant a tree. Boards of Trade, civic organizations, women's clubs, men's clubs, boys' clubs, can plant groups of trees or avenues of trees. National organizations can conduct sectional planting of groups of trees and of forests. Towns can plant town forests, states can further extend and plant state forests. In a word trees and forests are the type of memorials, which not only appeal to everyone, but which the father of our country himself would doubtless declare the most fitting memorial. (Pack, c. 1930, preface)

The group's charge to plant trees invoked Washington's personal connections with trees and forests but also his patriotism and desire for national self-sufficiency.

> As a lumberman, a woodsman, and a surveyor, Washington knew the value of trees. He would be surprised could he now see what tremendous depletion of our forest resources has taken place in 200 years. As a statesman, with the future of his country ever in mind, he would be a most earnest advocate of the restoration of our forests wherever economically possible. He would realize that the nation must become forest minded. (Pack, c. 1930, preface)

On the back cover of the guide to planting commemorative trees, the American Tree Association invoked Theodore Roosevelt, under the heading "The Part of Good Citizens", to stress the importance of planting trees.

> A people without children would face a hopeless future; a country without trees is almost as helpless; forests which are so used that they cannot renew themselves will soon vanish, and with them all their benefits. When you help to preserve our forests or plant new ones you are acting the part of good citizens. (as cited in Pack, c. 1930, back cover)

Roosevelt's quote underscores the links between these presidential forests, up and downriver in the Potomac watershed, and they signal an important change in the role of forests in the national landscape. Less than one hundred years earlier, forests were being cut rampantly on steep mountainsides, which were eroding and filling up waterways with sediment. By 1932, these same forests had regenerated due in part to conscious human cultivation and were deemed to be of enough value to commemorate beloved presidents. Being consecrated in this manner gave the forests added stature, stamping them with a seal of approval that testified to the changing perception of forests in the American imagination, and the numerous acts of cultivation and conservation that revived the forests as part of the watershed. No longer a resource to be exploited, they were valued for their role in protecting the watershed and as larger symbols of our nation, including right in the heart of the capital.

6 A RIVER RUNS THROUGH IT

As individual tales, the story of deforestation, erosion and reforestation of the Massanutten range and the sedimentation, filling and transformation of the Potomac Flats into the extension of the National Mall are compelling accounts of environmental change. But pairing them upstream and downstream from each other within the watershed offers a wider geographic perspective and yields different insights. Specifically, it allows the extension of the national mall in Washington to be equated with the reforestation activities upstream as responses to a particular environmental problem, and consequently it sheds different light on the important roles of human agency in modifying the environment.

George Perkins Marsh wrote in a time when he could assume that most of his fellow citizens would feel a sense of stewardship to the land, at least in part due to a shared religious belief that man's role was to exert dominion over the earth. (Lowenthal, 2000b) Until he published *Man and Nature*, most people assumed that human impacts improved the earth or were at least benign, and perhaps the greatest significance of his book was in disproving that assumption. According to Marsh's biographer, David

Lowenthal, (2000a) many Americans still felt a responsibility to steward the earth, and this led to significant steps toward restoring and preserving forests and planting trees. This included the inauguration of Arbor Day in 1872; creation of the Adirondack Forest Preserve in 1885 with Marsh acting as an important advocate for its preservation; the founding of many eastern national forests and implementation of reforestation practices after the passage of the Weeks Act in 1911, and the call in 1930 by the American Tree Association to plant ten million trees in honor of Washington's 200th birthday.

All these ameliorative acts are part of the stewardship response by people at all levels of citizenry in light of a pressing environmental problem. It would be easy to leave the story there, but following the sediment downriver to Washington, as Marsh himself had done, leads to a different component of the problem and a different outcome. In Washington, amelioration was not an available response unless the sediment were to be hauled back upriver to the headwaters. By contrast, filling the flats and extending the mall were creative and inventive acts making new land and eventually new national landscape from the literal spoils of the deforestation upriver. In a different era, that new land might have been developed as fully commercial waterfront, or instead the sediment may have been formed into a set of forested islands and braided channels instead of extending the mainland. Such alternatives point to the creativity involved in forming the river into its current S-shaped profile.

It is important to see this creative agency as part of the response to the problem of deforestation, and that is the benefit of pairing these stories up and downriver. Just as Marsh's wide geographical lens showed that the impact of human modification of the earth was cumulatively destructive and not benign, a wider lens in the Potomac watershed joins the ameliorative and creative responses to the problem of deforestation. Acknowledging the creative response is important because it counters the more modern legacy of *Man and Nature* that finds *only* negative impacts of human actions on the environment. (Pollan, 1991) Marsh himself did not lose his optimism, according to Lowenthal, but it is harder to find similar optimism today in the face of such pressing issues as climate change and mass extinction of species. Although these seem like overwhelming global issues today, so too did the problems that Marsh identified in his time. (Lowenthal, 2000b)

This is not to suggest that all creative acts are good simply because of their creative agency; the filled lands of the National Mall have their own set of environmental problems (continued settling of fill, a vertical hard edge with little habitat value, etc.) and with rising sea levels it's possible that the entire filled area could one day become part of the river again. But those environmental problems do not discredit the meaning to the nation that the new land has added as a site of national commemoration, public demonstration, individual grieving at war memorials, and recreation along the river, including the respite offered at Theodore Roosevelt Island.

What the creative agency affords is the possibility of inspiring new attachments to the land and to the forest, attachments which invite people to care more about the environment. As Lowenthal puts it,

> To be valuable enough to care for, the environment must feel truly our own, not merely a commodity but integral to our lives. Like our forebears and our heirs, we make it our own buy adding out own stamp, now creative, now corrosive. The environment is never merely conserved or protected; in Marsh's terms, it is modified – both enhanced and degraded – by each new generation. We should form the habit of lauding, not lamenting, our own creative contributions to the environment. Learning to praise, we become more apt to makes changes that we and our successors feel worthy of praise. (Lowenthal, 2000b)

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LANDSCAPE PERFORMANCE

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THE IMPACT OF SOCIAL GROUP BEHAVIORS ON LANDSCAPE PERFORMANCE: A CASE STUDY OF FOUR CHINESE URBAN PARK

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1 ABSTRACT

By using the approach of landscape performance evaluation, The Landscape Architecture Foundation (LAF) endeavors to measure the effectiveness of landscape solutions in achieving sustainability, and further to provide increasing knowledge and design exptise for future practice. But for now, the lessons learned summarized from the considerable cases are discursive in appearance. Comparatively, in the design process, the balanced benefits that sustainable development are pursuing (Campbell,1996) are comprehensive and strategy-oriented. In addition, the comprehensive strategies selection is subject to various social groups, not only designers. Therefore, this paper revealed the formative mechanisms of landscape performance, explored the factors influencing the performance of built projects at the social level, and drew up the diagram of hierarchical influence factors of landscape performance. Meanwhile, using literature review, it conducted a case study of four Chinese urban parks based on the data published in the Landscape Performance Series (LPS), and verified the influence relationship of social groups' behaviors to these projects' performance. At the community level, this paper connected the performance features of built landscapes with relevant factors that influence the design, and showed that the construction of the urban landscape is under the influence of social factors, to which great attention should be paid in future practice and research.

1.1 Keywords

landscape performance, formation mechanism, social group behaviors, case study, urban park

2 INTRODUCTION

With the current research trend of evidence-based design, the Landscape Architecture Foundation (LAF) launched the Landscape Performance Series (LPS; LAF, 2013a; ASLA, 2015a) in 2010, inspired by the forerunner of building performance. It purpose was to measure the performance of exemplary landscape projects and prove their environmental, social, and economic benefits. For that, LAF established the Case Study Investigation (CSI; ASLA, 2015b), to date, having completed over 100 case studies across the world. Further the performance data and results of these case studies were published in the Case Study Briefs (CSB; LAF, 2013b) on the website of LAF. This interactive set provides experience and lessons to help guide practitioners' work on sustainable and high-performance landscapes.

One problem worth discussing is whether plenty of effective landscape solutions, summarized simply, are able to help promote the coming landscape projects' comprehensive benefits in sustainability. Generally, we believe that good design solutions are able to make the built landscape produce good benefits. But the point is that the overall sustainability of a landscape project is not measured by certain sorts of high benefits. This means that a project's overall benefits are guided by integrated solutions, not one or some certain solutions. That is to say, designers should take strategies and methods under comprehensive consideration. Meanwhile, the selections of design solutions are not simply the individual behaviors of designers, but the result of social groups' behaviors. Accordingly, strategies and methods are factors at the level of appearance, but the method of selecting and integrating proper strategies and methods can influence the overall performances of landscape built fundamentally. And then back to the interactive set of LPS, it provides abundant shared resources of excellent cases and sustainable landscape solutions, yet it is unable to systematically help professional practitioners create sustainable landscape with comprehensive benefits. Therefore, we should clarify the formation mechanism of landscape performance, and seek the influential factors from the society level, so as to improve the comprehensive function of social groups' behaviors, then working on design solutions for sustainable landscape development.

By bringing to light the formation mechanism of landscape performance, this paper created a diagram of hierarchical influence factors of landscape performance. And then a case study demonstrated the relationship between these factors and landscape performance.

3 THE INFLUENCE FACTORS DIAGRAM OF LANDSCAPE PERFORMANCE

3.1 Directive factors influencing landscape performance

It is well known that a natural environment can provide numerous ecosystem services. Because urban green space is a kind of artificial natural environment, its capacity to generate benefits are influenced by human actions. The construction of urban greenland is the combined action of social groups, not only the individual action of designers. According to the general process of landscape construction, the formation mechanism of landscape performance can be illustrated as following: obeying relevant national policy and construction regulations, different social groups jointly affecting the final design solutions of urban landscape projects. In general, there are four groups, including the project owner, planner and designer, program reviewer, and user. Then this set of solutions would be drawn and be implemented by professionals; finally, the built landscape will produce various degree of benefits over different time periods (see Figure 1).

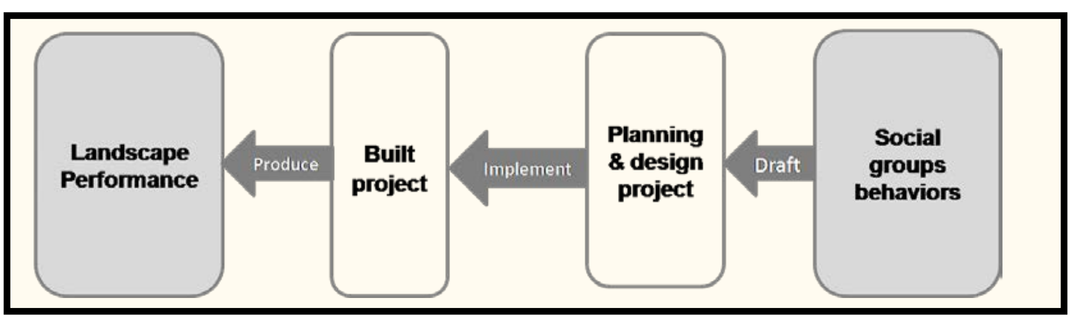

Figure 1. Diagram of Formation Mechanism of landscape performance (Diagram by the author)

From the above knowledge of the formation process of landscape performance, the four social groups play different roles in the stages of planning and designing the schemes which decide the form of the built landscape and affect the result of landscape performance. Therefore, they represent a significant directive influence to landscape performance.

3.2 Indirect factors influencing landscape performance

In the same context, generally speaking, a social group's actions have common features, which are affected by two factors: the specific role and function in the stage of landscape construction; and their thoughts on behalf of different group's social interests. We see them as the indirect influence factors to landscape performance.

According to the general construction and management mode of urban landscape projects, the four groups own their specific roles and functions (see Figure 2). Specifically, by providing the construction funds, the project owner has the development and decision-making rights. Based on the land development plan, they draft the basic design task statement, and also hold the decision-making power throughout the project, affecting the result of the project fundamentally. As the direct exporter of the design plan, the landscape architects largely determine the ultimate form of the project, by their design ideas and strategies. The reviewers have selection rights and partial suggestion rights, so their professional attitude and preferences affect the results of the project to a certain degree. As to users, they have the voting and suggestion rights, and in some countries and areas, the public users own the power of final decision making prior to the beginning of construction.

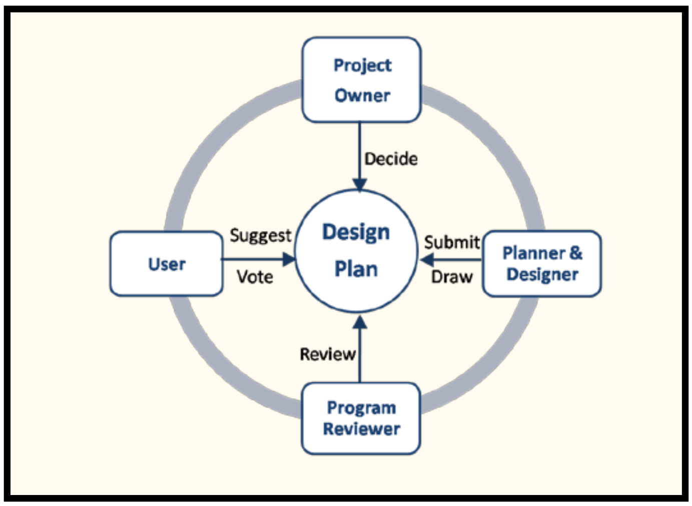

Figure 2. Roles and Functions of Four Social Groups in Project Phase (Diagram by the author)

On the basis of functional distribution, each group has their respective social interests, which induces their common group behaviors therby affecting the performance of the built project. For the project owner, the advantages brought by the project are paramount. The various types of green space are divided into municipal and commercial projects. Generally, the municipal projects focus on public welfare, along with some market functions, and are funded mainly by the government, or combined with corporations. As to the commercial project, it is dominated by economic interests, along with public welfare, invested by corporations mostly, and supervised by the government. Therefore, due to the different positions, the government department emphasizes the overall ecosystem services of green spaces according to its national development policy. The corporation pays more attention to the economic value. For the designer, their thoughts are reflected within the professional concepts of the individual or team. For the reviewer, their thoughts are a significant part of the mainstream thought in the industry. For users, the reasonable design of green space affecting the quality of life is quite vital. Relatively, their demands and suggestions are necessary to improve social services of the green space.

Overall, the four social groups have their specific functions in the project, and represent their own separate interests and thoughts. These features indirectly influence the landscape construction and its performance.

3.3 Fundamental factors influencing landscape performance

At a macroscopic level, these social group behaviors are closely linked with national socioeconomic development, guided and affected by national policies and rules fundamentally.

With the rapid development of modern cities, environmental issues are becoming more urgent. Governments worldwide are giving increasing weight to the construction and development of urban green space and have established macro policies suited to their national conditions. These policies give action guidance for local governments and industry staff. Meanwhile, for the practitioners, an important basis for construction work is the relevant construction industry laws and regulations, which usually clarify the duties of management departments, the technical conditions of project designers, construction mode and processes of types of green spaces, including matters from design solution, completion of project, approval and acceptance to the late-stage management.

3.4 The diagram of hierarchical influence factors of landscape performance

To sum up, the paper analyzed the corresponding influence factors based on the formation process of landscape performance, and established the hierarchical influence factor diagram of landscape performance (see Figure 3). As it has shown, the performances are produced by the built landscape,and result from planning and design solutions. The various social groups working on the final design solutions together, are seen as the main direct factors. Furthermore, the actions of these social groups are abided by related national policies and construction rules. As to the specific policies and regulations, different groups perform various roles and functions. The awareness and thought of a group are essentioal factors in guiding action. Therefore, objective roles and functions and subjective thoughts are regarded as indirect factors influencing the design solutions. And national policy and constuction regulations are considered as fundamental factors guiding the action of social groups' behaviors at the macro level.

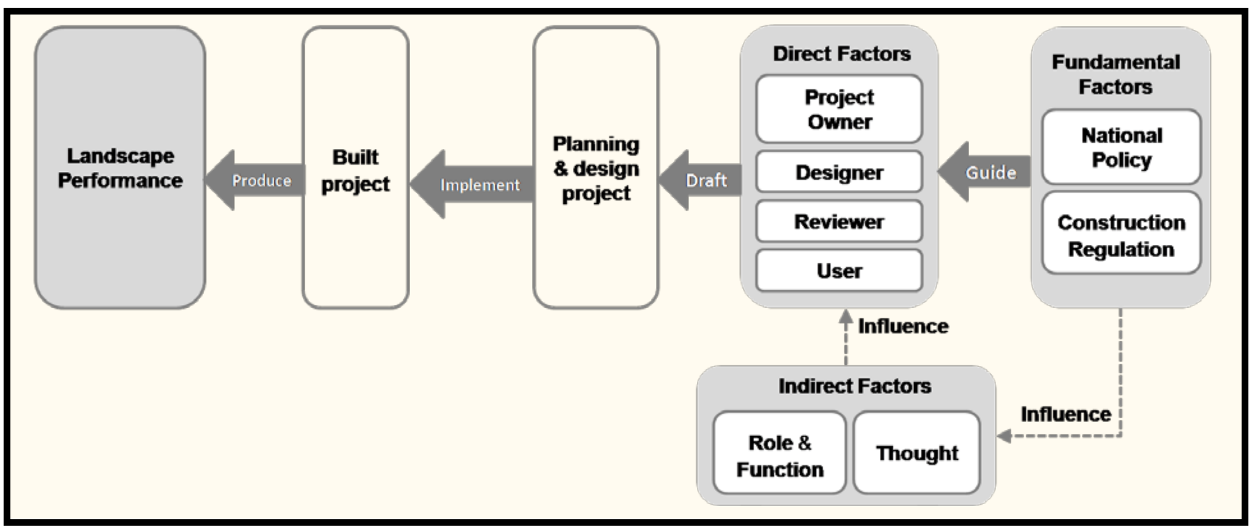

Figure 3.Diagram of Hierarchical Influence Factors of Landscape Performance (Diagram by the author)

4 CASE STUDIES

The case studies from CSI program funded by LAF were completed by student-faculty research teams consisting of research fellows, students and design firms. Though faced with many difficulties and challenges, their research is relatively excellent for the moment. Thus, given its research advantage and professionalism, this paper used data published on LPS by LAF.

4.1 Cases selection

In terms of cases, in the same social context as principle, this study used four Chinese exemplary urban parks, which are the Beijing Olympic Forest Park (2012),Tianjin Qiaoyuan Park (2012),Tangshan

Nanhu Eco-city Central Park (2011), and Shanghai Houtan Park (2011). As China is in a period of rapid urbanization with the prominent contradiction between environment, economy and society, the theory and practice of sustainable landscapes has been a long-term concern of the government and community. Furthermore, the urban park is the green space closely related to urban eco-environment and domestic living. Therefore, these cases are representative and meaningful in the sustainable landscape research area.

As representatives of landscapes built in the last decade in China, the four main park cases are well known in the world and selected by LAF as case studies on landscape performance evaluation, reflecting the status of sustainable landscape construction and development in China. These cases are all urban comprehensive park projects. The sites we're formerly brownfield, greyfield, and residential. In these cases, the Beijing Olympic Forest Park and Tangshan Nanhu Eco-city Central Park are large-scale parks, and Tianjin Qiaoyuan Parkand Shanghai Houtan Park are medium-scale parks; in terms of site features, they are all parks with multi-functions including wetlands, environmental restoration, stormwater management and so on, of which the Olympic Forest Park and Nanhu Eco-city Central Park have the function of protection of urban nature.

4.2 Research approach

Based on literature review, a qualitative and quantitative multi-method was chosen to make a comparative analysis. Firstly, the study conducted a comparative analysis of the composition of the benefits between the four cases, summarizing the common performance features of the same type green spaces in the same context. Then, based on the diagram of hierarchical influence factor, it analyzed four social groups' behaviors and relevant influence factors of the parks, testing the relationship between each factor and performance features of these parks.

4.3 Data collection

Performance evaluation conclusions of the Chinese four cases (published in LPS), and basic data of relevant cases were selected for organizing and summarizing. The four Chinese parks are over 1,000 acres or under 50 acres in size, and mainly used to be brownfield and greyfield. Table 1 shows the construction background of the selected cases. Table 2 shows the summarized performance information of these cases according to three categories of environmental, social, and economic benefits.

Table 1.Basic Information of Four Chinese Parks Cases

Case Project	Location	Size（acre）	Former Land Use	Project Function	Completion Time	Budget (million US $)
Beijing Olympic Forest Park	Beijing	1 680	Residential	Nature preserve; Open space; Wetland	2008	420
Tangshan Nanhu Eco-city Central Park	Tangshan He Bei	1 557	Brownfield	Nature preserve; Open space; Wetland	2009	68
Tianjin Qiaoyuan Park	Tianjin	54	Greyfield	Open space Wetland	2008	14.1
Shanghai Houtan Park	Shanghai	34.5	Brownfield	Open space; Waterfront redevelopment Wetland	2010	15.7

Table 2. Main benefits of projects in China (Source: LPS. http://landscapeperformance.org/case-study-briefs.)

Project	Main Benefits	Environmental Benefits	Social Benefits	Economic Benefits
	Carbon sink	●		○

Beijing Olympic Forest Park	Water saving	●		○
	Energy saving	●		○
	New energy resources	●		○
	Sewage disposal	●		
	Providing animal habitat	●		
	Biodiversity protection	●		
	Stormwater management	●		
	Providing recreation		●	
	Outdoor teaching		●	
	Job creation		●	●
Tangshan Nanhu Eco-city Central Park	Carbon sink	●		○
	Climate regulation	●		
	Providing animal habitat	●		
	Biodiversity protection	●		
	Water saving	●		○
	Waste gas treatment	●		
	Waste recycling	●		○
	Providing recreation		●	
	Commercial taxation			●
	Enhancing land value			●
Tianjin Qiaoyuan Park	Carbon sink	●		○
	Soil improvement	●		
	Providing animal habitat	●		
	Native biodiversity protection	●		
	Stormwater management	●		
	Pollution treatment	●		
	Waste recycling	●		○
	Reducing noise		●	
	Providing recreation		●	
	Outdoor teaching		●	
	Environmental education		●	
Shanghai Houtan Park	Carbon sink	●		○
	Sewage disposal	●		
	Providing animal habitat	●		
	Native biodiversity protection	●		
	Water and soil conservation	●		
	Water saving	●		○
	Waste recycling	●		○
	Providing recreation		●	
	Scientific education		●	
	History and cultural memory		●	
	Low maintenance cost			●

Note: "●" represents direct benefit, each "●" is counted once in calculation of benefits below;

"○"represents attached benefit, created by some environmental or economic benefits, whole "○" are accounted once in each project in calculation of benefits below.

With regard to Chinese urban parks, the four social groups are government officials, landscape architects, peer experts, and the public. Due to the restrictions in research, lacking the original file of projects, the paper obtained relevant data through literature review from website news, offical information and published papers, and summarized the projects' building objectives and tasks drawn up by policymakers (the design objective is in accordance with the upper master planning), the design strategies put forward by landscape architects in the program design phase, participation mode of each group, and literature implying the group's ideas and thoughts. In addition, national policies on strengthing urban green space construction refers to National Garden City, Ecological Garden City, Sponge City and other policy documents. The Regulations on Urban Greening(RUG) are the main construction regulations. (see the specific data on this below.)

4.4 Analysis on landscape performance data

First, this study focused on the ratio of each number of three benefit categories in a project to comparatively analyze its landscape performance composition. Accordingly, the ratio of the three environmental, social, and economic benefits is calculated in the following equation 1 (refer to the logic of Equation 2). The specific data of benefits are shown in Table 3, where each of the benefits is valued at 1.

Equation 1 $\mathrm{Rb} = \mathrm{B1{:}\,B2{:}\,B3}$(1)

Where Rb represents the ratio of each number of the three types of benefits; B1 represents the total number of the environmental benefit; Rb represents the total number of the social benefits; B3 represents the total number of the economic benefits.

Second, to further understand the composing characteristics of landscape performance in the specific social context of China, the ratio of the number of each type of benefit to the total benefits number in a project is calculated in the following equation 2 (Luo, Li, 2014).

$$\mathrm{R(R1, R2, R3)} = \frac{\text{number of each type of benefits}}{\text{total number of benefits}} \times 100\%(2)$$

Where R_1, R_2 and R_3 represent the ratio of the number of the environmental, social, economic benefit respectively to the total benefits number.

5 RESULTS

5.1 General performance feature of cases

The result of comparing the benefit composition of the four parks is shown in Table 3. In terms of the benefit composition characteristics, these parks had outstanding environmental benefits with great breadth, considering various comprehensive ecosystems including water, climate, animals and plants, resources and so on; but their social benefits were relatively simple in relation to providing some recreation and outdoor environmental education services, and the economic benefits of each park were thin as well.

Further, concerning the ratio of the number of each type of benefit to the total benefits number in a project, there were similar results in the four parks (see Table 3 and Figure 3). Generally, in these parks, the proportion of environmental benefits were similar, up to 60%, the proportion of social benefits were most at 25%-35%, and the proportion of economic benefits were at 15%-30%, averaging around 17%. Consequently, the model sustainable parks had a common benefit composition: high environmental benefits was twice the social and economic benefits, which were relatively low, and the economic benefits were comprised of indirect economic benefits resulted from environmental benefits.

From the above analysis, we see that in general, performance features of Chinese urban parks that the environmental benefits are high, and social and economic benefits are lower.

Table 3. Project ratio of three benefits number and each type of benefit number to the total benefits number

Project	Rb	R1	R2	R3
Beijing Olympic Forest Park	8:3:2	8:13	3:13	2:13
Tangshan Nanhu Eco-city Central Park	7:1:3	7:11	1:11	3:11
Tianjin Qiaoyuan Park	7:4:1	7:12	4:12	1:12
Shanghai Houtan Park	7:3:2	7:12	3:12	2:12

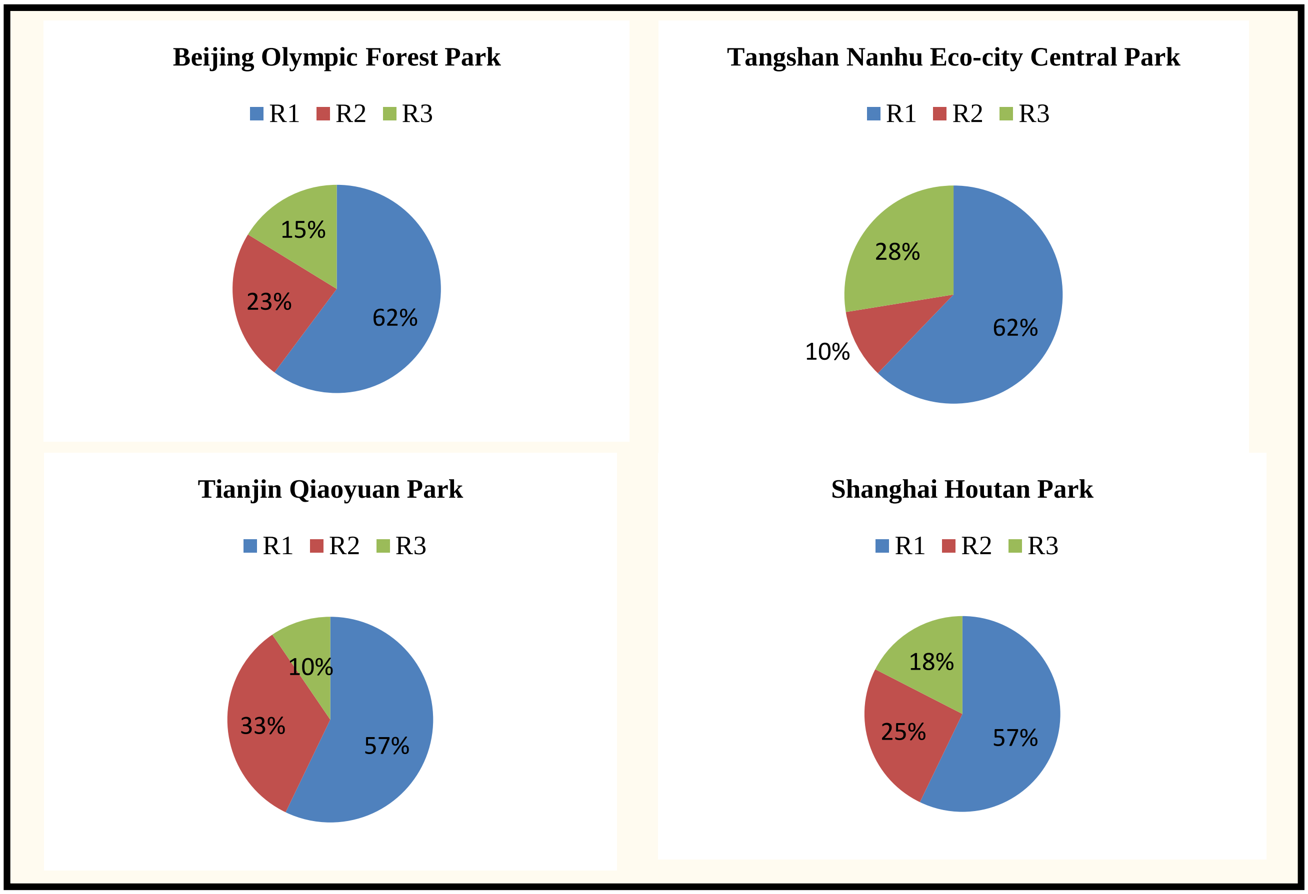

Figure 3. Diagram of Project Ratio of each type of benefit number to the total benefits number (Diagram by the author)

5.2 The social factors influencing the performance of cases

Next, following the diagram shown before in Figure 3, this study analyzed the direct factors of four social groups' actions in these projects (the groups are government official, designer, peer expert, and the public in Chinese projects), so as to make clear the relationship of the groups and project's performance feature. Then, it explored the indirect factors influencing the groups' actions in defining their potential common features. Finally, it discussed the fundamental factors guiding the groups' action at the macro level.

5.3 The direct factors influencing the performance of cases

The summary results of building objectives and design strategies are shown in Table 4 and Table 5. Known from these, in terms of program orientation, the local governments greatly focused on ecological environment within the green city, restoration of degraded land, as well as human well-being, which revealed that they pursued many environmental and social benefits, but few economic benefits. As to the designers of these park cases, the three types of strategies put forward were largely in agreement with the result of the performance towards the built parks; therefore, it is shown that these strategies had fulfilled their intended purposes, and that one strategy might cause multiple benefits. There were limited economic strategies, around cost-savings, raised systematically in the design phase, with the result that the economic benefits were low in the final performance evaluation. What is more, it needs to be mentioned that some strategies were not reflected in the result of performance evaluation, so there were some potential benefits unconsidered by the evaluators. It could also be a recommendation for later evaluators to combine the design strategies within the evaluation process.

As to peer experts, though, without their review data, viewed from the review organization of the projects in the Chinese city construction industry, the reviewers belong to the expert designers group from well-known design agencies and universities in the field. Thus, these programs of built landscape were approved and suggested by peer experts, and the final design strategies were in accordance with their opinions. As to the public, there were two forms of participation. One way was to vote and give comments on several optimal design plans reviewed by the Expert Evaluation Commission, the Beijing Olympic Forest Park being done in this way (BMCUP, 2003). Another way was to show the final plans assessed by peer experts, and give comments in a period of time. The other three parks (CECA, 2010; LC, 2009; Editorial S., 2009) being done in this way. Thereby, the public was limited in expressing their opinions, having little impact on the projects.

Table 4. Project orientation of four parks in China

Project	Project orientation
Beijing Olympic Forest Park (BMCUP, 2003)	Construct forest park a green and ecological area to become a part of green screens between urban and rural areas of Beijing, in order to improve the urban environment and climate, and provide entertainment and leisure for the general public. Reflect the theme of "Scientific Olympics, Green Olympics, Humanistic Olympics".
Tangshan Nanhu Eco-city Central Park (CECA, 2010)	Build the mining subsidence area into a new urban district having a beautiful and ecological environment and expressing humanism, that will be a central park in the future.
Tianjin Qiaoyuan Park (LC, 2009)	Municipal recreation Park; The key project of urban environment transformation program in Tianjin, that was built to provide an excellent recreation area for residents and include a bridge museum and some 1000 m^2 of commercial areas.
Shanghai Houtan Park (Editorial S., 2009)	Part of the core green space in the Expo Site; Show the Expo theme of ecology, science and technology, Humanism; Stick to the Expo theme of "Better City Better Life"; Achieve the strategic target of "Green EXPO and Ecological EXPO".

Table 5a. Design Strategies and Benefits Matrix of Beijing Olympic Forest Park (Hu et al, 2006)

Strategyclassifycat-ion	Benefits / Strategies	Carb-on Sink	Water Ssaving	Energy Conser-vation	New Energy Resour-ces	Sewage Disposal	Animal Habitat	Biodive-rsity Protect-ion	Stormwater Manageme-nt	Recrea-tion	Outdoor Teaching	Job Crea-tion
Environm-ental Strategies	Plant Diversity Design	●	–	–	–	–	○	●	–	–	–	–
	Native Plant Protection and Reconstruction	●	–	–	–	–	○	●	–	–	–	–
	Provide Habitat for Wild Animal and Build Swift Tower	–	–	–	–	–	●	●	–	–	–	–
	WaterPurification System	–	●	○	–	○	–	–	○	–	–	–
	Eco-wetland Landscape	–	–	–	–	●	○	○	●	○	–	–
	Green Energy	–	–	–	●	–	–	–	–	–	–	–
	Enegy-saving Building	–	–	●	–	–	–	–	–	–	–	–

Environm-ental & Economic Strategies	Waste Recycling	–	–	●		–	–	–	–	–	–	–
Social Strategies	Landscape Experience and Recreaion	–	–	–	–	–	–	–	–	●	–	–
	Wetland as Education Center	–	–	–	–	–	–	–	–	–	●	–
	Children Playgrounds	–	–	–	–	–	–	–	–	●	–	–
	Fire Protection Design of Forest Park	–	–	–	–	–	–	–	–	–	–	–

Table 5b. Design Strategies and Benefits Matrix of Tangshan Nanhu Eco-city Central Park (BTUPDI, 2011; Hu, 2014)

Strategy classifycat-ion	Benefits / Strategies	Carbon Sink	Climate Regulation	Animal Habitat	Biodiversity Protection	Water Ssaving	Waste Gas Treatment	Waste Recycli-ng	Recreation	Commerci-al Taxation	Land Value Promotion
Environm-ental Strategies	Reclaimed Water as Supplement	–	–	–	–	●	–	–	–	–	–
	Build Water System and Wetland Based on Existent Fishpond and Subsidence Places	–	○	–	–	●	–	–	–	–	–
	The existent plant Reservation and Native Plant Design	●	○	○	●	–	–	–	–	–	–
	Build Wooden Architecture and Reduce Emission and Resources Consumption	–	–	–	–	–	–	–	–	–	–
Environm-ental & EconomicStrategies	Industry Waste Treatment and utilization and Trash-filled Mountaion	–	○	–	–	–	●	●	–	–	○
Social Strategies	Create Green Space for Public Recreation	–	–	–	–	–	–	–	●	–	○

Environm-ental &Social Strategies	Connect with the Central Park by Green Corridor	–	–	–	–	–	–	–	●	–	●
EconomicStrategies	Cost Saving	–	–	–	–	–	–	–	–	–	–
	Business Taxes	–	–	–	–	–	–	–	–	●	–
	Enhance the Land Value	–	–	–	–	–	–	–	–	–	●

Table 5c. Design Strategies and Benefits Matrix of Tianjin Qiaoyuan Park (Yu et al, 2009)

Strategy classifycat-ion	Benefits / Strategies	Carbon Sink	Soil Improve-ment	Animal Habitat	Native Biodiversity Protection	Stormwater Management	Pollution Treatment	Waste Recycl-ing	Noise Reduct-ion	Recreat-ion	Outdoor Teaching	Environ-mental Educati-on
Environm-ental Strategies	Topographical Design Combining the Rainwater Collection System	-	○	-	-	●	-	-	-	-	-	-
	Resue the of Field Trash	-	-	-	-	-	-	●	-	-	-	-
	Choose Adaptability Plant by Dynamic Seeding	●	-	○	○	-	-	-	-	-	-	-
	Biodiversity Protection	-	-	●	-	-	-	-	-	-	-	-
	Restore the Characteristics of Regional Landscape	-	-	○	●	-	-	-	-	-	-	-
Social Strategies	Recreation System Design	-	-	-	-	-	-	-	-	●	-	-
	Advocate Ecological Esthetics	-	-	-	-	-	-	-	-	-	-	○
	Environmental Interpretation Design	-	-	-	-	-	-	-	-	-	●	●
EconomicStrategies	Low Cost	-	-	-	-	-	-	-	-	-	-	-

Table 5d. Design Strategies and Benefits Matrix of Shanghai Houtan Park (Yu, 2010a; Yu, 2010b)

Environmental strategy	Benefits / Strategies	Carbon Sink	Sewage Disposal	Animal Habitat	Native Plant Protection	Water and Soil Conservation	Water Saving	Waste Recycling	Recreation	Science Education	History and Culture Memory	Maintainance Cost

Environm-ental Strategies	Absorb Carbon Dioxide	●	-	-	-	-	-	-	-	-	-	-
	Purify the Contaminated Land and Water	-	-	-	-	●	○	-	-	-	-	-
	Sustainable Flood Control System	-	-	-	-	●	-	-	-	-	-	-
	Provide Habitat for Native Plant and Animal	-	-	●	●	-	-	-	-	-	-	-
Environm-ental & EconomicStrategies	Waste Recycling	-	-	-	-	-	-	●	-	-	-	-
Social Strategies	Create Path System with Landscape Experience	-	-	-	-	-	-	-	●	-	-	-
	Create Historical and Ecological Site	-	-	-	-	-	-	-	-	○	●	-
EconomicStrategies	Low Maintenance Cost	-	-	-	-	-	-	-	-	-	-	●

Note: "●" represents strong connections; "○"represents some kind of connections

5.2.2 Indirect factors influencing the groups' behaviors of cases

In terms of the roles and functions, since the four parks were funded by the government, the government officials had development and decision-making rights considerably. The design units of the parks were respectively Beijing Tsinghua Urban Planning & Design Institute and Turenscape, the representative design teams in China. The reviewers were peer experts invited by the government, who had the selection and suggestion rights partly. And the public, as the direct users and taxpayers, were unable to track the entire design process, though the designers conducted a survey review early in the process. They only could vote and make suggestions at the publication stage after the project had been formed, but the mechanism was opaque and incomplete.

In terms of the thought, as to government officials, since urban parks do not have direct or obvious economic benefits essentially, and lack market forces, they always considered controlling and saving costs, neglecting the potential economic benefits and cost-benefit ratio; besides, an urban park is an important carrier of political achievements, so they tended to embody the superior leaders' political thoughts of eco-city construction, highlighting the protection and improvement of the ecological environment, and providing recreational places for the general public (Qou,2013; Qiang, 2011). As to the designers, their thoughts are reflected within the professional concept of individuals or teams. Yu Kongjian and Hu Jie, the designers of these park cases as well as representatives of the excellent landscape architects in contemporary China, followed the sustainable landscape concept in practice, underlining ecological thought and humanities (Yu, 2004; 2007; Hu, 2008). As to experts, their thoughts are the significant parts of the mainstream thought in the industry. Several researches have shown that the ecological design concept of sustainable development, and achieving harmony between man and nature, is the key thought in the contemporary Chinese landscape industry (Yang, 2013; Zhu, 2008). As to the public, in China, they have few opportunities of participation into the design process, owing to the long-term centralization of power and planned economy in China. Thereby, the public, whose participation is repressed, are becoming sort of acceptable, without strong awareness of social services (Guo, 2004).

5.2.3 The fundamental factors influencing the groups' behaviors of cases

In order to explore the construction model of urban environmental development that conforms to Chinese national conditions, the National Housing and Urban-Rural Development(NHURD), as the supreme administrative department of urban construction in China, initiated the construction of National Garden City nationwide in 1992 and released officially National Garden City Declaration and Assessment Methods and National Garden City standards on March 25, 2005. After a period of development, these documents were revised, with more attention paid to ecological garden city, and new documents of Ecological Garden City Declaration and Assessment Methods and Ecological Garden City standards were issued on November 26, 2012. Besides, there were more policy documents issued by the government in relation to urban biodiversity conservation, wetland conservation, infrastructure development, and so on. Especially on October 22, 2014, *Sponge City Construction Technology Guidelines: Stormwater System Construction with Low Impact Development* was worked out to guide cities to strengthen infrastructure construction. According to the policies published by the supreme administrators, the ecological environmental protection and construction is regarded as an important national policy of urban development in China. Instructed by these policies, local government and industry staff would place environmental benefits in the most prominent position in specific construction practice, thus the environmental benefits are greater and apparent in the performance result of Chinese urban comprehensive park.

Currently, the *Regulations on Urban Greening* (RUG), originally implemented in 1992, is the only administrative regulation of the urban and rural greening in China (Lin, 2010), and it has played an important role in regulating and guiding the construction of the whole country. According to the RUG, the administrative department of urban construction would set the related construction index of urban comprehensive parks, and entrust the project to the design units with the appropriate qualification certificates, according to the basic procedures of approval. The stages from the design plan, project completion to putting into use shall be subject to approval, acceptance and management by relevant administrative departments. From the RUG, the construction and management mode of urban green space are clear. The comprehensive park is generally funded by the government; the processes from location, index control, design, construction, to operation, are all managed directly by the relevant administrative departments. Furthermore, the planners and designers are also commissioned and approved by administrative departments, but there is no rule to support public participation. Therefore, by analyzing the rules of RUG, we can see that the construction and management of urban parks are fully controlled by the government, with less market-orientation and little consideration for cost-profit balance and other potential economic benefits; besides, without legal guarantees, the public participation in landscape design is limited. Consequently the social strategies of the project are carried out with little substance, and it is hard to turn the social benefits into reality.

6 Discussion

By taking the cases of four Chinese sustainable urban parks, this paper revealed the characteristics and current problems in Chinese urban park construction with prominent environmental benefits and poor social and economic benefits. It indicated that the relationship among the three categories of benefits are comprehensively balanced in the construction of sustainable landscape projects in China at present. In terms of the protection and construction of the ecological environment, there is a solid social consensus and explicit policies to guide them, which promotes environmental benefits relatively prominently. By contrast, the considerations of the society and economy are still inadequate, causing the final social and economic benefits to not be obvious. Meanwhile, proceeding from the social group behaviors, this paper discussed the influences of multiple factors on performance of the cases. For the furture related landscape projects, it points out that it is required to proceed on the main factors to improve the situation and strengthen the way and intensity for the public participation to practically highlight the social benefits of landscape. Moreover, we need to do better in evaluation of the economy input-output and to exploit the potential economic value of the Landscape. In order to achieve these changes, we need to construct more improving and specific policies and more guided regulations of the construction at the national and community level to effectively lead the practice of sustainable landscape planning and design.

It should be noted that this paper mainly took a method of literature review, and did not carry out the specific assessment research during the case study, resulting in the lack of primary survey data. Besides, the case studies of the LPS are also incomplete. As these case studies were conducted after the project was built, and the project designers probably never anticipated the post-construction research, often-times little baseline data is available. That means their performance indicators are not flawless, as well as the assessment results.

Additionally, the influence factors diagram of landscape performance constructed in this paper was based on personal opinion from personal long-term experience in professional practice and research. This diagram has some inadequacy in scientifically logicality and rigorousness. In the subsequent research work, it will be necessary to strengthen the related knowledge of sociology to further elaborate on the different influences of social factors on the landscape design.

7 Conclusion

Landscape performance research is of great significance in showing and improving the values of sustainable landscape. When we get back to how to effectively promote the sustainable landscape design in practice, it needs to jump out from a pure thinking of design to design, as this study shows that, in addition to the designers, all other groups behaviors of the owners, reviewers and users will affect the landscape performance results, moreover their actions are subject to their specific roles and thoughts, guided by national policies and regulations as well. Thus, the construction of urban landscape is under the influence of social factors, which should be paid great attention in the future practice and research.

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LANDSCAPE PLANNING AND ECOLOGY

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THE YARDWORKS PROJECT: DEVELOPING URBAN ECOLOGICAL DESIGN STRATEGIES FOR RESIDENTIAL PRIVATE PROPERTY

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1 ABSTRACT

Private residential property already plays a significant role in urban ecosystems, yet considerable potential remains for improving the ecological performance of private gardens and landscapes. Urban ecological innovations on residential property however are only valuable if they are compatible with private landowner interests and needs- otherwise they may never be constructed. Landscape architects would benefit from more comprehensive guidance describing urban ecological design interventions that best fit within residential settings.

This paper describes the results of the first two years of studio research to develop urban ecological design strategies that are compatible with the programmatic and aesthetic goals of residential landowners. Each YardWorks Project began with a collaborative visioning and goal setting process at the neighborhood-level with community members. The design team then dropped down in scale to develop a set of site-level urban ecological design strategies that met these stewardship goals. Finally, the team tested these strategies by incorporating them into site-by-site designs while working directly with individual landowners during the process.

By year two the project developed residential landscape designs for over 35 properties, each incorporating urban ecological benefits compatible with the interests and needs of the owner. The results are organized into a series of emerging urban ecological design strategies for improving the landscape performance of private property in cities. These include strategies for landscape connectivity, vegetative structure, plant diversity, avian forage resource support, pollinator support, stormwater management, and others. Potential metrics for measuring the benefits of proposed project designs are also discussed.

1.1 Keywords

urban ecological design, urban habitat, residential design

2 INTRODUCTION

Private residential property represents a major part of the urban land base, with domestic gardens occupying nearly a quarter of the total urban land area in some cities (Evans et al., 2009). These areas already contribute a range of ecosystem services in cities (Cameron et al, 2012), yet there is substantial potential to improve the ecological performance of landscapes and gardens of private residences (Tratalos et al., 2007). More and more, cities are turning to private property stewardship in order to improve the environmental and ecological performance of cities (Cerra, 2014).

Birds are highly visible species, and are often selected as indicators of habitat quality when studying the ecological impacts of urbanization (Savard, 2000, Fontana et al., 2011, Mcdonnell and Hahs, 2008). Research studies may make specific recommendations for enhancing urban bird habitat, particularly when discussing the results of their specific research effort (see for example Fontana et al., 2011, Carbo-Ramirez and Zuria, 2011)). More complete sets of recommendations for enhancing urban avian habitat have also been made as the result of a literature review, based on years of acquired expertise in the field, or both (see for example Savard et al., 2000, Marzluff and Rodewald, 2006, Marzluff and Ewing, 2008). While these recommendations are insightful, less frequently are they scaled to a residential yard or resolved to the level required to guide site design. When such recommendations are specific to residential environments, they are often driven primarily by habitat quality enhancement goals and are not necessarily integrative of landowner interests and needs typically encountered in residential settings.

Urban ecology is defined by Alberti (2008, p.xiv) as “the study of ways that human and ecological systems evolve together in urbanizing regions.” Urban ecosystems are therefore considered conditional systems derived not independently of human influence, but within the context of interdependent social and ecological processes. The scientific community has also begun investigating social factors and their potential impacts (both positive and negative) on ecological factors in residential environments (Goddard et al., 2013, Belaire et al., 2014). Since local site factors can have an important effect on the assemblage of avian species (Evans et al., 2009), this opens up an opportunity for designers to investigate urban ecological enhancements and their compatibility with the residential aesthetic at the site level. Indeed, Nassauer rightly discusses how ecological design can engage ecology as something more than metaphor, but as an opportunity for designers “to work with dynamic environmental and human phenomena, anticipate surprises, and formulate synthetic normative approaches to intentional landscape change (Nassauer, 2012, p.223).”

Recently new works have made concepts of ecology more approachable to landscape architects by describing principles of ecological knowledge and their relevance to landscape design (Beck, 2013). These kinds of resources advance the dialogue within the profession about how new design strategies can bring ecological benefits to urban private property. Yet while there is growing interest in improving habitat quality on private property (ASLA, 2012, Goddard et al, 2010), landscape architects would benefit from a better understanding of what types of urban ecological design interventions best fit within residential settings. This includes both “what to do” in terms of making good ecological interventions that improve habitat quality, as well as “how to do it” in ways that address landowner preferences and needs, for example by “including design cues of human intention” into design strategies (Nassauer, 1995, p.162), or somehow otherwise nesting ecological interventions within design concepts in ways that are compatible with residential norms.

In pursuit of these questions, I developed a three-year, engaged design studio research investigation, the YardWorks Project, in collaboration with the Cornell Laboratory of Ornithology’s YardMap program and Cornell Cooperative Extension. The process of incorporating ecological processes and material changes, at multiple scales, into projects in ways that also critically incorporate the interests, programmatic needs, and aesthetic wishes of cooperating landowners is a key research goal for this project. The YardWorks Project embraces this intent by gathering ecological and community information, developing projects through a client-focused design process, and deriving a series of urban ecological design strategies that can be used by designers when working in typical residential settings. This paper describes the process and emerging results of our first two years of this research effort.

3 METHODS

The YardWorks Project has worked with two communities in New York State to date, and will work with a third in 2015. Each project engages participants within these communities in a semester-long process that begins with development of a vision and goals for enhancing the overall urban ecological condition of their neighborhood. The student design team then analyzes neighborhood-scale environmental systems, assesses individual sites, and works closely with individual landowners to generate habitat-friendly and watershed-friendly design solutions for the properties of each of the participants, consistent with both the community goals and the needs of individual landowners.

While a studio learning environment, the project also works directly with landowners on actual design projects with the understanding that these projects may someday be implemented by the landowner. The studio also functions as something of a "design laboratory" that asks and answers a set of research questions. With these multiple outcomes in mind, the project could be characterized as a variation of 'engaged action research' as described by Deming and Swaffield (2011), with combined pedagogical, practical and research benefits. The overall community engagement process is loosely adapted from a methodological framework described by Morrish and Brown (2000), and is further informed by a voluntary cooperative stewardship effort conducted by the author in private practice (Oregon Solutions, 2015). The approach is composed of a series of steps that are structured around four community meetings depicted in Figure 1. The process is further described below.

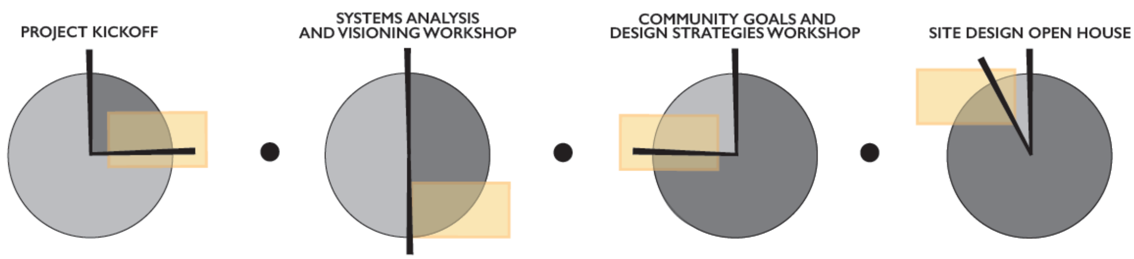

Figure 1. Overview of the YardWorks process for engaging communities (2015). Diagram by the author.

3.1 Project kickoff

The first meeting initiates the project and orients participants to the project process and timeline. It is a chance for both student team members and landowner participants to get to know one another and understand how their roles and relationships will grow and change over the course of the project. After an initial orientation, we also discuss landowner interest in the project, how they decided to get involved, and aspirations they have for the effort. Ultimately, this input allows the student design team to begin scoping a draft vision statement for the project, which we share in the second meeting.

3.2 Systems analysis and visioning

Following the first community meeting, students break into small groups to compose a draft vision statement, and then analyze the existing environmental and cultural systems in the neighborhood and community. During the second meeting the landowners and student design team convene as a group to discuss the draft vision statement, and then the design teams share their systems analysis results with community members in an informal, open house-style board presentation format. Finally, the group convenes again at the end of the meeting discuss specific goals for the project moving forward, informed by the project vision statement and analysis results presented.

3.3 Community goals and design strategies

After the second meeting the design team reviews and assembles the community-wide goals discussed for the project, and uses these goals as a guide to develop a set of related design strategies. These design strategies are typical approaches to site design, or design typologies, that are not specific to a particular site but are oriented to residential settings. While initially derived from the community goals, the development of each strategy is also informed by guidance provided by the Cornell Laboratory of Ornithology YardMap program through their website, selected literature, and consultation with experts in environmental science and design. Many of the urban ecological design concepts are oriented toward bird habitat due to the avian knowledge of the author, the ready availability of avian data, and recurring landowner interest in urban birds.

In developing these strategies, the design team conducts this research to set the rationale for each design concept and add greater depth in terms of its design potential. Each typology is examined from multiple perspectives to study the materiality, design methods, and dimensioning of the strategy. They are also investigated graphically in order to better understand how they may best be placed within a typical residential landscape layout. The design team shares this work in board layout format with landowners during an open house workshop. Landowners are asked to think about the kinds of design strategies they would like to explore, while the design team seeks feedback on how these strategies might be integrated into site-level projects.

The benefits of the ‘design typologies’ approach are two-fold- they encourage design ideation and innovation within the design team, and when completed provide a “menu of options” for landowners to see how their community-level goals can manifest in the form of site-level design outcomes that may be compatible with their own property interests. The result is that both ‘learning communities’ engaged in the YardWorks process- the students and the neighborhood participants- can share a common language of urban ecological design ideas and definitions that can be employed, explored, and refined moving forward. This approach greatly aids in project communication and workflow during the course of the semester, and adds consistency and compatibility as the project transitions to site design of the landowners’ properties, which is the final step of the project.

3.4 Site design development

Following the meeting, each student is assigned a landowner ‘client’ to work with for the remainder of the project. Over the course of the next two months, each student meets with this landowner to discuss their property design goals. They then conduct a site inventory and analysis to begin the design process. Through a series of additional exchanges students develop design concepts for the landowner’s property and share these with the landowner for feedback. After a process of landowner input and in-studio critiques, students move forward with finalizing their design concepts. Ultimately, they produce a complete set of material graphics and work products (e.g. plans, plant lists, diagrams, perspective drawings), site metrics for estimating design performance benefits, and a set of final design boards composing this information. Each one of these projects reflects a careful balancing of urban ecological goals with the intricacies of neighborhood cultural character, landowner programmatic needs and aesthetic interests.

Students share their work with their landowner client and other interested landowners during the final open house-style community meeting. The project closes by discussing with the landowners possible next steps for moving forward, including technical assistance and material resources that are available to them through the participating local county extension office and other organizations.

4 RESULTS AND DISCUSSION

Each YardWorks studio results in a) a consensus-based vision for the project; b) a set of stewardship goals set by the community based on the project vision; c) an analysis of human and natural systems present in the neighborhood; d) a series of design strategies that explore the spatial implications of goals set forth by the community; and e) a set of proposed project designs that reflect combined community and landowner interests for each participant property. These outcomes are immediately valuable to the community and individual landowners in the form of design products and community building, provide meaningful site design and client development learning experiences for students, and support the research intent of the YardWorks Project- that of extracting compatible urban ecological design strategies that can enhance the ecological and hydrological condition of residential neighborhoods.

A select set of these emerging urban ecological design strategies is described below. While we have developed other strategies specific to local needs of the certain neighborhoods (such as shoreline enhancement strategies for lakeside neighborhood participants) the following eight strategies are intended to be applicable to other urban and suburban locations throughout US. For each design strategy, the rationale, methods, and metrics for designing and measuring the benefits of these strategies in the studio are summarized. With respect to performance evaluation, the project intentionally sought metrics that were approachable, easily measured and achievable in a design studio setting.

4.1 Landscape network support

This strategy accesses an understanding of the surrounding landscape ecological network to look for clues in terms of how to compose a given project design within it. Making significant contributions to landscape ecological function can be challenging in urban areas where questions of parcel size, scale and degree of disturbance may limit contributions. However even relatively small interventions have the potential to contribute some connectivity value in consideration of certain species and ecosystem services (Beck, 2013). Habitat corridors and stepping stones can support urban ecosystem networks by improving connectivity that facilitates species movement and dispersal (Opdam and Steingrover, 2008). If the site is alongside an existing corridor, it could also enhance the corridor by contributing to corridor width, an indicator of corridor quality (NRCS, 2004, Beck, 2013).

By looking out in the landscape, designers can also begin to interpret the types of vegetative patches that exist in the landscape in order to better understand what types of vegetative conditions are present in the area. Ultimately the potential for a site to contribute to the landscape network will depend on the position and condition of the ecological network and a site's spatial and programmatic opportunities and constraints. Examples of connectivity interventions that may be compatible in residential areas include filling in gaps in street tree and other canopy corridors, connecting small patches of habitat with hedgerows, and providing planted stepping stones that reduce the isolation of other patches of similar habitat. See Figure 2. Metrics for measuring connectivity benefits of a design include changes in gap distances between stepping stones, degree of corridor continuity, distance between patches along a corridor, and corridor width.

In urban areas limited availability of data can create challenges for interpreting the landscape network, as the resolution of available land cover information may not be scaled to site design needs. Landscape-scale data can be generated however; in the urban areas we worked in, we found tree canopy to be the most readily available cover type due to its visibility in aerial photos and lidar data. Using digitized tree canopy data derived from these sources, we were able to determine the relative degree of connectivity, patch size, and isolation of a given site with respect to the tree canopy cover type.

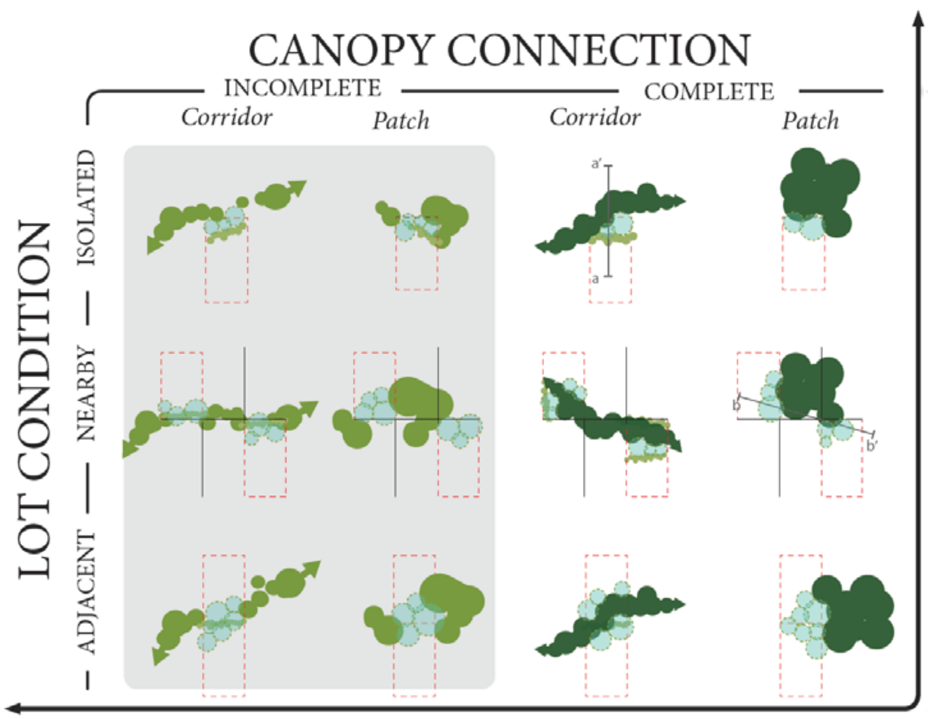

Figure 2. Landscape network support strategies diagram (2013). Graphic by and reproduced with permission of Alexander Reese BSLA'14 and Emma Martone BSLA'14, 2013 LA4010 Studio (Cerra), Cornell University.

4.2 Vegetative structure

This design strategy improves the composition of canopy, subcanopy, and groundlayer components in the landscape. Vegetative structure is a key factor defining habitat quality for birds and other species in the landscape. One or more of these vegetative layers that make up habitat structure are often absent in residential settings; the shrub component in particular is often lacking for birds (Stokes and Stokes, 2003). By being aware of the existing structural condition, designers can improve habitat quality by addressing structural deficiencies within a given site design. If you know what birds are using a given site and their habitat structure needs this can greatly inform your design moves, but you can also refer to nearby reference habitats to understand their vegetative structure as a guide. Filling in gaps in plant layers can also improve *vertical connectivity* in the landscape. For example placement of shrubs can improve connectivity and safe movement between overstory and understory layers for birds using a landscape. (YardMap, 2015a) Notably, layering of canopy, middle, and ground layers is also a basic planting design method (Booth, 2011). Properly executed, design in consideration of vegetative structure can be beneficial to both wildlife and people. See Figure 3. Vegetative structure can be assessed by calculating the percent cover of canopy, subcanopy, and groundcover layers and comparing these numbers against desired targets or predesign conditions.

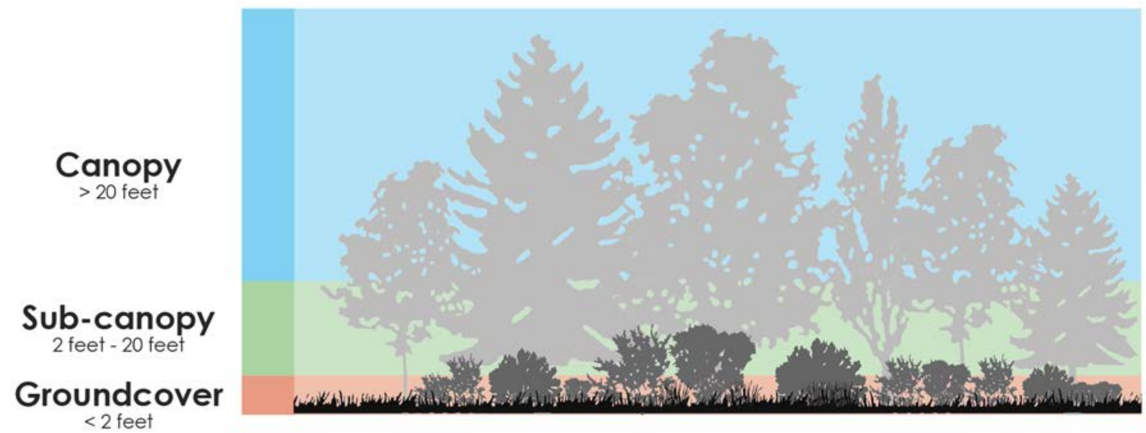

Figure 3. Illustrative diagram of vegetative structure elements (2013). Graphic by and reproduced with permission of Jeremy Schaub BSLA'14, Seung Ha Song BSLA'14, and Elizabeth Thompson BSLA'14, Cornell Landscape Architecture 2013 LA4010 Studio (Cerra), Cornell University.

4.3 Site refuge

This design strategy calls for clustering of shrubs to improve refuge opportunities for birds. Particularly in urban areas where a relatively high proportion of predators may be present in the landscape (e.g. house cats), providing areas of escape and safety from predators may improve the habitat quality of a site for species that may have this sensitivity. Planting shrubs in clusters increases the size of a shrub 'patch' and its cover potential for birds (YardMap, 2015a). Clustering of shrubs in groups of multiple plants of the same species versus individually is also a basic planting design method that improves the massing qualities and visual legibility of a planting (Booth, 2011). This compatibility improves the potential for integrating this strategy into the design process in ways that contribute to both urban ecological and aesthetic design goals. Metrics for measuring provision of site refuge in a given site design include areal proportion of shrubs that are in a clustered arrangement, and number of shrub patches.

4.4 Avian forage resource support

This design strategy optimizes the plant palette by providing forage for bird species when they need it. It is based on the understanding that most birds using our study areas can be categorized into three types- migratory birds that may only visit a site during migration in the spring and/or fall, breeding birds that are present typically during summer months, and resident birds that are present year-round. For example in upstate NY (roughly) migratory birds may visit in the spring between early March and May and in the fall between late July through September, breeding birds are typically present from May to July, while resident birds are present year-round. Publicly available avian database resources like Ebird (ebird.org) and the Breeding Bird Survey (available by state) are used to determine what birds have been identified at a project locale (and when). The planting design pallete can then be selected so that plant species produce seeds, berries, nuts, and other forage resources for birds when they are present. In this way, designers can accommodate the needs of migratory, summer breeding, and/or year-round birds by syncing the availability of forage resources to their temporal requirements. See Figure 4.

In our project studies to date, we've found all three categories of birds using the neighborhoods, and in both cases chose to design for year-round sources of food to the extent possible to accommodate these birds, both at the site-scale and at the neighborhood scale. Often the form, massing, and textural characteristics of plants desired by landowners could be met with forage-providing plants, and designers were therefore able to use them in their design projects. We found it challenging however to provide these types of forage opportunities in the spring season. Metrics used for determining the effectiveness of project designs in providing avian forage resource support include the proportion of individual plants or plant areal cover in a project design that provides forage during the seasons corresponding to the presence of spring migrants, breeding birds, fall migrants, and/or the winter season where year-round birds are present.

Other opportunities to improve the effectiveness of this strategy include incorporating information about season avian forage selection choices (e.g. Baird, 1980). It is also conceivable that information about the nutritional content of certain forage resources could be used to choose plant palletes that provide high value forage resources when species need them, or a broad range of nutritional forage types at a given time. Explicitly including provisions for incorporating "non-vegetarian" sources of food into this design strategy- e.g. by intentionally providing habitat for insects and other prey species- could also be further pursued, though aspects of this may be indirectly covered in other design strategies. Research continues in this area to tune and refine approaches to this design strategy.

4.5 Pollinator support

People often associate pollinators with European honeybees, and flowers with spring; however many species of native pollinators are also operating in the landscape, and collectively these pollinators are typically present for a much more significant part of the year than just spring. This strategy proposes that designers intentionally develop a plant palette that provides nectar resources across the entire season when pollinators are active. Mader et al (2011) recommend designing with a variety of plants that have overlapping bloom times throughout the seasons by choosing at least three pollinator plants within each of the three blooming periods of spring, summer, and fall. They particularly encourage planting flowers that bloom in the early spring to support early-emerging bees and those pollinators that produce multiple generations per year, like bumblebees (Mader et al, 2011). Different plants bloom at different times; by diversifying the 'portfolio' of nectar resources available, a project design can support a broader array of pollinators upon which many species (including ourselves) rely on for critical ecosystem services including plant reproduction and agricultural productivity (Mader et al, 2011). See Figure 4. Metrics for determining the effectiveness of project designs in serving this strategy include percent of individual plants or areal cover of plant species in a design that provide nectar within subsets of the pollination season, for example during early spring, spring, summer, late summer, and fall seasons.

We found that found that landowners were often interested in providing a balanced site nectar 'portfolio' for pollinators- particularly those that were interested in designed flower beds. Some landowners preferred flushes of similar species, rather than diverse 'meadow-like' plantings. In fact, planting groups of the same species of flowering plant is recommended for improving pollination efficiency (NAPPC, 2015), and such groupings over three feet in diameter may be more attractive to pollinators than smaller, more widely dispersed groupings (Mader et al, 2011). It should be noted that many species of shrubs and trees also flower, and can serve as significant sources of nectar for pollinators within a planting design.

Designers can also support pollinator life histories by including locally-suitable larval host plants- specific plant species upon which certain butterflies, whose caterpillar larvae have specialized food needs, must lay their eggs in order for their young to be able to feed when hatched- in their planting design palette (Summers, 2011, Mader et al, 2011, Sheperd et al, 2008). Other design opportunities include strategically locating nesting and overwintering habitat in the form of bare ground, nest boxes, and other site features (Mader et al, 2011, Shepherd et al, 2008).

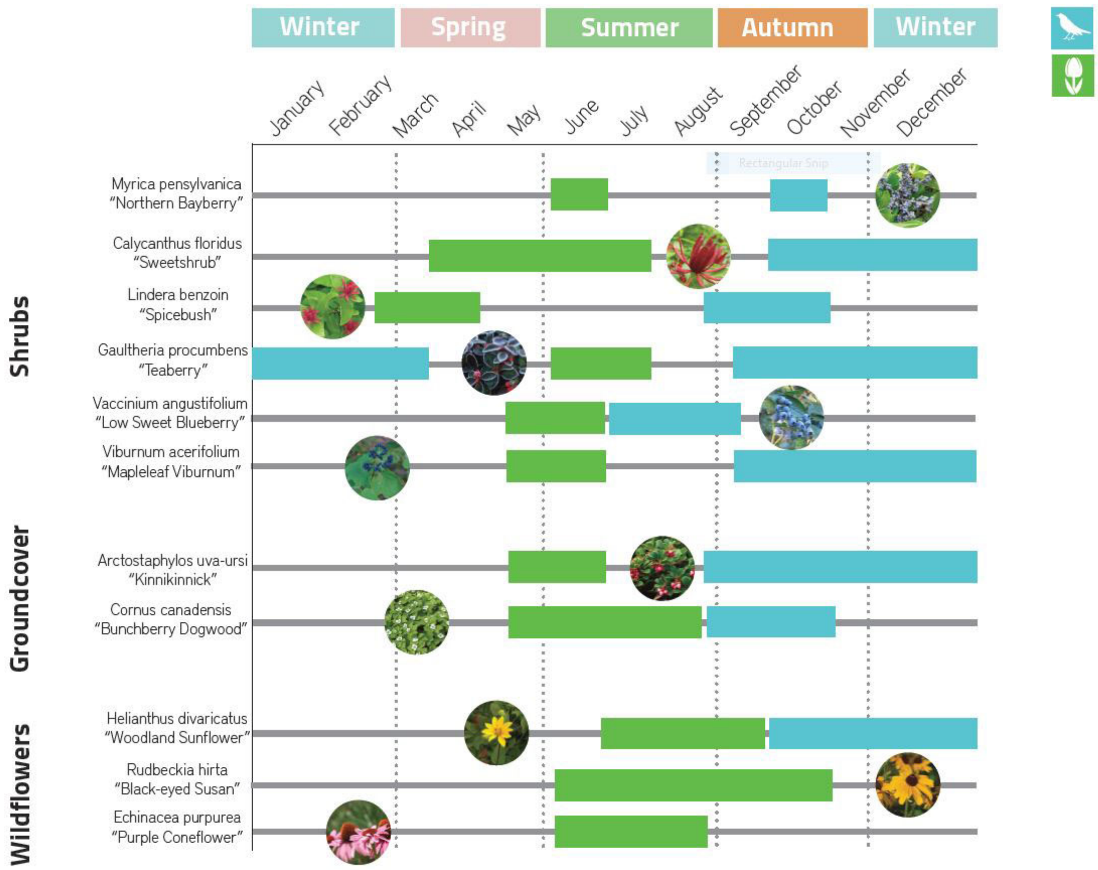

Figure 4. Plant pallete diagram depicting temporal distribution of avian and pollinator resources (2013). Graphic by and reproduced with permission of Lindsay Rappa BSLA'14, 2013 LA 4010 Studio (Cerra), Cornell University.

4.6 Plant diversity

Some residential landscapes may exhibit relatively low plant diversity. During the design process, consider the relative diversity of your plant palette and whether there are opportunities to increase diversity, particularly by providing species with traits like those identified in some of the other design strategies described. In doing so you might also consider the diversity of habitat quality benefits provided-for example provision of diverse seed, nut, and berry forage types. Increasing diversity is a general guide, but it may provide benefits and/or niche opportunities for a broader array of species in the landscape. Plant diversity may also need to be balanced in consideration of planting design legibility, landowner preferences and maintenance constraints in residential settings. Metrics for evaluating diversity can be as simple as identifying how many individual species are present on a landscape relative to pre-design conditions.

4.7 Discrete habitat features

Certain site assets operate as features in the landscape that provide habitat value. Examples include rock walls and piles, snags, and brush piles (YardMap 2015b). These features can provide different ecological niches in your yard, and contribute suitable habitat for birds and other wildlife. Often they can be creatively inserted into the landscape in ways that complement a design layout, or they may be screened by certain aspects of the layout. See Figure 5. A thoughtful design layout can introduce these features in ways that contribute additional habitat quality without detracting from the aesthetic wishes and programmatic needs of the landowner.

Figure 5. Discrete habitat features illustrative diagram (2013). Graphic by and reproduced with permission of Hilary Garnish BSLA'14, 2013 LA4010 Studio (Cerra), Cornell University.

4.8 Green infrastructure

While terrestrial habitat has been primarily discussed above, aquatic habitat in the form of streams, wetlands, lakes, and other water features is another important resource type in cities. Urbanization typically includes increases in impervious surface areas and storm sewer infrastructure that efficiently moves water off of and away from these surfaces. This lowers rates of infiltration and results in higher runoff volumes and velocities (Arnold and Gibbons, 1996). This can result in higher peak flows, higher nutrient and contaminant concentrations, reduced biotic richness and other aquatic impacts within an urbanized watershed (Paul and Meyer, 2001). Landscape architects can limit these impacts by incorporating low impact development or green infrastructure techniques into project designs.

In our work, we found certain green infrastructure strategies to 'fit' better than others in residential environments. Rooftop impervious surfaces were the most easily accessible sources of runoff we encountered. They are contained in size, often have a concentrated source of outflow that can be intercepted (gutter downspouts), and have the added benefit of being relatively low in contaminants like road salt. While some of the design projects we developed have included vegetated swales, rain gardens with their relatively small, localized footprints and low maintenance requirements seemed to scale well to the residential conditions and landowner interests we worked with. In certain situations, proposing disconnection of the downspouts from the sewer network was also possible and desirable, particularly if soil, slope, and vegetative conditions allowed for adequate infiltration.

While perhaps not initially considered a habitat enhancement technique, green infrastructure techniques actually can contribute valuable habitat benefits in urban areas. The difference between this urban ecological design strategy and others discussed is that these interventions may primarily provide ecological benefits offsite of a project property rather than directly onsite. However green infrastructure facilities can also introduce different microclimatic conditions (e.g. different hydrologic patterns) that may allow different types of plants to grow in them than in other project locations. These variations can then be accessed by a designer to support other urban ecological design strategies within a site design.

5 CONCLUSION

Urban ecological innovations on residential property are only valuable if they are compatible with private landowner interests and needs- otherwise they may never be constructed. The YardWorks Project responds to these needs by developing, testing, and refining a series of approachable strategies that can enhance the ecological condition of residential properties in ways that are compatible with the needs and interests of residential landowners. It does so by bringing the potential for urban ecological change to actual communities of people through a collaborative process of engaged discovery, learning, and decision-making in an academic studio setting.

From the standpoint of the practicing landscape architect, there are few available resources describing site-based urban ecological design strategies or methods that explicitly appeal to the profession. It is the belief of the author that if clear, understandable and reasonably implementable strategies for urban ecological design were readily available to members of the profession, the likelihood of their adoption would be higher. 'Clear, understandable, and reasonably implementable' means strategies that: a) are conceptually approachable and within the technical grasp of the profession; b) describe techniques that leverage the spatial sensibilities of landscape architects; and c) can be implemented in fast-paced project environments where time is often limited. The YardWorks Project pursues development of such a resource.

Paker et al. describe the need for interdisciplinary investigations "between landscape designers and zoologists, in order to achieve a better understanding of the required garden structure and composition for enhancing the enjoyment of people as well as the number of bird species living in it (Paker et al., 2014, p.193)." Nassauer wrote about how a synthetic approach to the "landscape medium" "can contribute urban ecological design knowledge to science and make science knowledge applicable to urban ecological design (Nassauer, 2012, p.227)." While there is much work left to do in meeting this aspiration, practitioners in urban ecological design are poised to make significant positive impacts on human and natural environments by contributing new insights into how sustainable site ecosystems can be situated in urban spaces, for the benefit of all city inhabitants.

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DESIGNING FUNCTIONAL HABITAT USING WILDLIFE HABITAT RELATIONSHIPS: A MISSING CURRICULAR CONCEPT IN LANDSCAPE ARCHITECTURE EDUCATION

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1. ABSTRACT

The purpose of this paper is to describe wildlife habitat relationships (WHR) and its basis for use in landscape architecture and habitat design. An 'ecological greenway' design process, within a landscape planning and design studio context, provides examples of student work using WHR models in three river case studies in the Central Valley, California. WHR modeling is species-specific life history information that links vegetation communities and their structure to individual wildlife species suitability models. Without incorporating WHR models for focal species in a design process to predict functionality for wildlife species of concern, it is unlikely a landscape will effectively function for them. None of the major textbooks in landscape architecture have an adequate description of WHR models despite their utility in ecological design. Students implemented an integrated dual-track design process, one track focused on natural systems and the other on cultural systems. For these exercises emphasis was placed on natural systems conservation planning and design using a set of focal species. To design habitat areas for each focal species, a California-specific WHR system was utilized. Students created a GIS database for each case study by collecting a variety of data layers including land use, land cover, roads, 100-year floodplain, and soils. Techniques utilizing GIS, CAD, and illustration software were combined to create site analyses and phased master plans for each river system. GIS was used effectively to communicate phasing in an animated sequence. WHR is a vital concept in ecological design and should be included in landscape architecture curricula.

1.1 Key Words

Ecological greenway; wildlife habitat relationships; habitat design; migration corridor; rivers

2 INTRODUCTION

Ensuring that landscapes and greenways are intentionally designed to serve ecological functions and meet the habitat requirements of specific wildlife species is the focus of this paper. A very important tool for greenway and ecological designers is the utilization of wildlife habitat relationships (WHR) models. WHR modeling is species-specific life history information contained in a database that links the composition and structure of vegetation communities to individual wildlife species suitability models (Beck & Suring, 2009; Morrison, Marcot, & Mannan, 2012). Without considering or incorporating WHR models into a design process to "build-in" or "predict" functionality for wildlife species of concern (e.g. threatened or endangered), it is unlikely a landscape or greenway will effectively function for them. Unfortunately, this basic method to conceptualize and design functional habitat is missing from nearly all major textbooks in landscape architecture and environmental planning. The WHR literature remains primarily in highly specialized articles and books on wildlife habitat analysis. However, a paradox exists because some literature in landscape architecture (such as Ndubisi, 2002; Verboom & Pouwels, 2004) actually address *advanced uses* of WHR models in the context of metapopulation analysis (i.e., modeling population viability). It appears these advanced methods (e.g., using LARCH or LANDEP) tend to be used more by ecological scientists and less by environmental designers and planners. Thus, there remains an important knowledge gap at the undergraduate (introductory) level of the basic concepts of WHR and how it can be used to design functional wildlife habitat. This issue is further addressed in the Discussion.

The objectives of this paper are: (1) to describe the basic concept of WHR and how it can be used in habitat evaluation, ecological design, conservation planning, and greenway design in a studio course context; (2) to describe a planning and design process and show some student work products from a series of undergraduate greenway design studio courses using WHR methods on three California river systems; and (3) to review and critique literature in landscape architecture (including prominent educational textbooks, book chapters, and journal articles) regarding WHR concepts and methods.

2.1 What is WHR, how is it measured, and how is it used?

Wildlife habitat is a species-specific concept, meaning habitat types — such as vegetation communities and other land cover — have different suitability values for each species (Beck & Suring, 2009; Verboom & Pouwels, 2004). WHR models describe the ecological needs of *individual species* by breaking down habitat into various life history functional units (or "life requisites") such as (1) feeding habitat, (2) cover habitat, and (3) reproductive habitat (Cooperrider, 1986). WHR is an extension of ecological niche theory and is sometimes referred to as "resource selection functions" (Noss, O'Connell, & Murphey, 1997). Habitat is often represented as a land cover (choropleth) map typically using a floristically coarse classification system of vegetation communities. Each of the three life requisite variables are separately scored for suitability (on a scale from zero to 1.0; see section 2.2 below for more detail) and the three scores can then be averaged or weighted (mathematically combined) into a single habitat suitability index (HSI) score. There are many metrics to combine the separate habitat scores (see Cooperrider 1986, p. 767), but two widely used metrics are the arithmetic and geometric means (statistical averages) as shown below:

$$HSI = \frac{R + C + F}{3} \qquad (1)$$

$$HSI = \sqrt[3]{R \times C \times F} \qquad (2)$$

where *HSI* is the habitat suitability index for a particular wildlife species at a site and *R* is reproduction habitat, *C* is cover habitat, and *F* is feeding habitat (CDFW, 2014a). Equation 2 is a more conservative metric because if any of the life requisite variables is rated as zero then the entire HSI score is zero. It should be noted that the suitability scores (or ratings) of each life requisite habitat type are usually designated by species experts or by scientific studies of habitat preference; they are empirical estimates based on the best available information.

The following example illustrates this overall approach. If a species at a particular site has feeding habitat rated as 1.0 (excellent feeding habitat), cover habitat rated as 0.66 (medium), and the site lacks any reproductive habitat (i.e., reproduction = 0; or unsuitable), then its arithmetic mean is 0.55 and its geometric mean is zero. If population persistence at the site is a management imperative then the latter metric (Equation 2) is more appropriate because it explicitly requires that all three habitat types are present and suitable, including reproductive habitat.

Another important aspect of WHR models is the presence of certain 'habitat elements' or 'habitat components' at a site that are essential for a species survival and persistence (Cooperrider, 1986, Table 1, p. 760; CDFW, 2014a, p. 13-14). Habitat elements can be 'living' or 'dead' resources, for example snags for late-seral cavity nesting birds, or rock piles for most reptiles, or small rodents as prey for raptors. Such habitat elements may not be mapped easily using GIS land cover data and therefore its presence is often confirmed by field visits to the site being evaluated.

WHR models can be used for many purposes. Often they are used to predict which wildlife species could potentially be present at a site, a method commonly employed in habitat conservation plans (HCPs; implemented under the federal Endangered Species Act; see Noss et al., 1997). Another application for WHR models is for estimating impacts in environmental impact statements (EISs; implemented under the federal National Environmental Policy Act) by predicting the potential loss of habitat and species associated with those habitats due to urban development or timber harvest. A third application, which is the focus of this paper, is for designing functional habitat (using patch composition, structure, and habitat elements) for selected focal species or species of special concern. WHR models can also be used to *infer* ecological processes such as seasonal migration and juvenile dispersal for wildlife species with those needs. Maintaining processes such as these is a great challenge in nature conservation planning. For wide ranging generalist species such as most ungulates, WHR models can be used to design contiguous habitats, commonly referred to as "wildlife corridors" where habitat connectivity is essential. Functional connectivity (as opposed to structural connectivity) means that the corridor is composed of habitat types that a species has been observed using to migrate, thus "connectivity is both species- and landscape-specific" (Noss, 2006, p. 71 citing Bennett, 1999).

A common dilemma in greenway planning is justifying the areal width of the park's physical alignment. In the case studies presented below, greenway width is determined by the ecological function of a seasonal migration corridor for a wide ranging ungulate species and habitat for endangered species. Suitable habitat types were identified using a WHR system designed for California wildlife species. Spatial dimensions and configuration of the migration corridor were derived from a species-specific spatial study of migration (see section 3.2 below for further discussion). It is important to note that most WHR systems (databases) do not yet have a spatial component for determining minimum patch sizes or corridor configuration parameters, though these will likely be developed in the future. Another criterion for determining greenway width on a river system is using flood frequency, in particular, the boundary of the 100-year recurrence interval (see Greco & Larsen, 2014).

2.2 WHR systems

There are numerous WHR modeling systems that have been developed in the U.S. and worldwide. For example see the Oregon and Washington state WHR system (Johnson & O'Neil, 2001). This paper mainly focuses on the California Wildlife Habitat Relationships (CWHR) system that was first developed in the 1980s to describe habitat use by all terrestrial vertebrates in the state (Mayer & Laudenslayer, 1988). Currently the database system has 712 species represented as WHR models including all birds, mammals, reptiles, and amphibians. The database is a stand-alone program for Windows-based PC computers and is now free and available to the public though the California Department of Fish and Wildlife website along with multiple support documents (see https://www.dfg.ca.gov/biogeodata/cwhr/). The current version (CWHR v9.0) was recently released and runs on Windows 7 (and above) operating systems and accommodates 64-bit computing (CDFW & CIWTG, 2014b).

The CWHR system classifies habitats into seven tables of broad categories of major habitat types: (1) trees, (2) shrubs, (3) herbaceous, (4) tree-shrub, (5) aquatic, (6) agricultural, and (7) other habitat (urban and barren). Within each major habitat type, multiple vegetation communities are broken down into structural classes (combining size classes with cover classes; see Figure 1 for tree habitats). For example, the tree habitats table (matrix; Table 1) has 23 tree habitats (i.e., vegetation communities dominated by trees) and each tree habitat is broken down into 17 structural stages ranging from seedlings to medium/large trees. The tree habitats have six size classes (1-6) and four cover classes (sparse, open, medium, dense) that are combined to create up to 17 unique structural classes per vegetation community (most have 16 structural types; see Table 1). Each box with a dot in its center in

Table 1 is rated by species experts using empirical studies for habitat suitability (high = 1.0, medium = 0.66, low = 0.33, and unsuitable = 0) for feeding, reproduction, and cover for each of the species in the

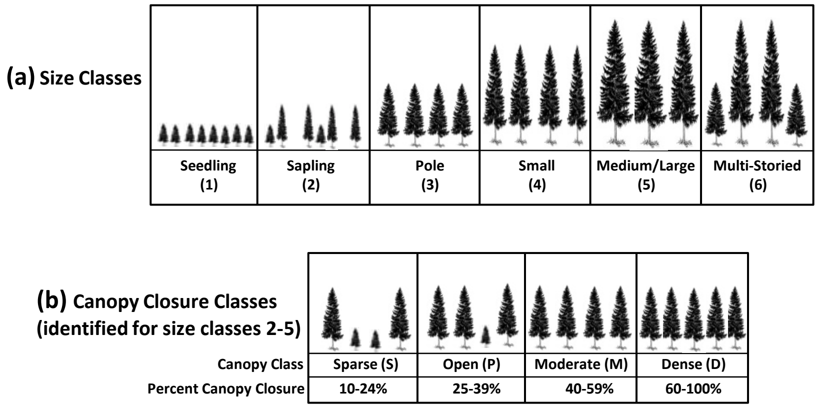


Figure 1: (a) Vegetation size classes (for tree habitats) and (b) canopy cover classes (habitat stages) in the CWHR system (diagram by author adapted from Airola, 1988).

database (Table 2). These three ratings can be combined using Equation 1 or 2, above, to evaluate an overall habitat rating (see Table 3 for an example using Equation 1). Each of the other six broad categories of major habitat types (shrubs, herbaceous, tree-shrub, aquatic, agricultural, and "other" habitat) are also broken down into structure/cover categories, though fewer than for the tree habitats, and rated for each species' suitability. Thus, each species' WHR model includes all the habitat types it uses and reflects the quality of each habitat for the species. Importantly, WHR habitats can be mapped as land cover using a GIS (see http://www.biogeog.ucsb.edu/projects/gap/gifs/vert.gif for an example map using the black-headed grosbeak). The last component of each model is a list of habitat elements either required or preferred by the species.

Table 1: Tree habitat matrix from the CWHR system and standards for tree size classes and canopy closure classes (below the matrix; from Mayer, K. E., & Laudenslayer, W. F., Jr. [Eds.] [1988]. A guide to the wildlife habitats of California. Sacramento: California Department of Forestry and Fire Protection. Copyright 1988. Reproduced by permission of the California Department of Fire and Forestry Protection.)

Table 1. Available Habitat Stages For Tree Dominated Habitats

Tree Habitat		Habitat Stage																	
		1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D	5S	5P	5M	5D	6
SCN	Subalpine Conifer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
RFR	Red Fir	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
LPN	Lodgepole Pine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
SMC	Sierran Mixed Conifer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
WFR	White Fir	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
KMC	Klamath Mixed Conifer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
DFR	Douglas-Fir	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
JPN	Jeffrey Pine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
PPN	Ponderosa Pine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
EPN	Eastside Pine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
RDW	Redwood	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PJN	Pinyon-Juniper	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
JUN	Juniper	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
CPC	Closed-Cone Pine-Cypress	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
ASP	Aspen	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MHC	Montane Hardwood-Conifer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
MHW	Montane Hardwood	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
BOW	Blue Oak Woodland	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
BOP	Blue Oak—Digger Pine	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
VOW	Valley Oak Woodland	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
COW	Coastal Oak Woodland	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
MRI	Montane Riparian	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
VRI	Valley Foothill Riparian	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

Standards For Tree Size

WHR	WHR Size Class	Conifer Crown Diameter	Hardwood Crown Diameter	dbh
1	Seedling Tree	n/a	n/a	‹1"
2	Sapling Tree	n/a	‹15"	1"–6"
3	Pole Tree	‹12'	15'–30'	6"–11"
4	Small Tree	12'–24'	30'–45'	11"–24"
5	Medium/Large Tree	›24'	›45'	›24"
6	Multi-Layered Tree	Size class 5 trees over a distinct layer of size class 4 or 3 trees, total tree canopy exceeds 60% closure		

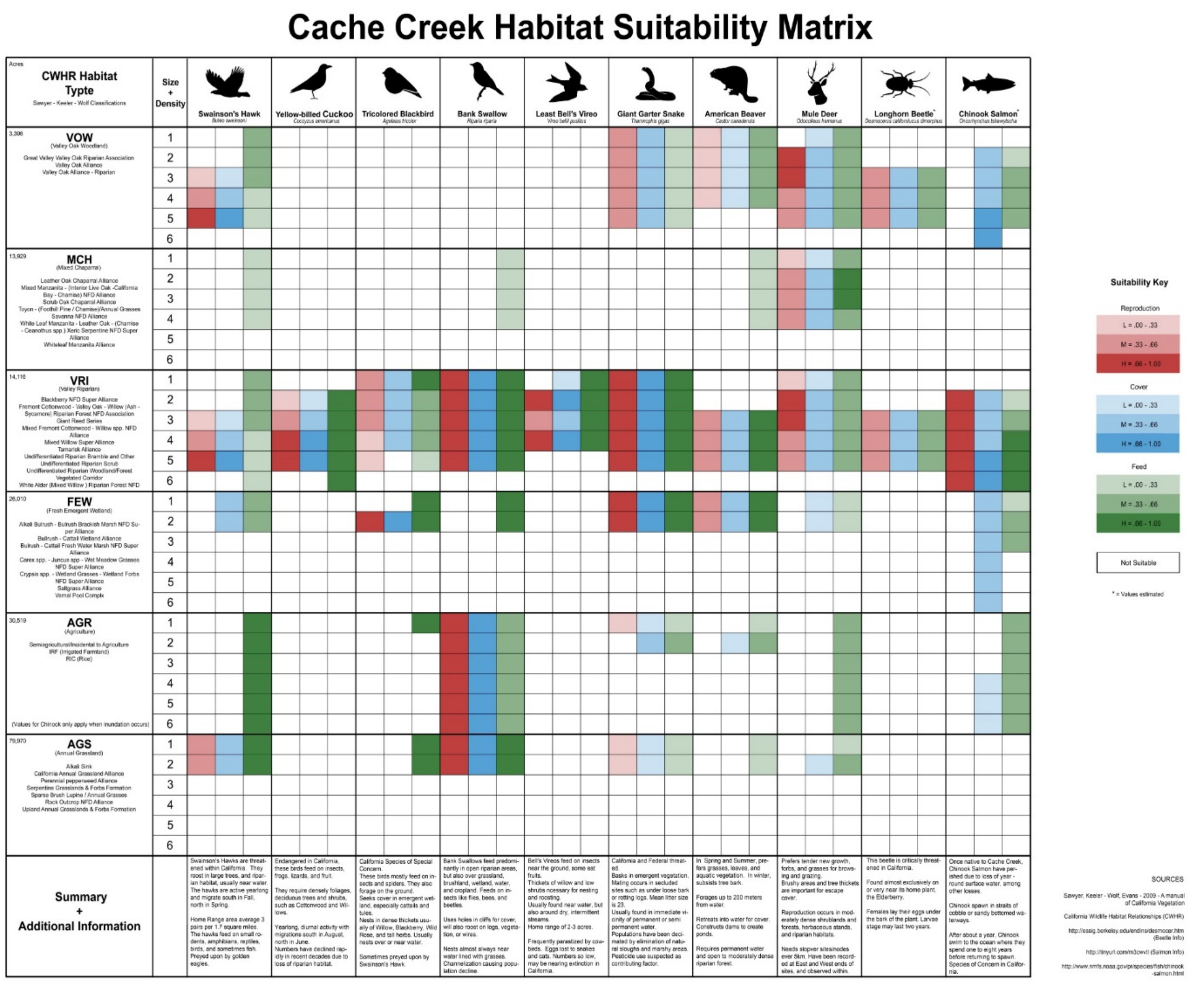
Standards For Canopy Closure

WHR	WHR Closure Class	Ground Cover (Canopy Closure)
S	Sparse Cover	10–24%
P	Open Cover	25–39%
M	Moderate Cover	40–59%
D	Dense Cover	60–100%

2.3 WHR systems and vegetation classification

An important conceptual component of WHR systems is its use of land cover maps, and in particular, vegetation classification systems. To use WHR systems effectively the pedagogy of understanding and applying classification crosswalks between databases is essential. WHR systems tend to use broadly classified vegetation communities to describe habitat types. As such these broadly defined communities usually contain many different vegetation alliances and plant associations. A "crosswalk" defines equivalent classes between tabular database systems to perform reclassification (Woolmer, 2010). Commonly, land cover datasets are mapped using different vegetation classes than a WHR system uses and therefore a crosswalk is necessary to define the WHR types from the land cover types. For example, in the CWHR system, the "valley/foothill riparian" (with the acronym "VRI") tree habitat type consists of many riparian plant community alliances and associations, such as various cottonwood and willow alliances and associations. If a land cover map is created using more floristically resolved alliances or associations, then they must be redefined (i.e. generalized) as VRI using a database crosswalk table that defines these equivalent classes. Crosswalks are implemented using a table join function in a GIS. Crosswalks are sometimes provided for commonly used land cover systems to facilitate use of the WHR system (for an example see Mayer & Laudenslayer, 1988, p. 26; Sawyer, Keeler-Wolf, & Evens, 2009).

Table 2: Selected focal species to act as a conservation umbrella for the Cache Creek Greenway near the city of Woodland. An example of student studio work (from Student Group 2015b). Colors (hue) show feeding, cover and reproductive habitats and value reflects habitat quality (darker equals higher suitability).



3 METHODS

3.1 Studio course overview and structure

Three undergraduate senior-level studio courses were taught at the University of California, Davis in the winter quarters of 2010, 2012, and 2015 (see the Acknowledgements section for student credits), examining three different river systems (each about 30 miles in length) in the Central Valley of California; to create regional greenways to connect the valley floor to the higher elevation foothill and mountain landscapes (source areas for native ungulates). The three river systems were: (1) the Stanislaus River, a west-side tributary to the San Joaquin River in the San Joaquin Valley connecting to the Sierra Nevada mountains, (2) Putah Creek, an east-side tributary to the Sacramento River in the Sacramento Valley connecting to the Coast Range mountains, and (3) Cache Creek also an east-side tributary to the Sacramento River in the Sacramento Valley connecting to the Coast Range mountains.

The design program goals of the studio projects were: (1) to facilitate seasonal migration between the valley and mountain ranges by a wide ranging ungulate, the mule deer (*Odocoileus hemionus*), (2) to provide sustainable habitat for other local wildlife and plant communities (using a coarse and fine filter approach), including special status species, such as species listed as threatened or endangered under the federal and state Endangered Species Acts, and (3) to provide recreation opportunities, including hiking trails and a regional bicycle trail. Each river is situated within a primarily agricultural landscape matrix and none currently function as a deer migration corridor, though they had historically. Each river's

Table 3: Combined suitability values of CWHR habitat types for a suite of focal species for greenway planning and design. An example of student studio work (from Student Group 2012a).

Species Habitat Suitability Index

Species			Habitat																
Common Name	Scientific Name	Habitat Type	1	2s	2p	2m	2d	3s	3p	3m	3d	4s	4p	4m	4d	5s	5p	5m	5d
Mule Deer	*Odocoileus hemionus*	Blue Oak Woodland	L	H	H	M	M	H	H	H	M	M	H	H	M	M	M	M	M
		Valley Foothill Riparian	M	H	H	M	M	H	H	H	M	M	H	H	M	M	M	M	M
		Valley Oak Woodland	L	H	H	M	M	H	H	H	M	M	H	H	M	M	M	M	M
Giant Garter Snake	*Thamnophis gigas*	Valley Foothill Riparian	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
		Valley Oak Woodland	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Yellow-Billed Cuckoo	*Coccyzus americanus*	Valley Oak Woodland	L	L	M	M	M	M	H	H	M	M	H	H	M	H	H	H	H
Yellow Warbler	*Dendroica petechia*	Blue Oak Woodland	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
		Valley Foothill Riparian	N/A	M	H	H	H	H	H	H	H	H	H	H	M	M	M	M	M
		Valley Oak Woodland	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Northern River Otter	*Lontra canadensis*	Valley Oak Woodland	L	H	H	H	H	H	H	H	H	L	H	H	H	L	H	H	H
Bank Swallow	*Riparia riparia*	Valley Foothill Riparian	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Peregrine Falcon	*Falco peregrinus*	Blue Oak Woodland	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
		Valley Foothill Riparian	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
		Valley Oak Woodland	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Common Name	Scientific Name	Habitat Type	1	2O	2M	2S	2G	2R	2B	3O	3M	3S	3G	3R	3B	4O	4M	4S	4G	4R	4B
Bank Swallow	*Riparia riparia*	Riverine	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	L	L	L
Peregrine Falcon	*Falco peregrinus*	Riverine	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Giant Garter Snake	*Thamnophis gigas*	Riverine	L	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Northern River Otter	*Lontra canadensis*	Riverine	N/A	M	M	M	M	M	L	N/A	N/A	N/A	N/A	N/A	N/A	L	L	L	L	L	N/A

Common Name	Scientific Name	Habitat Type	1S	1P	1M	1D	2S	2P	2M	2D
Bank Swallow	Riparia riparia	Annual Grassland	H	H	H	H	H	H	H	H
		Fresh Emergent Wetland	L	L	L	L	L	L	L	L
Peregrine Falcon	Falco peregrinus	Annual Grassland	H	H	H	H	H	H	H	H
		Fresh Emergent Wetland	M	M	M	M	M	M	M	M
Mule Deer	*Odocoileus hemionus*	Annual Grassland	L	L	M	M	L	M	M	M
Giant Garter Snake	Thamnophis gigas	Annual Grassland	L	L	L	L	L	L	L	L
		Fresh Emergent Wetland	H	H	H	H	H	H	H	H

LEGEND:
High Habitat Suitability (.66-1.0)
Medium Habitat Suitability (.33-.66)
Low Habitat Suitability (.00-.33)

floodplain is significantly fragmented and constrained by human land uses. Overall, the goals of the projects were to enhance and restore ecological functionality and provide limited-impact human recreation.

The main pedagogical objectives of these studio design projects were to apply the principles of WHR, landscape ecology, conservation planning, and recreation planning to real world landscapes in the

Central Valley (near UC Davis), including the cities and towns, and the surrounding agricultural landscape matrix near the rivers. The learning objectives were to:

- Examine a landscape system and ecological issues at a regional scale;
- Utilize WHR models to design functional habitat for an ecological greenway;
- Select focal species and focal habitats for planning and design (coarse and fine filter);
- Use GIS to construct a spatial database (including the use of a crosswalk);
- Design low-impact recreational facilities;
- Depict the phased implementation of the greenway.

Each student in the studio courses volunteered to participate in two teams: an information team and a design team. The information teams were divided into three topical research areas: natural systems, cultural systems, and database construction. Each design team consisted of at least one member from each information team topical area. Thus, each design team had 5-6 students with at least one representative from natural systems, one from cultural systems, and one from database construction. The information teams performed the resource inventory, some preliminary analyses, and constructed a collective database for all the design teams to utilize. Subsequently, the design teams performed additional analyses and prepared greenway alignment alternatives and selected a final alignment with phasing for their master plan.

These projects examined landscape structure and function for natural and cultural systems, however, it emphasized analysis and planning for natural systems. Each class collected a variety of information types and developed a GIS database of existing spatial data and additional data layers were developed by the students. Using these data each team of students followed a design process to: (1) conduct an inventory by summarizing important GIS layer variables, such as land use and land cover, including performing a crosswalk to WHR classes; (2) conduct a site analysis for a set of target focal species (using a multi-species umbrella approach; see section 3.2 below) in the river's region by identifying existing and potential source habitat areas, corridors, barriers, and sink habitats; (3) conduct a site analysis for public access and recreation; and (4) create a coordinated conservation greenway (or “ecological network”) master plan that incorporates the opportunities and constraints identified in the site analyses.

The studio courses were 10 weeks in length and the studio project described above was completed in the first six weeks and a second studio project followed it lasting four weeks. The second project had the students choose key nodes on their greenway alignment and they worked at a more detailed site scale to design habitat patches and recreational facilities. Typically, the second project also involved designing a multifunctional wetland (for storm water or for tertiary waste water treatment) within one of the greenway nodes. The wetland design required a topographic grading plan, planting plan, and detailed trail design that reflected design concepts to minimize conflict between people and wildlife based on the work of Cole (1993), Hellmund (1998), and Flink & Searns (1993).

3.2 A note on focal species and the multi-species umbrella approach

There are many approaches to selecting species for biodiversity planning (i.e., the 'fine filter') including: indicator species, charismatic species, flagship species, umbrella species, focal species, vulnerable species, ecological engineers, keystone species, economically valuable species, link species, narrow endemic species, phylogenetically distinct species, and special cases (Ahern, Leduc, & York, 2006; Noon & Dale, 2002; Noss et al., 1997). Often a variety of these methods are combined for a particular conservation project.

A widely cited and popular approach is the selection of a multi-species umbrella of focal species that meet a spectrum of ecological criteria (Lambeck, 1997). In this approach Lambeck argues that a suite of focal species be selected based on key ecological limitations such that, as a whole, they protect all or most other species in the respective landscape (i.e., the umbrella effect). In this scheme species are selected based on whether a species' needs require reconstruction of habitat (restoration) or whether a species needs land management actions to recover the population. The species that need habitat restoration are species that are area-limited, dispersal-limited, or resource-limited, while the species that need land management are typically process-limited and may require removal of exotic predators or weeds, or the addition of prescribed fire or cattle grazing.

This approach has been criticized for the assumption of nested-niches, or "nestedness," meaning that life history requirements of multiple species cannot be assumed to entirely overlap (Lindenmayer, Manning, Smith, Possingham, Fischer, Oliver, & McCarthy, 2002). However, as Noon & Dale (2002) point out, it is *impossible* to monitor and assess the viability for all species at a site, especially for large regions, and therefore it is necessary to pick a subset of species for this purpose. In a response to Lindenmayer et al. (2002), a rebuttal by Lambeck (2002) states that despite the theoretical limitations of the umbrella concept, his method is the best approach because it is practical and effective, given limited funding and resources for species recovery planning and monitoring. It is important to note that the use of a WHR system can be a powerful tool to compare and group species based on their common niche requirements and identify those that do not meet the assumption of nested-niches. Cooperrider (1986) points out that WHR models can facilitate identifying guilds (i.e., groups that feed on similar food types).

For the studio course, students were instructed to use the CWHR system to select representative focal species for each of the major habitat types in the study areas including threatened or endangered species. As discussed above the students also had to include the mule deer as their wide ranging ungulate species. To determine the spatial parameters for the configuration of the seasonal migration corridor the students used a detailed spatial study mule deer migration by Sawyer, Kauffman, Nielson, & Horne (2009). The students then modeled the habitat of each species in a GIS using a land cover data set and combined all species together into a single suitability map reflecting all species (Store & Jokimaki, 2003).

4 RESULTS

The results in this paper are sample products from the student group work from the planning and design studios described above (see the Acknowledgements section for student credits). The studio products demonstrate that undergraduate students can readily understand and implement WHR models for conservation planning and greenway design projects. The CWHR models for a set of focal species representing an umbrella for a river system are shown in Table 2 and Table 3 above. A sample design process flow chart depicting a dual-track natural-cultural systems approach is shown in Figure 2.

A master plan for the Stanislaus River (2010 studio) is shown in Figure 3. The master plan depicts the final phase, configuration, and circuitry of the greenway. An example master plan from the Putah Creek greenway studio (Figure 4; 2012b) also shows the configuration, circuitry, regional bicycle trail, and greenway implementation phasing in three parts. Two example master plans are presented from the Cache Creek studio in 2015. The first example depicts a master plan and illustrates the spatial configuration and four-part implementation phasing (Figure 6). The second example also well describes the configuration, phasing and recreational facilities, including a regional bicycle trail and numerous other activities (Figure 7).

5 DISCUSSION

There is a distinct lack of discussion of the basic concepts of WHR by leaders in the field of environmental design in nearly all the major educational textbooks. This dearth of information on what WHR is and how it can be used is puzzling given its relative simplicity and its potential power as an assessment and ecological design tool. Why might this be the case? The first speculative reason for this could be its regional nature, that WHR systems are place-based, meaning the WHR models apply to vegetation communities and land cover specific to a particular geographic region. The California WHR system was first released in the late 1980s (Mayer and Laudenslayer, 1988) with its precursor publication focused on the Sierra Nevada mountains by Verner & Boss (1980). California has one of the most advanced systems in the nation, though other geographic areas also have fairly well-developed systems such as the states of Oregon and Washington (see Johnson & O'Neil, 2001). Another speculative reason for the lack of WHR discussion in the textbooks in the field of environmental design is perhaps the concept and method is too 'new' since the first major books on the topic were published in the mid-1980s (Verner, Morrison & Ralph, 1984) and early 1990s (Morrison, Marcot, & Mannon, 1992). The next major publication in this research realm was entitled *Predicting Species Occurrences: Issues of Accuracy and Scale* (Scott, Heglund, Samson, Haufler, Morrison, Raphael, & Wall, 2002). I co-authored a chapter in that book showing how a WHR model could be used to retrospectively map (postdict) habitat quality over a 60-year time period (1937-1997) using a decadal interval, for an endangered bird species and quantify the shifting habitat mosaic on a large meandering river (Greco, Plant & Barrett, 2002).

In my unsuccessful quest to find the WHR topic in educational textbooks of the environmental design field, and in the field of landscape architecture in particular, I offer a brief critique, meant as constructive criticism for improvement of future textbooks. The closest description of the WHR concept I could find in the landscape architecture educational textbook literature was in Frederick Steiner's (2000) *Living Landscape* (second edition) in the section describing wildlife. The description did not use the term "WHR," however, and Steiner shows a good example of how different habitats are used for "eating" (feeding), "living" (cover), and "breeding" (reproduction) for each species presented in the species-habitat matrix (see Steiner, 2000, p. 104, 106). In the classic textbook by William Marsh (2010) there is no explicit discussion of WHR models or how to use them for designing habitat for wildlife; in the section on "Vegetation as a Tool in Landscape Planning and Design" (Marsh, 2010, p. 414-419) the concept of designing wildlife habitat is entirely missing, while seven other common themes are discussed mostly relating to human landscape functionality. The case study by John Rodiek and Tom Woodfin at the end of that chapter (in Marsh, 2010, pp. 423-426) entitled *Vegetation and Wildlife Habitat in Residential Planning, Central Texas* also does not mention WHR, but does discuss "habitat" in non-specific terms.

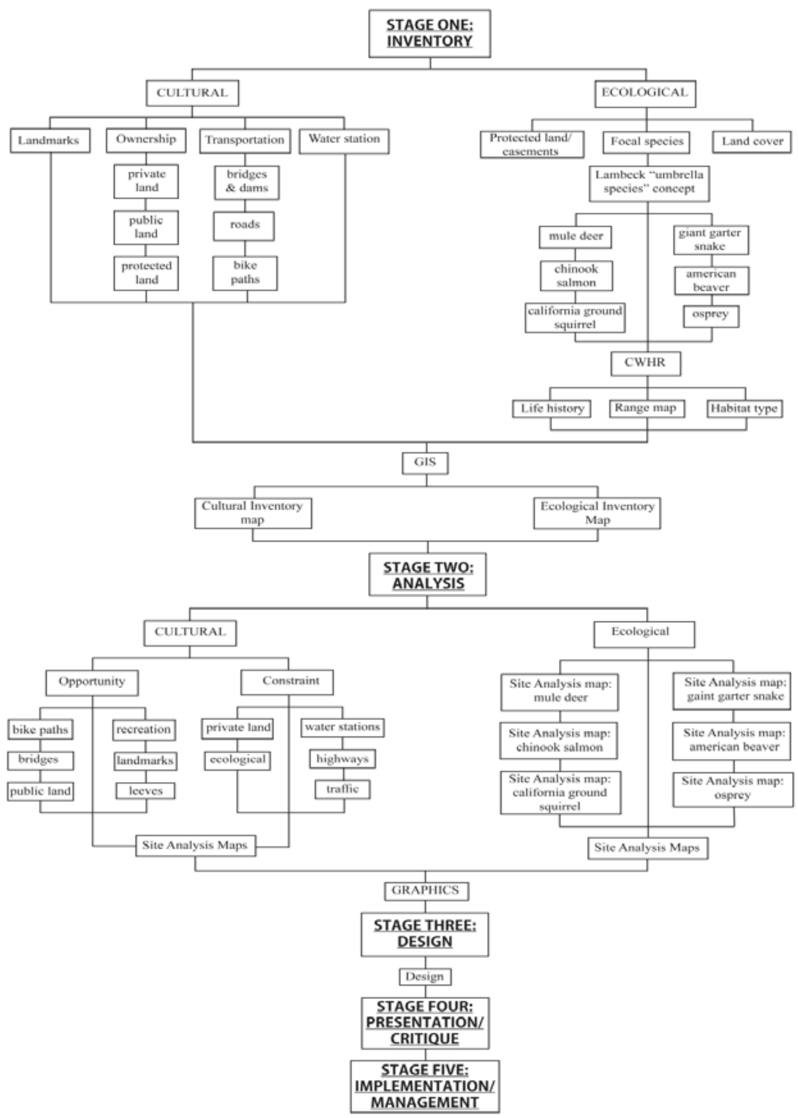


Figure 2: A dual track ecological-cultural design process for greenway planning and design. An example of student studio work (from Student Group 2012b).

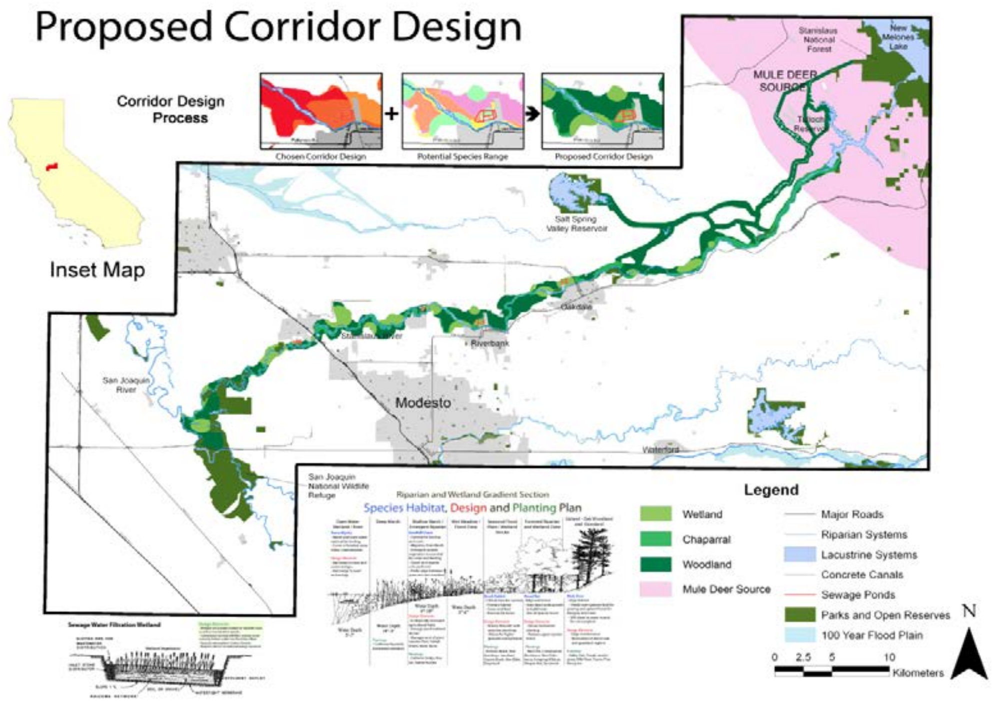


Figure 3: Master plan showing all phases of the ecological greenway on the Stanislaus River near the cities of Modesto, Riverbank, and Oakdale. An example of student studio work (from Student Group 2010).

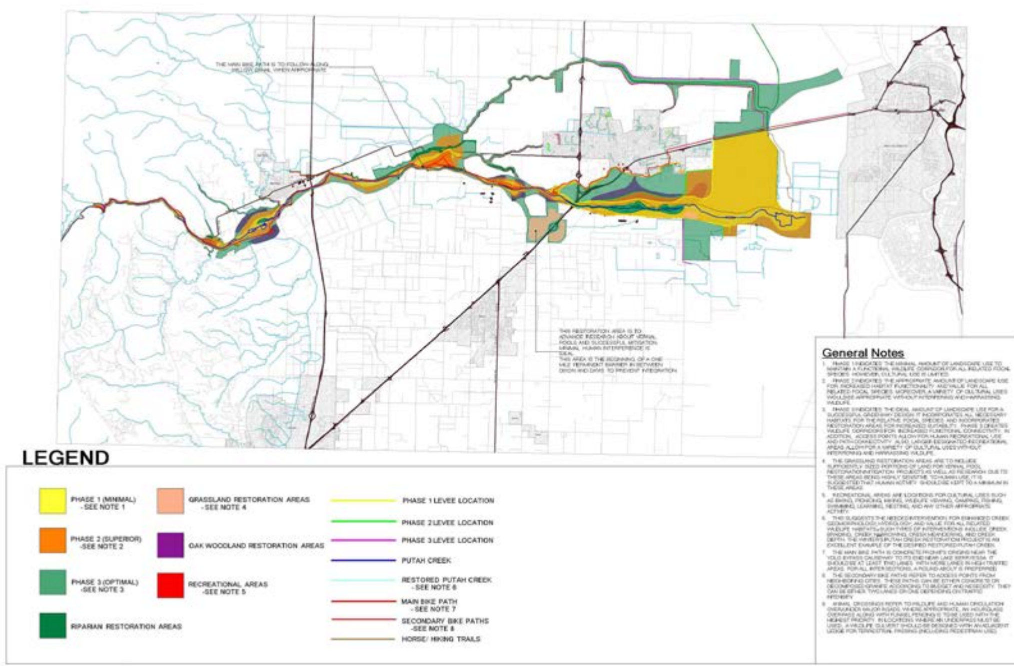


Figure 4: A master plan showing each phase (color) of the ecological greenway on Putah Creek near the city of Davis. An example of student studio work (from Student Group 2012b).

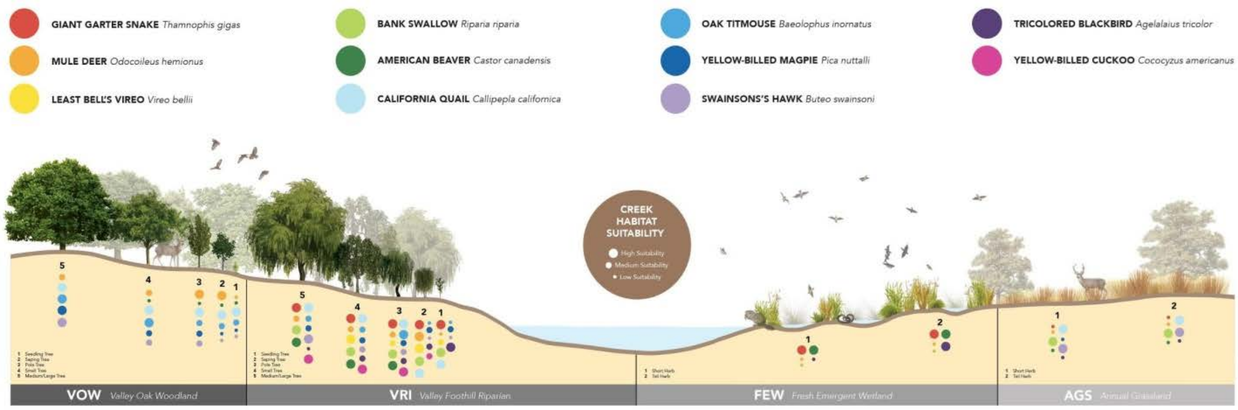


Figure 5: The interrelationships between different wildlife habitat relationships for 11 focal species for the Cache Creek greenway project. An example of student studio work (from Student Group 2015a).

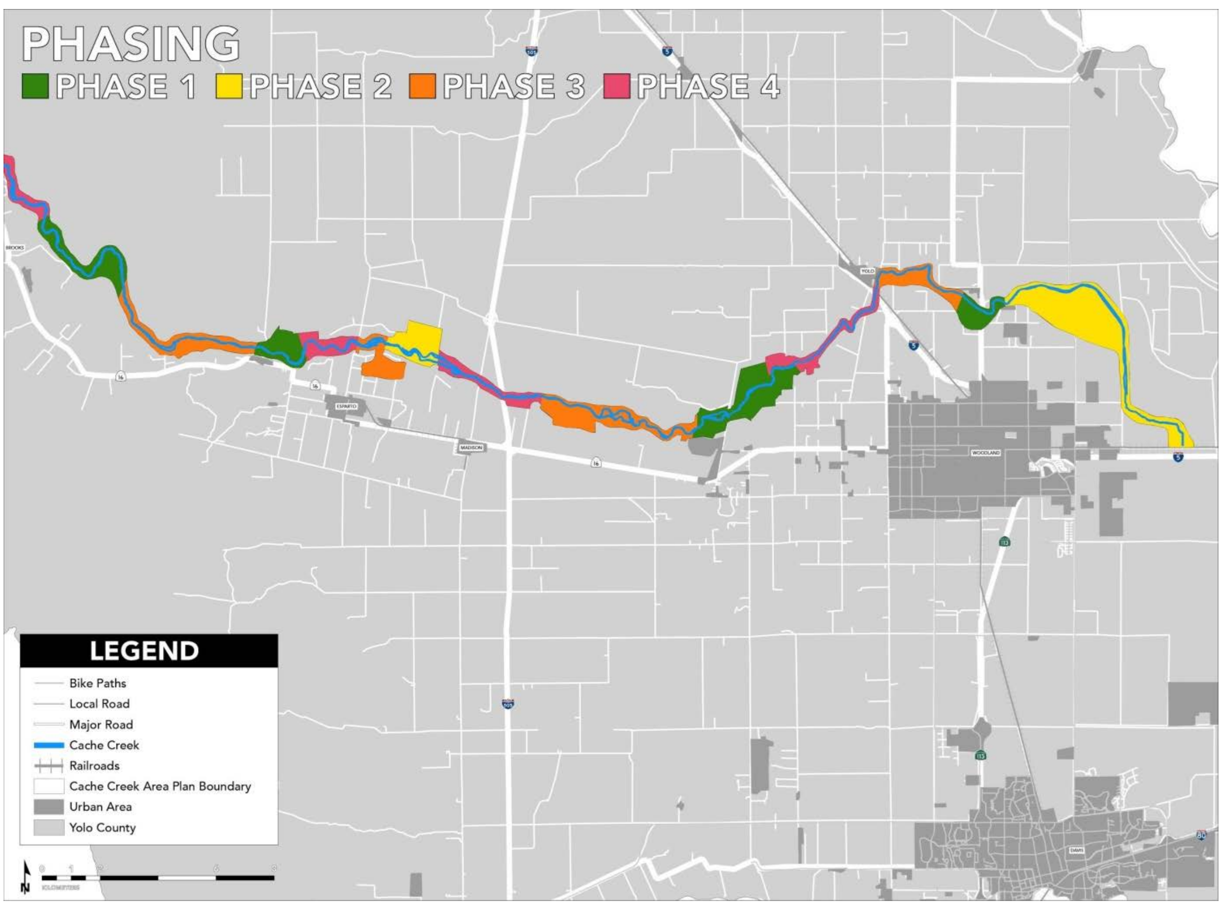


Figure 6: Master plan showing each phase (color) of the ecological greenway on lower Cache Creek near the city of Woodland. An example of student studio work (from Student Group 2015a).

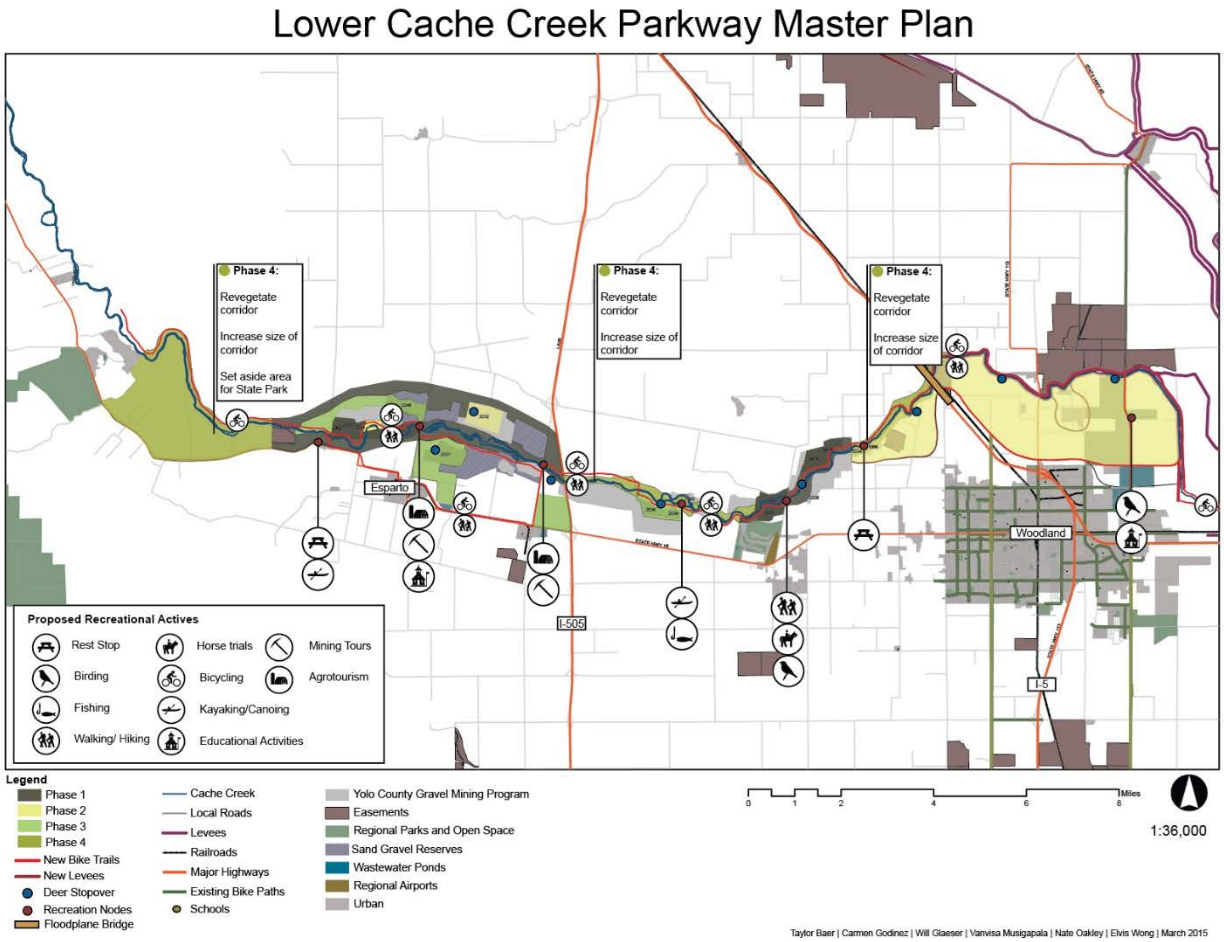


Figure 7: Master plan showing each phase of the ecological greenway and recreational opportunities in each zone on lower Cache Creek near the city of Woodland. An example of student studio work (from Student Group 2015b).

I was unable to find any references to the concept or use of WHR in Johnson & Hill's (2002) edited text on *Ecology and Design*. In Steinitz' (2002) contribution in that volume entitled, "On Teaching Ecological Principles to Designers," it is highly recommended that WHR modeling be added as a pedagogical objective in a core curriculum. The very useful mini-textbook entitled *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning* by Dramstad, Olson, & Forman (1996), as well as Forman & Godron's (1986) and Forman's (1995) landmark texts on landscape ecology, also do not explicitly discuss WHR concepts. In Peck's (1998) book on *Planning for Biodiversity*, wildlife habitat models are briefly mentioned but are not given in-depth treatment. And in terms of greenway design textbooks and articles, neither the Hellmund & Smith (2006) text nor the now out-of-print book by Flink & Searns (1993) address the concept of WHR. The final chapter in the Hellmund & Smith (2006) textbook, however, shows how species movement habitat criteria can be incorporated into the greenway design process, which is valuable.

A review of the greenway research literature similarly yielded little information about habitat design using the WHR concept and methods. The compilation of papers by Fabos & Ahern (1995) from the *Landscape and Urban Planning* journal in the book *Greenways: The Beginning of an International Movement* is an excellent resource, however, it too lacks a discussion of WHR models. A section in that book addresses "Ecological resources and nature protection in greenway planning" (Fabos & Ahern, 1995, p. 157) and contains six articles that discuss many complex planning and design processes that refer to habitat analysis, for example in Burley's (1995) study, and structure and function, such as the modified abiotic-biotic-cultural (ABC) strategy described by Mdibisi, DeMeo, and Ditto (1995), which appear to implicitly refer to WHR attributes of habitat. Interestingly, Burley (1989) published a paper that described the overall intent of HSI models but did not describe the underlying structure of WHR models.

In what seems somewhat paradoxical, as described above in the Introduction, there is some literature in the environmental design field that uses WHR models in a highly advanced form. An example of this is found in the book edited by Jongman & Pungetti (2004) entitled *Ecological Networks and Greenways: Concept, Design, and Implementation*. In that book a chapter by Verboom & Pouwels (2004) uses WHR models, again implicitly, to identify habitat for a suite of species to determine their population viability through time using the procedure known as LARCH (Landscape ecological Analysis and Rules for the Configuration of Habitats). Similarly, Ndubisi (2002) describes the use of the modeling systems LARCH and LANDEP (Landscape-Ecology-and-Optimization method) that use some form of WHR models at their core. Unfortunately, none of these articles, books, or book chapters describe the underlying WHR concept in its basic form or how it's used. It seems an assumption is made that the reader already understands the structure and use of WHR models and those models are then used to model habitats in a more or less black-box form and results are presented as maps or analyses.

From the discussion above there appears to be a pedagogical need for a middle ground description of the WHR concept and its application for habitat design for landscape architecture and environmental planning students at the undergraduate level. I have integrated the WHR concept into the curriculum of my undergraduate *Site Ecology* course (a combination of general ecology and site planning) and the advanced planning and design studio course that produced the results in this paper.

It is important to note that existing WHR systems are still evolving and being refined over time and new WHR systems are being invented for more geographic regions around the world. WHR is a descriptive method and it is important to understand its limitations. For example, WHR models alone can only describe species spatial distribution and *not* abundance (Jennings, Csuti, & Scott, 1996). More advanced habitat evaluation systems use WHR as an input and build upon it, such as LARCH, which can add other parameters such as home range size, or territories, to estimate carrying capacity and population viability. The California WHR system, CWHR, is a well-developed database that describes habitat vegetation composition, vegetative structural attributes (i.e., size and density), and habitat elements, however, as previously noted, the CWHR system lacks specifications for habitat spatial configurations, such as minimum patch size or corridor width. An improvement to the CWHR system would be the addition of a fourth habitat life requisite in addition to feeding, cover, and reproduction habitat. The fourth life requisite is 'movement habitat' and each habitat type/structural class in the system would be rated for each species for movement suitability or as a "cost" to movement (sometimes defined as $1 - x$, where x is the habitat suitability value for a particular land cover type). An example of this approach to model habitat connectivity to facilitate species movement was used in a study at the Stanislaus River site near Riverbank, California (Huber, Shilling, Thorne & Greco, 2012).

6 CONCLUSION

Understanding the basic concept of WHR modeling is an important planning and design skill for landscape architects and environmental planners. It is a tool that helps implement landscape ecological theory and island biogeography theory. WHR has powerful applications in habitat design and conservation planning and should not be a technique that only wildlife biologists use and conduct research in. The theory and methods of WHR modeling are unfortunately absent, for the most-part, from the educational textbooks in the field of landscape architecture and environmental design. In future revisions of these textbooks the concept should be included and examples provided.

This paper demonstrates that WHR concepts can be taught to undergraduate students and the students can design regional greenways using these and complementary methods. By using WHR methods the resultant greenway designs are more likely to perform the ecological functions intended: to provide feeding, cover and reproductive habitat for a selected set of focal species.

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Hannah Levy, Kelly Matheson, & Gary Ng. **Student Group 2012b** (Studio class LDA 181F): Micheline Chagniot, Carson Cooper, Hoang-Lan Nguyen, Gabriel Munoz, Brooks Taylor, & Ying Ying Zhong. **Student Group 2015a** (Studio class LDA 191): Evelyn Chang, Jonathan Chavarria, Bernice Guintu, Leslie Lung, & Sean Vang. **Student Group 2015b** (Studio class LDA 191): Taylor Baer, William Glaeser, Carmen Godinez, Vanvisa Musigapala, Nathaniel Oakley, & Elvis Wong.

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THE MIASMIST: GEORGE E. WARING, JR. AND THE EVOLUTION OF MODERN PUBLIC HEALTH

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1 ABSTRACT

George E. Waring, Jr, developed an influential manual in 1867 entitled Draining for Profit, Draining for Health*, reflecting two particular obsessions of the gilded age—wealth and miasma. Waring supported the long-held miasma, or anti-contagionist, theory, insisting that diseases were spread through the air, emerging as a poisonous vapor from damp soil. By the 1880s, the new contagionist theory of the germ was gaining European support, yet Waring remained a lifelong miasmist, supporting the anti-contagionist movement in the United States. He applied his technical knowledge of farm drainage to an urban theory of public sanitation, beginning with the drainage plan for Central Park in 1856, continuing with studies for Memphis and Havana, and culminating with the Department of Street Cleaning in New York City. Though Waring conducted his work on scientifically unsound precepts, his conclusions regarding drainage were correct. Waring is an important yet unsung hero of urban environmental history; his significant body of primary texts are worth revisiting to enhance current urban green infrastructure practices in the landscape architecture profession. Given the miasmists' interest in urban disease transfer, particulary the spread of cholera and yellow fever, Waring's emphasis on the sanitation of the physical environment is worth reassessing in light of current public health issues arising from the impact of climate change and the rise of vector-driven diseases such as Zika and dengue. Waring's environmental emphasis on clean water, air, and soil reflects a contemporary vision of improving public health by reducing urban impacts on the atmosphere and waterways.*

1.1 Keywords

George E. Waring, Jr., Central Park, public health, green infrastructure, drainage, miasma, contagionism

2 THE SCIENTIFIC MANAGEMENT OF FARMS

Colonel George E. Waring, Jr. was born in Pound Ridge, New York in 1833, the son of an industrialist father who ran a successful foundry in Samford, Connecticut, manufacturing stoves and agricultural tools. (See Figure 1.) Young Waring was educated as an agricultural scientist, avidly reading the current scholarship from Europe about new farming practices. He wrote his first technical manual, *The Elements of Agriculture: A Book for Young Farmers,* in 1853 and lectured widely at regional farmer clubs in New England. In 1855, he moved to Chappaqua, New York, to manage the farm of the editor of the *New-York Tribune*, Horace Greeley, a New York congressman and a one-time presidential candidate. Greeley, like many gentleman farmers of the period, dabbled in experimental agriculture on his Chappaqua farm, writing about these techniques in his popular weekly column in the *Tribune*, attracting a vast number of readers from rural America. Greeley also constructed an unusual concrete barn on the property, naming it the Rehoboth. This was one of the first concrete structures in the United States, and it drew visitors to Chappaqua from far away—indeed, Greeley wrote that he considered this barn his life's finest accomplishment.[1] Waring's work with Greeley as farm manager gave him the opportunity to experiment with the novel techniques and tools of field drainage that he later developed into the influential manual of 1867 entitled *Draining for Profit, Draining for Health*, a lovely title reflecting two particular obsessions of this gilded age—wealth and miasma. The long-held miasma theory held that the origin of disease was in the air, emerging as a poisonous vapor from rotting organic matter or the soil. By the 1880s, strong support of the new contagionist theory of the germ was gaining support in Europe, yet Waring remained a lifelong miasmist and supporter of the anti-contagionist movement in the United States. And along the trajectory of his career from farm manager to drainage engineer to urban public health advocate, Waring's mechanistic battle against miasma was waged at multiple scales, from the rural farm to the large urban park to the entire city.

The importance of Waring's early work in agricultural drainage and its adaptation to the urban sphere as part of a comprehensive battle against disease transmission, particularly mosquito-borne yellow fever, is well worth revisiting as a significant contribution to a holistic view of environmental history and its beginnings in the late nineteenth century. Public health and adaptation to climate change are both critical issues of the twenty-first century and significant fields for engagement by landscape architects. New experimental urban green infrastructural practices addressing these issues would benefit from a contemporary examination of Waring's innovative contributions, both the unexpectedly successful strategies—for example, the reduction of standing still water that supports mosquito larvae—as well as those best viewed with a cautionary lens, such as the complete drainage of intertidal wetlands for urban development.

Figure 1. Colonel George E. Waring, Jr., full-length portrait, seated facing slightly left, 1897. Source: United States Library of Congress.

3 THE MECHANIZATION OF CENTRAL PARK, NEW YORK

Waring's career was significantly transformed from that of an agricultural scientist to an urban public health advocate upon meeting Egbert L. Viele (1825-1902), a West Point graduate and civil engineer. Viele is well known for his highly detailed 1865 *Sanitary and Topographical Map of the City and Island of New York,* colloquially known as the "water map" of Manhattan, a topographic overlaid with the Commissioners' Grid of 1809 and identifying the historic streams, marshes, meadows, and "made land" that transformed the shoreline of Manhattan, along with the city's main sewer lines. The map was prepared for the report of the Council of Hygiene and Public Health of the Citizens Association. But Viele had produced earlier surveys of Manhattan as well. In 1853, just after the City of New York legislated the Central Park Act, identifying as public land the parcel that was to become Central Park, Viele began a survey of this terrain, described in the Act as the land "bounded southerly by Fifty-ninth-street, northerly by One Hundred and Sixth-street, easterly by Fifth Avenue, and westerly by Eighth-avenue."[2] (See Figure 2.)

In 1856, Viele was appointed Chief Engineer of the future park by the First Central Park Board of Commissioners. Viele, himself an ardent miasmist, embraced the well-known "ground water theory" of disease developed by the German scientist Max Joseph von Pettenkofer (1818-1901) in the 1850s. Believing the cause of disease and fevers to be the result of noxious odors emitted from excess moisture in the ground, Viele prepared a preliminary drainage plan for the park from 1856 through 1857, an eleven-foot-wide drawing entitled *Plan of Drainage for the Grounds of the Central Park.* In August 1857, 24-year-old George E. Waring Jr. was hired by Viele as his Superintendent of Drainage—Waring assisted with the development of this drainage map and insisted, to the apparent annoyance of Viele, that his name be added to the title. [4] Shortly afterward, in September 1857, Frederick Law Olmsted was appointed by the Board of Commissioners as Superintendent of Central Park, reporting to Egbert Viele, Chief Engineer.

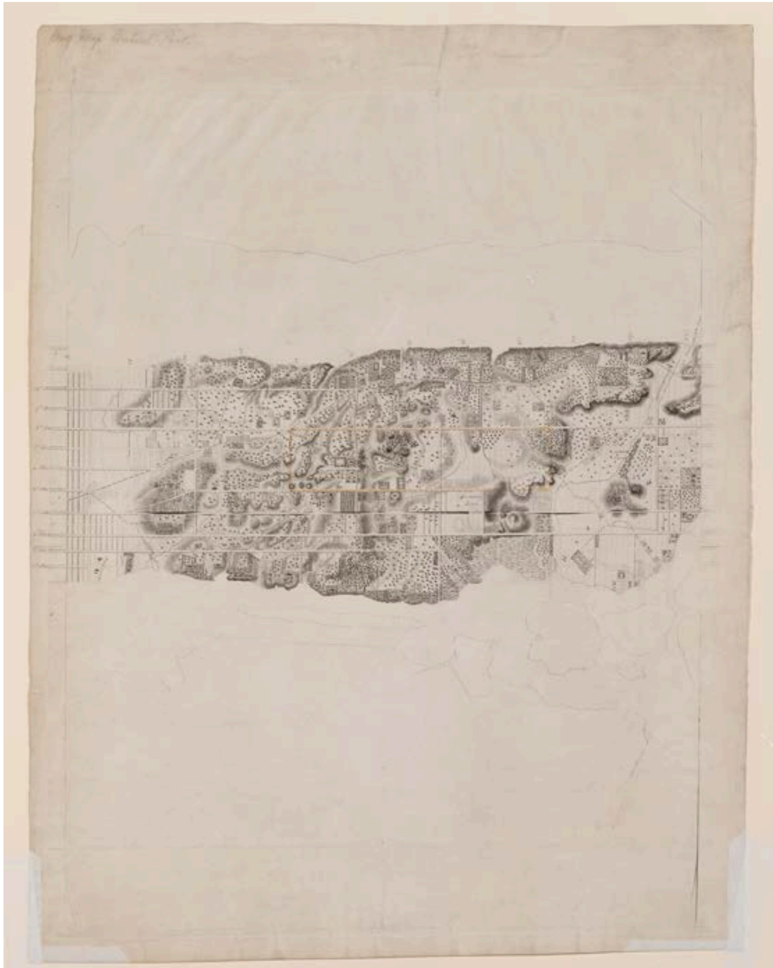

Figure 2. David H. Burr, cartographer. *Topographical Map of the City and County of New-York,* c. 1836. The location of the parcel of land designated as Central Park was outlined in a sepia wash c. 1858. Source: Metropolitan Museum of Art, Harris Brisbane Dick Fund, 1924. Accession Number: 24.66.1492. www.metmuseum.org

Waring's new title and role, Superintendent of Drainage, may seem unusual for a project to construct a public park. But the very idea of Central Park was developed to provide much more than a place of recreation and open space within the city—those initial 778 acres were part of a carefully constructed argument to combat disease in an increasingly crowded city. Indeed, the park was seen not as a captured piece of unspoiled "nature," as it is often characterized, but rather conceptualized as a massive air, water, and ground cleansing machine that would restore health to its urban citizenry.

At this same time, medical science, until the transformative European germ-theory discoveries of Robert Koch and Louis Pasteur in the 1870s and 1880s, still held that epidemic diseases such as cholera, typhoid, and yellow fever were caused by a noxious miasma, a word deriving from the ancient Greek Μίασμα, or 'bad air,' emerging from rotting organic matter in the ground. The miasma theory was further developed in the nineteenth century by the British sanitarian Edwin Chadwick, who posited that diseases were caused by a place, by an environment, by an odor—not by another infected person or agent. And that place, identified by its foul smell, was one with contaminated water, poor hygienic conditions, and decomposing organic matter. Pettenkofer and others believed it developed in deep wet ground as a poison, emerging as a diseased ground exhalation. Thus, in late nineteenth-century New York, the medical miasmists gave rise to this position of Waring as Superintendent of Drainage, transforming him from an agricultural engineer into an urban sanitary engineer. Waring drew on his agricultural knowledge of farm drainage and tiling and applied it to an urban park on a massive scale. He would mechanically transform the nature of this ground from its existing hydrology into a gravity-fed hydraulic system, quickly shedding and transporting surface and ground waters from the territory of the park.

In September 1857, the First Board of Commissioners of the Central Park requested that its new Central Park Superintendent, Frederick Law Olmsted, provide a comprehensive plan for draining the land of the park. This request came just one month prior to the launch of the competition for the design of the new Central Park, advertised in October 1857. Olmsted, ever strategic, knew the terrain well thanks to Viele's comprehensive topographic survey. He responded to this request, the first since his appointment as Superintendent, by stating the following:

> "Owing to the exceedingly diverse character of the ground, the great amount of rock, both above and below the surface, with which it is encumbered, and its numerous springs, hidden and superficial, a detailed plan of drainage for the Central Park could only be formed after such a careful study as a proper attention to the ordinary duties of my office forbids me at present to give to the subject. The depth and direction of the drains must be, in many cases, also, adjusted to the elevation of the brooks, cascades, and standing water, which will be established solely on artistic grounds, as well as to the roads which may be lain out. Until therefore, a complete plan of the Park shall have been definitively determined on, I think it would be unwise to carry a consideration of the drainage-plan beyond the adoption of certain fundamental rules, to which even the landscape design should be subordinate."
> (Olmsted 1857, in Beveridge and Schuyler, eds. 1983: 94)

Olmsted goes on to insist upon these fundamental rules of drainage: the drainage of the park should be "thorough," meaning a completely comprehensive system of underground drainage tiles, a "mechanical improvement" removing all excess water; the drains themselves should be ceramic tubes of one-inch diameter and greater, in sections laid end to end; and the drains should be set at a depth of three feet in the open glades and at a depth four feet in the wooded areas, and in both cases spaced fifteen feet apart.

A month after writing this letter to the Commissioners, Frederick Law Olmsted and Calvert Vaux entered the competition to improve and expand New York's Central Park. In April 1858, their Greensward Plan was selected as the winning entry. Viele would become Olmsted's frustrated rival, while Waring would continue to work closely with Olmsted, developing a close relationship with him and even renting his family farm on Staten Island. Olmsted and Vaux's Greensward Plan won on the grounds of artistic achievement. Viele also submitted a proposal to the competition, but lost. Indeed, Viele's submission to the competition was dismissed by Clarence Cook as being "just such a matter-of-fact, tasteless affair as is always produced by engineers, when they attempt anything in the way of ornamental design." (Cook 1869: 25) Shortly after selecting the submission of Olmsted and Vaux, the Commissioners dismissed Viele and promoted young Waring, who had assisted Viele on his earlier drainage plan for Central Park, as the new Drainage Engineer for the execution of the Greensward Plan.

Immediately upon the award of the commission for the Greensward Plan, Olmsted began implementing "thorough" drainage based on the new plan drawn by Waring. The Second Annual Report of the Board of Commissioners of the Central Park, published in January 1859, includes a beautiful drawing entitled *Map of the Drainage System on Lower Part of the Central Park as far as completed up to December 31st, 1859.* (See Figure 3.) In this drawing, which includes the southern section of the park from 59th Street to the 66th Street transversal road, major rock outcrops are identified with topographic shading, lawns are lightly shaded, and paths are left unshaded. The red lines represent the tile drains, red circles are the silt basins, and the heavy black lines indicate the sewers. In Olmsted's words, the park is "mechanically improved." Olmsted later described Waring as the man who "planned and superintended the work of agricultural drainage, superficial and thorough, upon the Central Park from the outset. I believe it to be the best work of the kind in the world. The difficulties he met were great and various and the experience acquired in overcoming them must be very valuable for any similar undertaking." (Olmsted 1860, in Beveridge and Schuyler, eds. 1983: 105)

Figure 3. George E. Waring Jr., drainage engineer, and H. Bieringer, assistant engineer. *Map of Drainage System on Lower Part of the Central Park as far as completed up to December 31st,* 1858. Lithograph from the *Second Annual Report of the Board of Commissioners of the Central Park,* January 1859. Source: Collection of the New-York Historical Society. Call no. NS12 M9.2.41, Neg #80370d. Photography © 2015, New-York Historical Society.

4 THE MEMPHIS SYSTEM AND THE MOSQUITO

In 1861, after completing his work on the Central Park drainage network, Waring enlisted in Union Army at the onset of the Civil War, accepting a commission as a Major in the 4th Missouri Calvary. He was promoted to the rank of Colonel in 1862. After the end of the war in 1865, Waring returned to Rhode Island and his career of farm management and treatise writing, but continued to expand and focus his work on sanitary engineering. (Melosi, 1977) Waring began by advocating sewerage within the individual house, then expanded this theory to advocate for the necessity of cleansing entire communities in order to prevent disease.[5] Pure air, pure water, pure soil: this was the "sanitary idea" as presented by Edwin Chadwick in 1828, borrowed from the ancient Hippocratean ideal, and was to be considered at the scale of the city. Waring landed the opportunity to test sanitation at an urban scale in 1878, after the devastating yellow fever epidemic in Memphis, Tennessee that infected around 17,000 people and killed over 5000. Appointed by President Rutherford B. Hayes as a Commissioner working with the National Board of Health, Waring was charged with creating a plan for the sanitary improvement of Memphis. He proposed a complete sewerage system—his work for the "thorough" drainage of Central Park was now expanded to a city scale. Interestingly, Waring championed and installed a separate sewage system—the alternative to the combined sewage system and its overflows that are still the environmental plague of large urban cities such as New York and Chicago. Waring claimed that his separate sewer system, the "Memphis" system, had banished yellow fever from Memphis.[6] Though better drainage did keep waste water away from drinking water wells, yellow fever was not in fact spread by inadequate sanitation, but by the *Aedes* or *Haemagogus* species mosquito, which breeds in stagnant water. But this connection had not yet been established, and for now, Waring won a battle in Memphis in the ongoing debate between the contagionists and the miasmists. And indeed, much of today's focus on developing new urban green infrastructures, such as bioswales and constructed wetlands, is intent on reducing the negative impacts of the combined sewer systems that discharge wastewater directly into rivers and oceans when overwhelmed by storm water from heavy rains. Infiltration is the key element of these green infrastructures—but here the difference between Waring's tiling and sewering and the current green infrastructural practices advocating absorption and evapotranspiration is revealed.

5 THE WHITE WINGS OF NEW YORK CITY

In 1894, Waring was appointed Commissioner of the Department of Street Cleaning of the City of New York, the predecessor of today's Department of Sanitation. Waring radically and aggressively reformed the department, outfitting the men in white canvas uniforms, updating the street-cleaning and garbage collecting equipment, and establishing military-like discipline. (See Figure 4.) Under his leadership, and in the name of health and cleanliness, the streets of New York were cleared of waste in daylight hours by this new corps of streetcleaners, the "White Wings." Waring established new practices, including the separation of trash at each household (organic garbage, ashes, and rubbish), a rubbish-sorting plant, a reduction plant at Barren Island, and land reclamation at Rikers Island. Waring wrote of his department:

> "An inefficient and ill-equipped working-force, long held under the heel of the spoilsman, has been emancipated, organized, and brought to its best. It now constitutes a brigade three thousand strong, made up of well-trained and disciplined men, the representative soldiers of cleanliness and health, soldiers of the public, self-respecting and life-saving. These men are fighting daily battles with dirt, and are defending the health of the whole people. The trophies of their victories are all about us—in clean pavements, clean feet, uncontaminated air, a look of health on the faces of the people, and streets full of healthy children at play."
> (Waring 1896: 190)

Figure 4. A White Wing street sweeper with his handcart, 1896. These wheeled carts were designed by Waring's wife, Emily Waring. Source: New York Public Library.

His efforts were successful. The streets of New York, once shin-deep with waste, were swept clean on a regular schedule. In 1896, Waring orchestrated a grand parade of his sanitation men in their white uniforms and helmets down Fifth Avenue—he led the parade, astride a white stallion. Though his position as Commissioner ended in 1898, his innovative reforms led to permanent improvements in the street cleaning and garbage collection services in New York, and served as an example for many other cities. It was the miasma theory at its finest–anti-filth, clean, and pure white.

6 HAVANA

In 1898, at the end of the Spanish American War, the United States Army commanders were concerned with the risk of yellow fever to the troops that would be occupying post-war Havana. Indeed, it was this fever which had caused most of the American casualties during the war. Waring was appointed by President William McKinley as the chairman of the Commission charged with making suggestions for the proper sanitation of Havana and the army camp sites in Cuba, and he arrived in Havana in October 1898. He surveyed Havana for three weeks, noting the extensive marshes, its lack of sewers, the abundant filth and garbage in the streets, and the lack of any street cleaning or garbage disposal plan. Drawing on this work for both Memphis and New York, Waring drafted a proposed set of recommendations during his return trip to the United States, including the construction of a complete sewerage system, extensive street paving, thorough marsh drainage, and the organization of a Department of Public Cleansing.[7]

The day after his return to New York, Waring contracted a fever. He died of yellow fever four days later, at the age of 65, on October 23, 1898. Public health officials in the city, now adhering to the contagion theory of disease transmission, required that his body be placed in a hermetically-sealed metallic casket and transported by a quarantine boat to Swinburne Island in New York Harbor, where his remains were cremated.[8]

7 LESSONS LEARNED FROM THE MIASMIST

Did Waring's death ironically demonstrate the futility of the miasma theory? Though it appears the contagionists may have won the final battle, Waring's death by yellow fever was not in fact caused by a contagious disease transmitted person-to-person. There was no need for such extraordinarily careful handling of his remains. Two years after his death, in August 1900, the United States Army physician Walter Reed proved that yellow fever was spread by a bite from an infected *Aedes aegypti* mosquito—now known as the yellow fever mosquito, this is the same mosquito that is the main carrier of the Zika virus, along with its cousin the Asian tiger mosquito, *Aedes albopictus*. (See Figure 5.) In addition to the Zika virus, other threats from these species of mosquitos include the West Nile virus, dengue fever, chikungunya, and several types of encephalitus.

Waring and other miasmists' focus on the visible environmental factors of disease control were somewhat on the right track—although they did not realize that the importance of draining for health was to eliminate the breeding grounds of the vector of a disease-causing virus—the mosquito—not to purge the noxious exhalations of the earth. Today, international health officials struggling to contain the spread of the Zika virus advise citizens to remove or cover containers or rain gutters that might collect standing water—spraying larvicide over nonresidential areas, which has environmental complications, is not a particularly effective tactic against *Aedes aegyptii*, as this species breeds primarily in gardens and homes.

Yet certainly the consequences of removing all standing water, when expanded to the agricultural or urban scales addressed by Waring, must be carefully considered by today's health officials, landscape architects, and environmental advocates. The "thorough" drainage of swamps, as advocated by Waring in the 19th century and as practiced in the early 20th century as a mosquito control measure, resulted in serious environmental degradation due to the destruction of valuable wetland ecosystems. These same wetlands, though indeed providing potential mosquito breeding areas and habitat, also support the predator species that contain mosquito populations. Robust salt marsh wetland systems do not maintain ponded standing water, but support intertidal flow. The extensive "mosquito trenching" of urban wetland areas through the creation of open ditches, a practice common in the early 20th century, has had serious detrimental impacts on the integrity of the salt marsh complex. First employed in the intertidal salt marsh complexes of New York City's Jamaica Bay and Staten Island, as a mosquito eradication technique, the implementation of these V-shaped anti-mosquito ditches to drain the marshes of standing water resulted in massive marsh fragmentation and degradation.[9]

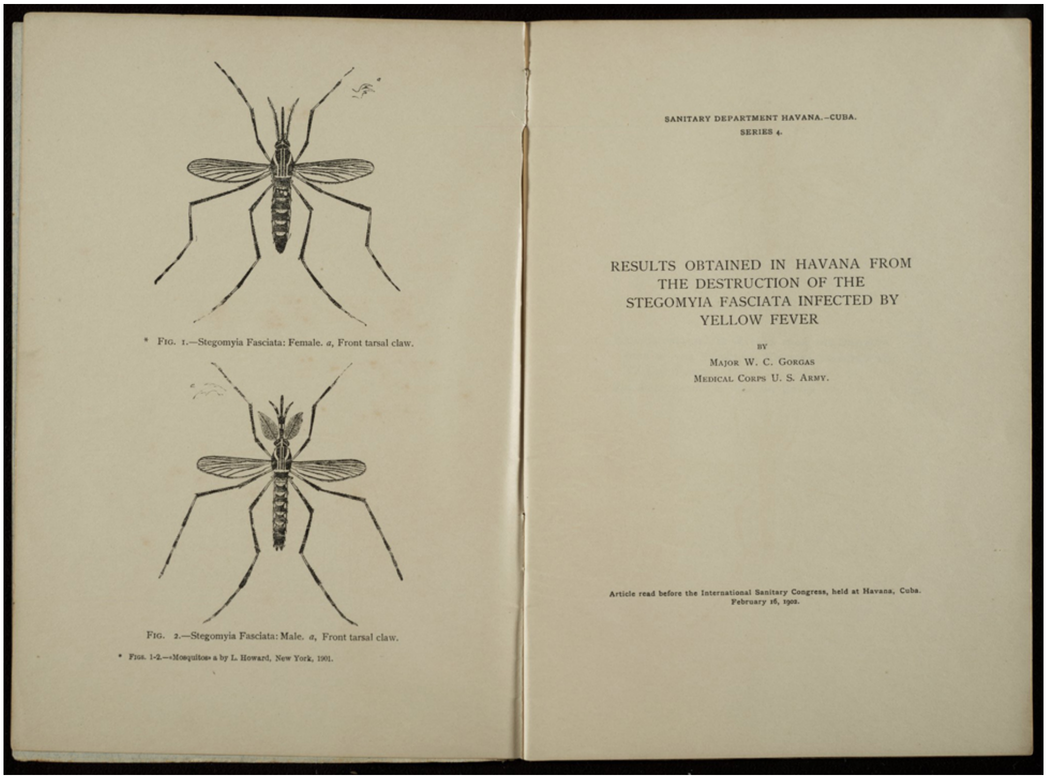

Figure 5. Frontispiece of the 1902 report entitled *Results Obtained in Havana from the Destruction of the Stegomyia Fasciata Infected by Yellow Fever.* Source: US Army Medical Corps.

Though the theory of miasma was disproven by the success of germ theory in the early twentieth century, the miasmists, particularly George E. Waring, Jr., failed brilliantly in the urban realm, leaving an extraordinary legacy for urban design and planning, landscape architecture, and the continuing development of new forms of urban green infrastructure. The miasmists' focus on an improvement of the visible environment developed into contemporary urban public health strategies supporting a cleaner, healthier planet as well as healthier inhabitants. Much can be learned from the miasmists and applied to today's novel conditions, addressing issues that will continue to emerge with climate change. Waring developed a fascinating mechanical park, an atmospheric scrubber and carbon sink. His reforms at the Department of Street Cleaning in New York City led to modern practices of recycling and waste reduction. His separated sewer system at Memphis remains a conceptually radical alternative to the antiquated combined systems that discharge raw sewage into adjacent waterways with each moderate to heavy rainfall. A contemporary interpetation of the miasmists' emphasis on clean water, clean air, and clean soil reflects a shared landscape ethic—not simply a singular concern addressing disease transmission, but a series of strategies for reducing the environmental impact of urban actions on the atmosphere, waterways, and planet.

8 ENDNOTES

1 For more on Greeley's experimental agricultural practices, with an extensive discussion of the concrete barn and strategies of drainage, see Horace Greeley (1871), *What I Know of Farming: A Series of Brief and Plain Expositions of Practical Agriculture as an Art Based upon Science* (New York: The Tribune Association).

2 Waring argues for thorough land drainage wherever possible, stating, 'Land which requires drainage hangs out a sign of its condition, more or less clear, according to its circumstances, but always unmistakable to the practiced eye. Sometimes it is the broad banner of standing water, or dark, wet streaks in plowed land, when all should be dry and of even color; sometimes only a fluttering rag of distress in curling corn, or wide-cracking clay, or feeble, spindling, shivering grain, which has survived a precarious winter, on the ice-stilts that have stretched its crown above a wet soil; sometimes the quarantine flag of rank growth and dank miasmatic fogs.' See more in George E. Waring, Jr. (1867), *Draining for Profit, and Draining for Health* (New York: Lovejoy and Son).

3 The Central Park Act of 1853 and the delineation of this parcel of land is cited by Morrison H. Heckscher (2008), *Creating Central Park* (New York: The Metropolitan Museum of Art and New Haven: Yale University Press), 15. The precision of these boundaries and dimensions were predicated on siting the existing rectangular Receiving Reservoir, another hydraulic mechanism, at the exact center of the park.

4 See Benjamin Miller (2000), *Fat of the Land: Garbage in New York* (New York: Four Walls Eight Windows) for an account of the tense relationship between Viele and the younger Waring.

5 Waring was an early American proponent of the British-designed 'earth closet,' an alternative to the increasingly popular 'water closet,' which he claimed, in true miasmist style, could pose dangers to human health because of the noxious sewer gas which the defective units produced. For more on the earth closet, see George E. Waring, Jr. (1868), *Earth Closets: How to Make them and How to Use Them* (New York: Tribune Association). Later Waring wrote the influential 1884 *The Sanitary Drainage of Houses and Towns* (Boston: Houghton, Mifflin and Company), a book much admired by Olmsted.

6 For a full account of the seweraging of Memphis, see James H. Cassedy (1962), 'The Flamboyant Colonel Waring: An Anti-contagionist Holds the American Stage in the Age of Pasteur and Koch,' *Bulletin of the History of Medicine,* Volume 36, March-April 1962, pp. 168-170.

7 For a summary of Waring's incomplete report on Havana, drafted on his return trip to New York, see Albert Shaw (1899), *Life of Colonel George E. Waring, Jr.: The Greatest Apostle of Cleanliness* (New York: Patriotic League) and George Everett Hill (1898), "Colonel Waring on the Sanitation of Havana," *The Forum* 26: 529-546.

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Landscape Research Record No. 5

PEOPLE-ENVIRONMENT RELATIONSHIPS

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CREATING OUTDOOR PLAY ENVIRONMENTS TO SUPPORT SOCIAL INTERACTIONS OF CHILDREN WITH AUTISM SPECTRUM DISORDER; A SCOPING STUDY

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1. ABSTRACT

Autism Spectrum Disorder (ASD) is a developmental disorder characterized by impairments in social interaction and gestural communication. Various play-based interventions have been used to help children with autism develop social skills. Interventions that consider how children play, instead of the final outcome of the play session, seem to be more effective in addressing each child's needs. But because children with autism display a large range of variability the results of play interventions are usually very unpredictable. Research suggests that play environments for children with ASD need to be structured in order to be effective and structured teaching strategies are often used in the absence of well-structured environments. However, well-designed outdoor play environments may provide the necessary structure to support social interactions, creating an important place where children with ASD can learn social skills through play. The purpose of this study is to explore best practice outdoor play environment design strategies that support the social skills development of children with ASD.

To do so, a scoping study was conducted to review the literature involving children with ASD, outdoor play environments, and social skill development. Scopus, Google Scholar, and EBSCOHost were searched followed by ancestral and descendent searches. While there are few studies specific to outdoor play environments, the numerous studies examining the play behaviors of children with ASD can be categorized into four primary areas of impacted development: low motor skills and coordination, sensory integration, generative play, and joint attention. Addressing these four primary areas of impacted development in the design of the outdoor play environments likely plays an important role in creating spontaneous and pleasurable play opportunities for children with ASD, and may well support social interactions, creating an important place were children with ASD can develop social skills through play.

1.1 Keywords

Play, autism spectrum disorder, social interaction

2 BACKGROUND

Play is a spontaneous, pleasurable and enjoyable act, which has no goal imposed from the outside (Garvey 1977; Jordan 2003; Mastrangelo 2009; Wolfberg and Schuler 1993). Yet, play is a crucial part of childhood promoting cognitive, physical, social and emotional well-being (Ginsburg 2007). Through play children learn to develop more complex functions and gradually master their behaviors and acquire social skills (Tsao 2002). Play is particularly important for social skills development.

Autism Spectrum Disorder (ASD) is one of the most prevalent developmental disabilities, estimated to be between 1% and 1.5% of the world population (CDC 2014), and the fastest-growing developmental disability (CDC 2008). ASD is a developmental disorder characterized by impairments in social interaction and gestural communication (Baron-Cohen Leslie, and Frith 1985; Ingersoll and Schreibman 2006). Even though children with ASD display a large range of variability in intellectual functioning they are usually characterized by repetitive and stereotyped behavior, verbal delays, aggressive or self-injurious behavior, obsessive routines and rituals, fear of change in the environment, and atypical responses to sensory stimuli (Folstein and Rosen-Sheidley 2001; Gillot, Furniss, and Walter 2001; Mastrangelo 2009). In addition, deficits in reciprocal social interaction and communication in children with ASD create special challenges in initiating and maintaining play as the children are usually unable to relate to others and understand social cues (Jordan 2003; Bruinsma, Koegel, and Koegel 2004; Mastrangelo 2009). The acquisition of social skills does not occur naturally among many children with ASD (Harper, Symon, and Frea 2008).

Various play-based interventions have been used to help children with autism develop social skills. Interventions considering how children play instead of the final outcome of the play session seem to be more effective in addressing each child's needs. But because children with autism display a large range of variability, the results of play interventions are usually very unpredictable (Bass and Mulick 2007; Mastrangelo 2009). Therefore, applying a multiple method approach appears to be the most effective way to support play behavior for children with autism spectrum disorder.

Mastrangelo (2009) describes two general play-based intervention approaches used for children with ASD's social skill development, as well as other developmental goals; a behavioral approach focuses on structured planned interventions that rely on behavioral principles for learning, and a developmental approach. Developmental approaches emphasize incidental teaching during child-led interactions (Mastrangelo 2009). Highly structured behavioral-based interventions have been proven effective in addressing social interaction among children with ASD (Brock et al., 2006; National Research Council, 2001). At the same time, the developmental approach is preferred for greater flexibility in play choices based on the child's strengths and areas of interest, as well as keeping play a spontaneous internally driven act. Proponents of the development approach contend that the developmental approach encourages natural, spontaneous social interactions (Greenspan and Wieder 2006, 2007; Lu et al., 2010).

Child-led play behavior in typically developing young children, or those whose development is not affected by impairment or disability, are particularly influenced by the design of the play environment (Barbour 1999; Bowers 1988). At the same time, research suggests that children with ASD are often isolated and unable to participate on the playground (Locke et al. 2015). The environment is capable of providing functional play experiences by offering developmentally appropriate challenges that support spontaneous play (Bowers 1988; Frost 1987; Beckwith 1988). According to Frost (1988) a developmentally oriented playground "should include space, materials, equipment and activities to enhance, enrich, and encourage all the forms or processes of play appropriate to the age or developmental levels of the children involved." Outdoor play environments, which are developmentally appropriate, help support social skills development by providing a child-led play environment (Barbour 1999; Bowers 1988; Frost 1987).

Research suggested that play environments for children with ASD need to be structured in order to be effective (Mastrangelo 2009; Wolfberg and Schuler 1993). Well-designed outdoor play environments may provide the necessary structure to support social interactions, creating an important place where children with ASD can learn social skills through play (Burdette and Whitetaker 2005; Menear, Smith, and Lanier 2006). Yet there is little understanding of the design of outdoor play environments which support the social skills development of children with ASD (Yuill, Strieth, Roake, Aspden and Todd 2007).

3 METHODS

The purpose of this study is to explore best practice outdoor play environment design strategies that support the social skills development of children with ASD. Although conducted systematically, this literature review research was approached as a scoping study to inform the purpose across a host of disciplines, rather than a systematic literature review. The scoping study involved a review of the literature conducted using Academic Search Premier (EBSCOhost), Scopus, and Google Scholar. The literature searches were focused on outdoor play environment design, social skill development, and children with ASD. Searches were conducted using the following words and phrases; ((autism OR ASD OR autism spectrum disorder) AND (playground OR outdoor play environment OR play) AND (social interaction OR social behavior OR social communication OR social skills)). Initially, EBSCOhost returned 632 search results (6 identified as relevant), Scopus returned 6 results (2 identified as relevant), and Google Scholar returned 9,910 of which only the first 100 were assessed for relevancy (11 identified). The title and abstracts were reviewed for relevancy according to the stated purpose of the study which, in addition to the three focus topics, emphasized evidence-based understanding. The combination of which greatly limited the applicable results. The literatures identified as relevant were reviewed in their entirety. Ancestral and descendent searches were conducted for those which continued to be relevant after thorough review, slightly expanding the results. Further, the literature was expanded as necessary to explore the play behaviors of children with ASD in the context of social interactions to inform best practice in design. At the same time, some studies were eventually excluded when the play environment was solely the setting for observation of the effect of a non-environmental treatment, such as a peer training intervention (Owen-DeSchryver et al. 2008; Machalicek et al. 2009). An overview of the final results is presented hereafter to help establish best practices in the design of outdoor play environments which support the social skills development of children with ASD.

4 ASD PLAY BEHAVIORS

Numerous studies examine the play behaviors of children with ASD. These studies can be categorized into four primary areas of impacted development which are associated with social skills: low motor skills and coordination, sensory integration, generative play, and joint attention.

4.1 Low Motor Skills and Coordination

Underdeveloped eye-hand and speech coordination, difficulty with balance and other motor impairments, create barriers for the development of social skills in children with ASD (Green et al. 2009; Menear et al. 2006; Folstein and Rosen-Sheidley 2001; Leary and Hill 1996). It is believed that these difficulties in communicating ideas through speech and awkward physical behavior create isolation (social exclusion) from typical developing children (Wolfberg and Schuler 1993; Bass and Mulick 2007). Low muscle strength can greatly affect their play opportunities as children might be unable to perform tasks such as throwing a ball or running (Menear et al. 2006; Hilton, Zhang, Whilte, Klohr, and Constantino 2012). Therefore, outdoor play environments emphasizing physical play or a particular skill level may be detrimental by not offering an appropriate level of physical challenge to children with ASD (Naber et al. 2008) that ultimately results in their exclusion from participating with typically developing children in these play activities.

4.2 Sensory Integration

Children with ASD present atypical responses to sensory stimuli, which intensify their structured and stereotyped behavior (Dawson and Watling 2000). The need for visual boundaries, diminished response to potential hazards, and a preference for exploration through touch, taste and smell versus visual and auditory cues affect play opportunities for children with ASD (Menear et al. 2006; Naber et al. 2008).

4.3 Generative Play

Children with ASD generally exhibit frustration in the generation of spontaneous play, which tends to create detachment and lack of motivation in their social engagement (Mastrangelo 2009; Jordan 2003). Unstructured play environments impact children with ASD's ability to initiate play with peers, as they increase confusion in the generation of play ideas and development of theory of mind skills that result in understanding others perspectives (Menear et al. 2006; Mastrangelo 2009; Libby, Powell, Messer, and Jordan 1998), creating a deficit in the ability to apply symbolic meaning and engage in symbolic play (Libby et al. 1998; Hobson et al. 2008; Mastrangelo 2009).

4.4 Joint Attention

Observed as difficulty making eye contact, children with ASD exhibit impairments in establishing joint attention. This results in slower development of social skills through play (Jordan 2003; Bass and Mulick 2007). The reciprocal nature of social interaction creates positive affects in joint attention among typically developing children, compared to neutral affect in children with ASD (Jordan 2003; Bruinsma et al. 2004). These affects can impact the generation of social relationships as typically developing children may feel ignored, thus developing social exclusion towards the child with ASD (Jordan 2003). Social exclusion leads to solitary play and thereby to failure to develop and practice social skills (Jordan 2003).

5 DESIGN CONSIDERATIONS

This study suggests that there is very little empirical evidence-based practices in the design of outdoor play environments which support the social skills development of children with ASD. However, characteristics of outdoor play environments will impact the four areas of children with ASD's development associated with social skills. In order to create effective outdoor play areas that contribute to the social skills development of children with ASD, outdoor play environments should be structured to appropriately address low motor skills and coordination, sensory integration, generative play, and joint attention. The following discussion represents the available literature, including what direct empirical evidence is available, suggesting how these four development areas may be influenced by the play behaviors the structure of the outdoor play environment supports. Table 1 outlines the design strategies which address each impacted area of development.

Table 1. Play Environment Design Strategies to support Children with ASD's Social Skills

Affected Play Behavior	Design Strategies to Address
Low Motor Skills and Coordination	Movement
	Swinging
	Loose Parts
Sensory Integration	Structure
	Visual Boundary
	Sensory Stimuli
	Sand Play
Generative Play	Defined Areas for Socialization
	Play Cues
	Music
Joint Attention	Parallel and Cooperative Play
	Low Degree of Concentration
	Visual Scripts
	Imitation

5.1 Low Motor Skills and Coordination

Outdoor play environments are an optimal place where children can practice and develop motor skills (Fjørtoft 2001). The design of the play environment and the inclusion of developmentally appropriate activities can influence motor skills acquisition in young children (Barbour 1999). Children with ASD, who are hesitant to engage in physical activity and/or engage in less physical activity than their peers without disabilities (Pan and Frey 2006), face self-imposed isolation limiting opportunities for interactions and social skill practice. The following elements may be used in outdoor play environments to support motor skills and coordination development meeting the needs of children with ASD.

5.1.1 Movement. Play activities which involve motor planning such as climbing, dancing, running, jumping, hopping, and sliding help children develop core strength and coordination skills, while helping regulate their nervous system (Bowers 1988) (See Figure 1.). The act of walking on stepping stones, low beams, or uneven surfaces, as well as navigating obstacles of rocks, logs, or play equipment, are more accessible motor planning opportunities that may help children with ASD develop coordination and balance while strengthening their upper and lower extremities. Indeed, these types of repetitive activities may be attractive to children with ASD (Honey, Leekam, Turner, and McConachie 2006; Folstein and Rosen-Sheidley 2001; Mastrangelo 2009).

5.1.2 Swinging. The rhythmic, slow, full body movement (vestibular stimulation) of swinging can have a calming effect. This type of vestibular stimulation is much more accessible to children who are hypersensitive to movement, while simultaneously decreasing hyper-reactive responses to sensory input. In addition, swinging may help develop sequencing and motor coordination skill development, which is often delayed in children with ASD. Swinging is an important vestibular experience for children with ASD. Seesaws, and other similar activities, may also provide opportunities to access similar vestibular stimulation, while also requiring cooperation with another child, thereby increasing opportunities for social interaction.

Figure 1. Movement activity emphasizing motor planning. Photo by the author.

5.1.3 Loose Parts. According to Nicholson's Theory of Loose Parts (1971), movable parts empower creativity. Loose parts become anything the child wants them to be, by extending existing forms of play and providing opportunities for cooperative play (Frost 1987; Barbour 1999). Loose parts such as sand, water, blocks, containers, garden tools, mechanical tools, and sports equipment, offer multiple combinations and immeasurable scenarios for varied play experiences (Frost 1987). In particular, one study demonstrated that sand play coupled with other loose parts increased and sustained social interaction among children with ASD (Lu et al. 2010). Loose parts support unstructured play which can influence children to experience new sensory stimuli and learn to respond appropriately (Bowers, 1988). Loose parts may also be used to augment structured play settings. One study found that age-appropriate loose materials, for example playground balls, bubbles, etc., positively impacted the amount of time children with ASD interacted with peers (Ledford, Lane and Shepley 2014). In doing so both the structure to guide the play of children with ASD and the child-led opportunities supporting creative and cooperative play are available to children with ASD.

Outdoor play environments serve an important role in the development of motor skills and coordination, which prepares children for cooperative play. Understanding that children develop motor skills at their own pace is essential when designing developmentally appropriate outdoor play environments. As a result, there needs to be a continuum of developmentally appropriate opportunities for motor skill development to meet the diverse needs of children with ASD. Appropriate opportunities for vestibular and proprioceptive stimulation, or movement and body positioning, create opportunities for social skill practice.

5.2 Sensory Integration

Sensory processing disorders are relatively common among individuals with ASD (Dawson and Watling 2000; Harrison and Hare 2004; Myles, Cook, Miller, Rinner, and Robbins 2000; Volkmar, Cohen, and Paul 1986). In general, children with ASD present varying responses to sensory stimuli (Adamson, O'Hare, and Graham 2006; Kern, Garver, Grannemann, Trivedi, Carmody, Andrews, and Mehta, 2007; Kern, Garver, Carmody, Andrews, Mehta, and Trivedi 2008; Lane, Young, Baker, and Angley 2010; Leekam, Nieto, Libby, Wing, and Gould 2007). Sensory integration can contribute to the reduction of rigid and stereotyped behavior in children with ASD (Dawson and Watling 2000). The following opportunities in outdoor play environments may be instrumental in the integration of various sensory stimuli.

5.2.1 Structure. Children with autism benefit from structured environments (Jordan 2003). Structure helps emphasize where and how activities are to take place, thereby contributing to reduced stress, anxiety, and behavioral problems in children with ASD by making things predictable (Gillot et al. 2001). Outdoor play environments provide children with ASD with the necessary structure to carry out play activities in a typical manner, reducing conflicts and misperceptions with typically developing children (Thomas and Smith 2004). Thus, greater opportunities for social interaction.

5.2.2 Visual Boundary. Unlike typically developing children, children with ASD do not generally segment their environment, making it difficult for them to understand what is to occur in large open areas (Mostafa 2008). Clear physical and visual boundaries, such as fences, paths, and changes in texture or planting, can help children with ASD to understand where each area of the play environment begins and ends (Mostafa 2008), in essence increasing the recognizable structure of the play environment. Further, clear boundaries assist children with ASD in understanding the social boundaries of play in the area, when the two are designed to correspond.

5.2.3 Sensory Stimuli. Children with ASD are much more likely to demonstrate unusual responses to sensory stimuli than typically developing children (Adrien et al. 1987; Kern et al. 2008; Ornitz 1983), particularly hyporesponsiveness characterized by the absence of the expected response to a stimulus (Watson et al. 2011). Hyporesponsiveness is associated with the appearance of passivity and disengagement (Watson et al. 2011), which understandably has a negative impact on social interaction. Children with ASD may benefit from strong multi-sensory landmarks and activities which will attract the shared attention of all children. In order to engage their senses, sensory cues need to be organized clearly to reduce overstimulation of the child. This can be achieved by clear boundaries and consistent patterns of color, tone, texture, and sound that help define specific areas where particular activities are to occur. Within these areas of sensory consistency, a multi-sensory landmark may be used to focus shared attention between children with ASD and their typically developing peers. Opportunities to pace and regulate sensory stimulation should be available within the play environment, preferably in close proximity to active areas. These spaces may be child-scaled and partially enclosed.

5.2.4 Sand Play. Research suggests that sand play, when combined with loose parts to support symbolic play, provides multi-layered support for sensory play including social expression (Lu et al., 2010). For children with ASD, the evidence suggests that sand play opportunities provide enough structure to support the development of socialization skills (Lu et al., 2010). Sensory integration in the play environment can help children with ASD to increase alertness, success and productivity, by providing cues that help them construct appropriate, meaningful responses to stimuli.

Figure 2. Sand Play. Reproduced by permission of Utah State University's Center for Persons with Disabilities.

5.3 GENERATIVE PLAY

Generativity is vital for social skills development in young children. Children with ASD may have difficulty in initiating pretend play because of impairments in the generation of play ideas (Jarrold, Boucher, and Smith 1996). The following elements of the play environment can help support generative play for children with ASD.

5.3.1 Defined Areas for Socialization. Children with ASD have difficulty understanding physical space communication (Arnaiz Sanchez, Segado Vasquez, and Albaladejo Serrano 2011). They are particularly susceptible to the development of proxemics which might lead them to feel threatened by unexpected social intrusion (Jordan 2003). Areas where socialization is expected should be designed to bring children together in cooperative types of activities with clearly defined space for each participant. Clear physical and visual boundaries, as well as play cues, can help reduce distress caused by social interaction in children with ASD (Jordan 2003; Arnaiz Sanchez et al. 2011). This may allow children with ASD to enlarge their intimate zone and comfortably increase peer interaction and dramatic play (Jordan 2003).

5.3.2 Play Cues. The lack of play signals is one of the major inhibitors of social interaction in children with autism (Jordan 2003). Studies show that young children with autism are capable of producing pretend play and generating play ideas when prompted with play cues (Lewis and Boucher 1995). The design of the outdoor play environments may provide these play cues, as prompts to engage in appropriate play. Gentle themes that are not overly prescriptive are ideal to provide children with cues, while not limiting their creative play. However, abstraction in outdoor play environment design is not beneficial due to the unclear play cues which may be confusing, particularly given children with ASD's impairments in play generativity. For example, a play structure designed to look like a truck with a steering wheel provides a clear play cue suggesting children should pretend they are driving (See Figure 3). While a playground stage designed to look like a boat communicates conflicting messages, should you be sailing or putting on a musical?

5.3.3 Music. Studies have shown that music therapy reduces self-stimulation and encourages self-expression in children with ASD (Stephens 2008; Kern and Aldridge 2006). Reducing self-stimulation increases spontaneous play among children with ASD (Koegel, Firestone, Kramme, and Dunlap 1974). A musical center becomes a place in which children of all abilities are able to participate. That no specific outcome is expected reduces anxiety and frustration in children with ASD.

Providing the necessary structure and play cues may increase children with ASD's ability to generate play ideas and engage in spontaneous play (Jarrold et al. 1996; Lewis et al. 1995). The structure of the environment serves an essential role in promoting pretend play and thereby increasing peer interaction in children with ASD.

Figure 3. Play setting with clear play cues. Photo by the author.

5.4 JOINT ATTENTION

Mundy (1997) defines joint-attention as "the use of gestural acts to direct attention in order to share the experience of an object with another person." Eye contact, smiles and gestures provide people with the ability to interact with others nonverbally. Children with ASD may be less able to share attention because deficits in understanding that others have points of view different from one's own creates impairments in the development of their social abilities (Baron-Cohen et al. 1985; Mundy and Crowson 1997; Kasari, Freeman, and Paparella 2006; Jarrold et al. 1996). Even though there is little literature investigating joint attention in play activity, different type of stimuli may be included in outdoor play environments to promote joint attention in children with ASD.

5.4.1 Parallel and Cooperative Play. Providing comfortable opportunities for playing in close proximity with others, such as in parallel play, where eye contact can be easily made, is beneficial in fostering social interaction. One study found that playground activities of shared interest among children with ASD and typically developing peers supported increased social interaction through natural proximity, mutually reinforcing events, and reciprocity (Harper, Symon, and Frea 2008). Over time, play activities can become increasingly cooperative and include taking turns, sharing materials or emotional expression which will promote the generation of play ideas and allow the children to share a common focus (Yang, Wolfberg, Wu, and Hwu 2003).

5.4.2 Low Degree of Concentration. Children with ASD have clear attention and concentration impairments (Patten and Watson 2011). Play activities that do not require a high degree of concentration can be beneficial in allowing children with ASD to produce functional play and interact with others simultaneously. Activities that require low physical effort and encourage the use of natural body positions can make shared play experiences more enjoyable for children with ASD.

5.4.3 Visual Scripts. Studies have shown that children with ASD are able to engage in functional play when they are taught specifically how to play with a certain toy (Thomas and Smith 2004; Wolfberg and Schuler 1999). These play scripts, or prescribed play responses, can contribute to the structured development of play skills in children with ASD (Thomas and Smith 2004; Rogers 2000). Visual scripts can take the form of graphic cues that will prompt the child on how to play with a specific piece of equipment, without being too prescriptive to leave room for the development of their own play ideas. Appropriate play structured by the use of play scripts can assist children with ASD in appropriately playing with typically developing children, thus promoting cooperative play and social interaction (Thomas and Smith 2004). The use of visual scripts is expected to vanish overtime as the child has learned and mastered the expected behavior (Rogers 2000). Play scripts can be provided in the outdoor play environment using simple signage employing pictorial depictions, such as Mayer-Johnson symbols (see Figure 4), which communicate what the suggested behavior is to the child.

5.4.4 Imitation. Imitating play behavior teaches children with ASD the benefits of shared attention and social interaction (Stephens 2008). Promoting play areas in which reciprocal imitation is encouraged (a seesaw for example) will allow children with ASD to socially interact with others.

The social nature of joint attention makes it a crucial element that needs to be addressed in outdoor play environments. By taking into consideration the elements listed above, children with ASD can learn to enjoy the benefits of sharing a common focus, an essential aspect in the development of their social abilities.

Figure 4. Mayer-Johnson symbols for play area. Photo by the author.

6 SUMMARY

Play is important for social skills development in children with ASD. As children with ASD display a large range of variability in their behavior and functioning, different methods are necessary to guide social interaction through outdoor play environments. The design of the environment can determine the success or failure of a playground in supporting social interactions for young children with ASD. While there is little empirical evidence on specific design strategies to support social skills development in outdoor play environments for children with ASD, there is a body of support to suggest best practices addressing the four primary areas of play deficits among children with ASD: low motor skills and coordination, sensory integration, generative play, and joint attention. Supporting social interaction among children with ASD may be supported by analyzing the impact of specific design elements on the identified behaviors.

Design opportunities may include easily accessible motor planning activities which may help children with ASD improve their balance and coordination. Other activities such as swinging can have a calming effect for children with ASD who are often hypersensitive to movement. The use of loose parts in structured areas of the play environment provides unstructured play within a structured environment, which promotes creative and imaginative play. A structured play environment in which sensory cues are clearly organized can help reduce overstimulation in children with ASD. This along with the implementation of clear physical and visual boundaries can contribute to addressing sensory integration deficits.

The use of gentle themes as “play cues” can contribute to the generation of play ideas in children with ASD. Play scripts in the form of visual cues can indicate how to participate in a play opportunity without being too prescriptive. Music opportunities can help reduce self-stimulation and anxiety, thereby helping children naturally engage in spontaneous play with their peers.

Design opportunities which address joint attention deficits and promote social skills development in children with ASD include providing opportunities for cooperative types of activities to take place, instead of competitive play. Activities that required low physical effort and low degree of concentration, can contribute to joint attention and social skills development in children with ASD.

7 FUTURE RESEARCH

As discussed earlier, here is little, if any, empirical research or case study evidence which supports these suggested design strategies. It would be meaningful to provide research through empirically based studies to support evidence based design practices focused on how the design of the outdoor play environment can influence social skills development in children with ASD by targeting specific design strategies and aspects of their play behavior. Given the wealth of research supporting the need for play intervention or instruction to provide or model the structure of play for children with ASD, the potential for play environments which are physically structured to inherently provide support for the play of children with ASD is significant.

The design of the outdoor play environment plays an important role in creating spontaneous and pleasurable play opportunities for children with ASD. Well-designed outdoor play environments may support social interactions, creating an important place were children with ASD can develop social skills through play.

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PRESERVATION PLANNING IN THE BAKKEN: PROTECTING RURAL CULTURAL AND PHYSICAL HERITAGE

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1 ABSTRACT

The development trends of North Dakota's rural communities near resource extraction sites lack a clear planning process and community input. This paper discusses a proposed preservation planning method by which critical thresholds of disturbance can be identified at the state level and encourage communities to start the heritage preservation process at the local level.

This study's focus is the Bakken Oil formation, which stretches 200,000 square miles through portions of Montana, North Dakota, Saskatchewan, and Manitoba; its development underlines an arc of physical implications (flaring of thousands of oil and gas wells) that can be seen from space, but little has been done to prepare rural communities for the surge of growth associated with the burgeoning workforce and subsequent drop as oil prices fluctuate.

This paper also illustrates a collaborative process where changing rural communities can identify heritage needs in the (quantifiable) built environment (via multi-scale geospatial analysis) and prioritize the socio-cultural qualities of agrarian heritage (via local value assessment interviews).

Richardton, North Dakota serves as the case study for the proposed Heritage Preservation process. The downward turn in oil prices has hastened the importance of preservation planning following this process to provide rural communities on the threshold of critical disturbance with the guidance necessary to utilize new and existing resources for a sustained legacy.

1.1 Keywords

Historic Preservation, Quality of Life, Community Engaged Process, Local Values Assessment, Geo-Spatial Analysis

2 THE BAKKEN AND NORTH DAKOTA

The Bakken Oil formation and its 14,000 plus active wells in North Dakota underline an arc of physical implications that can be seen from space (gas flares) but little has been done to prepare rural communities for the surge of growth associated with the burgeoning workforce and subsequent rapid decline as global oil prices fluctuate. Booms and busts have been common throughout North Dakota's history; first, fur and bison in the 18th Century then the bonanza farms and homestead grabs of the 19th Century and later coal and oil extraction. Population shifts are not new to the state, however outmigration of state residents remained consistent after the population peaked in 1930 and did not surpass its former mark until 2011. Since the end of the last oil bust in the 1980s rural communities in western North Dakota have been quiet agrarian landscapes beckoning a slow pace and simplicity of daily rituals and values. Townships consisted of scattershot homesteads and town centers persevered at the railroad steam engine capacity intervals of approximately 15 miles. Along the gravel roads and asphalt county roads of Thomas Jefferson's Rectangular Survey Grid System the section lines seemed conveniently spaced for oil well pads and access roads.

The land best known for its far horizons of wheat, flax, and, further west, grazing cattle, sheep, goats, and bison quickly sprouted with oil wells, tankers, and campers in 2008, when the marriage of hydraulic fracturing (fracking) and horizontal drilling made the Bakken Oil formation highly lucrative in the global oil market. Rural roads once home to an occasional combine, tractor, or rake are now saturated with semi-trucks delivering goods for oil development. Towns experienced an unprecedented surge in population. Reactive and sprawling development coupled with demolition of civic and cultural institutions along main streets have destabilized the cultural identity and historic characteristics of many rural towns. A long record of resource extraction has left these communities unable to sustain their heritage, legacy and normal way of life. The injection of oil money and new populations make the need for preservation more urgent, especially if these rural communities wish to sustain themselves beyond the latest downturn. Since the completion of this study the price of oil has dropped from over $100 per barrel in 2008 to approximately $47.00 per barrel in 2016.

Anticipating when housing and other infrastructure development pressures will occur is difficult, it can happen rather suddenly, and communities often must develop in a reactionary growth pattern, annexing land or approving greenfield development more rapidly than planners, if they are available, can review. The problems arise years later when municipalities are unable to maintain transportation or municipal water infrastructure or pay the bonds needed in the first place. The population of Williston, ND nearly doubled between 2008 and 2015, but the city tripled in size from 7.45 square miles to 20.25 square miles.

In this study we review a multidisciplinary approach to heritage preservation planning in this context. We begin with the use of geo-spatial analysis tools for macro-scale maps that utilize public data to identify communities at the threshold of physical disturbances and outside the priority of the state's hub city (population of 12,500 or more) funding model. The results provide a starting point for communities to self-assess their needs by laying out a process for preservation planning in communities similarly impacted by oil extraction. Local Value Analysis interviews then provided the framework for charting this proposed preservation process.

The process outlined in this paper can guide communities developing a heritage preservation plan by providing a directed decision-making process guided by professional services and resources. Rural towns can flourish from the immediacy of boomtown growth while also maintaining the long-term culture, character, and heritage of their community. Recommendations include following a preservation process chart that guides the allocation of economic gains set aside in funds from oil industry related tax revenues and from other existing sources. A Heritage Preservation Plan as a component to the city's Comprehensive Plan, allows officials and citizens to make informed decisions about the use of heritage resources that support city planning efforts.

Also identified are key factors that contribute to the cultural and physical disruption of rural communities through geo-spatial analysis. By mapping workforce housing densities and industry growth patterns of towns on the fringe of oil extraction we identify those in highest need of preservation planning. We chose to identify communities that were being affected by oil extraction, but were outside the state funding model by eliminating hub cities from our study. While we focused on towns at key thresholds of development, the offered preservation planning process can be applied at different stages of growth or decline. By forecasting coefficients of oil industry growth on rural landscapes, the state can preemptively identify cities and communities can anticipate and prepare for boomtown disturbances. Identification of such cities by the state could activate the heritage preservation planning process. We describe how to identify these cities, how the planning process is activated and by whom. The following example plan is intended to serve three basic functions through the focused recommendations that resulted from the heritage and local value interviews. The first is to create a platform for balanced discourse for stakeholders and officials during the local decision-making process to identify which physical resources are encouraged for preservation. The second is to recommend planning policies at the local, county and state level. Lastly, to link subsequent projects to resource allocations at the appropriate governmental level. Educating and connecting communities to consultants will see the newly illustrated process completed. For this study we use Richardton, ND as a case study for deploying the suggested heritage preservation process.

3 METHODOLOGY

The mixed methods of the study include first geospatial analysis via a geographic information system, here ArcGIS, followed by structured interviews to assess heritage and local values. Geographic information collected for this study included county population data, rig and well geo-data, workforce housing unit and population data and road and town boundary data. This data is publically accessible (i.e. viewable) but in order to analyze it the meta-data must be downloaded from the North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division, home page (dmr.nd.gov) as a shape (.shp) file. Using these vector-based GIS maps we were able to create visualizations for among other things, the different ranges of oil development in the Bakken region based first on the density of active wells (Figure 1). This gave us a general sense of which counties remained within the Bakken oil formation, but were less developed than others. Next we mapped the locations and sizes of workforce housing in the region based on the total number of units and created 4 ranges of 20-mile proximity buffers, the general overlap of rural social infrastructure with thresholds from 1 unit built up to 160 units (Figure 3) to determine areas of greatest and least disturbance.

The heritage research in western North Dakota was conducted first from review of archival video footage of state officials discussing resource development (Link 1973) and then by contacting targeted stakeholders to interview. Local histories and development inquiries were recorded via open-ended interviews structured from a base of six questions regarding heritage priorities. The interviewees were largely native (North Dakota) born European Americans with a strong knowledge of the case study region. Inventory and observation of the surrounding community was conducted on four occasions between 2011 and 2015.

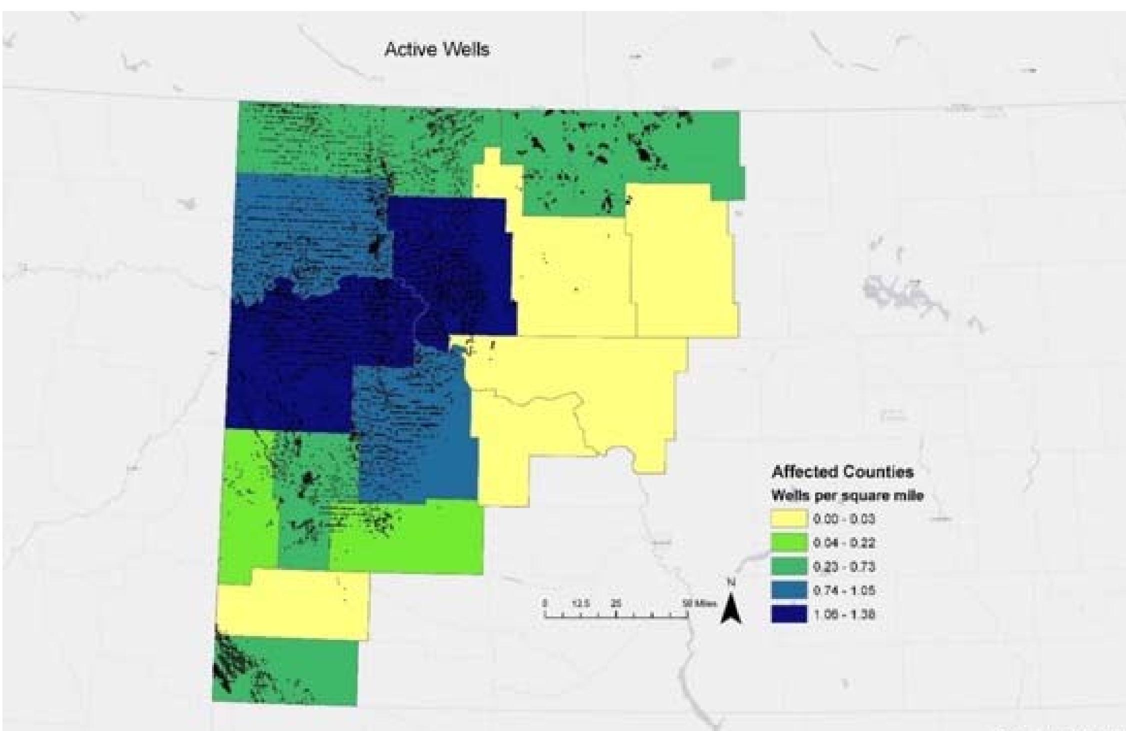

Figure 1. Active wells and density in counties per square mile (2015). Map by the authors.

3.1 Geospatial Analysis for Identifying Threshold Communities in the Bakken

The landscape change impacts of oil development can be direct and immediate, such as building a well pad and support areas, access roads, water handling facilities and workforce housing. Indirect impacts are not as obvious and thus are more difficult to quantify and map. The rate of growth has resulted in a boomtown atmosphere in many rural communities. Unfortunately, many of these areas were unprepared for such significant shifts in population and physical and cultural infrastructure requirements. The demographic history of the region results in unique challenges for these communities. Until 2010, North Dakota had been experiencing out-migration since the 1930s. Geographic isolation of communities means no urban center to absorb workers or provide services (Great Plains Restoration Council 2015).

Historically homogeneous social and cultural ways of life, institutions and infrastructure makes it difficult for communities to take in a rapid influx of diverse worker populations. The absence of well-developed local infrastructure and governance, schools, medical facilities, law enforcement, recreation facilities, and so on increase the potential of severe impacts to their viability, at least during the early stages of growth. Had an interdisciplinary planning process for identifying and preserving critical areas and other forms of growth management been in place perhaps stronger and more efficient forms of development would have taken place. Appropriate anticipatory targets for heritage preservation planning begin with mapping oil development to anticipate growth areas, by using oil rig, oil well and oil permitting data with ArcGIS software. The State of North Dakota compiles and updates geographic data on its GIS hub data portal website as it become available, usually within 10 days, and data is continually being updated. ArcGIS software is able to analyze a set of database design specifications through thematic raster-based layers, such as land us/land cover, elevation, topographic position, human disturbance (e.g. distance from roads, road density, housing density), or other relevant data.

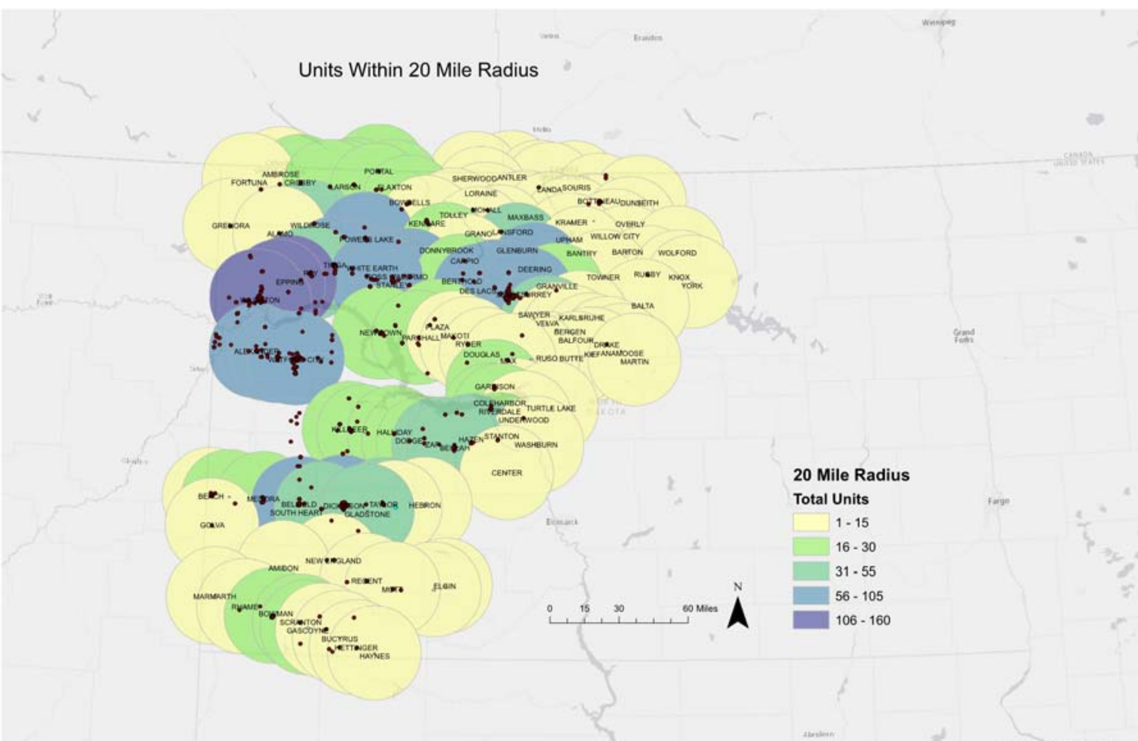

Figure 2. Workforce housing impact zonal analysis (2015). Map by the authors.

The first step of this collaborative study began by collecting well density and workforce housing data per county to analyze at which thresholds affected communities began to see significant changes to the patterns of their cultural and physical infrastructure. Using this data and a suitability threshold that ranks both density of oil development and workforce housing units per county, we created a proximity buffer of 20 miles to target towns that were on the fringes of areas impacted by oil development. We chose to use a 20 mile range for the buffer analysis because is corresponds to the typical distance in which social infrastructure like schools or fire protection is offered in these rural communities. While any town within these development boundaries could benefit from following this preservation process, we focused this study on towns that were likely to be affected by future growth. This model is intended to provide a template for other areas of oil and gas development that wish to anticipate physical disturbance and highlight critical need for the heritage preservation planning process.

Removing the highest level of development, to determine the threshold for critical fringe areas yet to be affected, we identified only those towns that intersected oil well development at a density less than .22 wells per square mile and the proximity of workforce housing at a threshold of 31-55 units in each 20-mile proximity buffer. The results of these overlays yielded 35 towns (Figure 3) in an 8,401 square mile area, or approximately 30% of the active drilling area. This boundary is effectively the threshold for fringe communities and a starting place for communities in need of establishing a preservation plan. Richardton at the eastern fringe of the Bakken oil formation was one of the first towns identified by the workforce housing impact analysis.

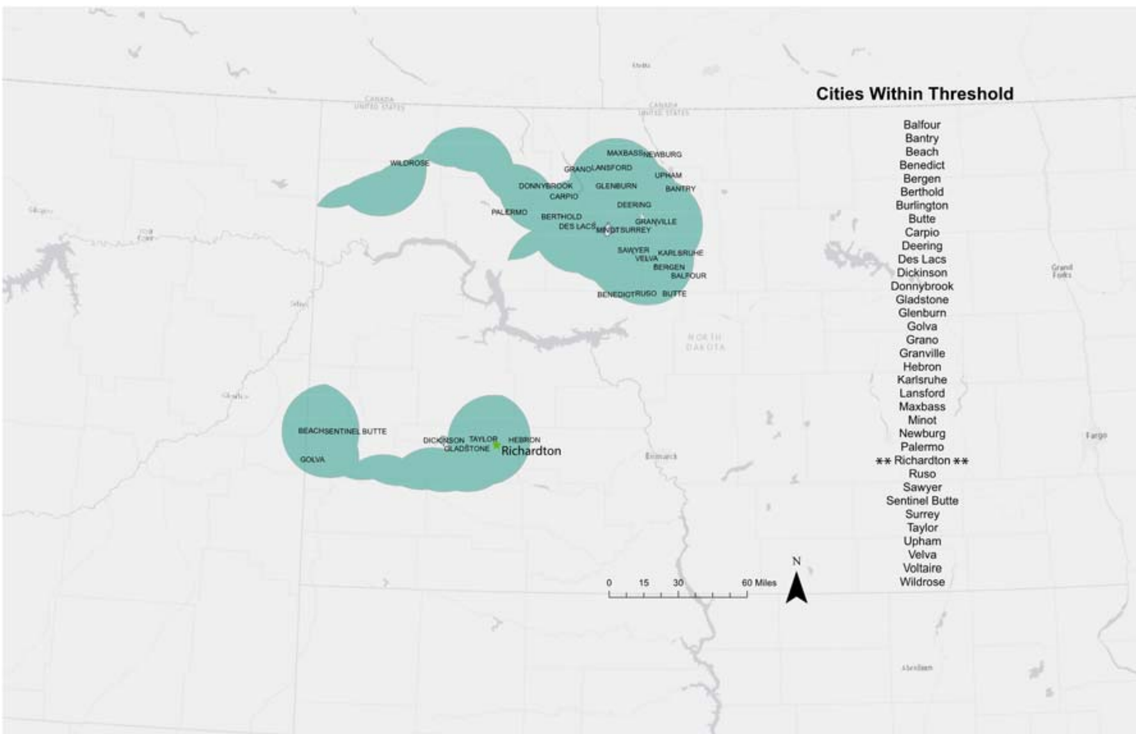

Figure 3. Threshold communities identified (2015). Map by the authors.

3.2 Heritage and Local Values Interview Results

The local values analysis of participants was conducted through a series of interviews, archival document collection, and casual conversations with local citizens, entrepreneurs, historian, monks and leaders in the community of Richardton. In order to identify local values an assessment of the current context provided a benchmark for guidance to address long range needs and concerns specific to rural cultural landscapes. The immediate and potential demands of the energy development on Richardton are starting to take hold. The themes of these interviews were consolidated to guide the recommendations for each of the steps in the proposed process.

"Main street is probably moving out here now (referring to highway lined development)," said Ambrose Hoff, "like every other city, unfortunately. We'd like it to be in town… but there's no place downtown to put a facility like this," referring to the new grocery store located off the interstate.

The Mayor and City Commission of Richardton are seen as being “cautiously conservative” in regard to main street restoration referencing addition expenses and the potential amount of legal paperwork. The stance of the Commission has not encouraged potential investors to consider opportunities for historic properties. The city was offered a potential community center site downtown that was to be donated, but the city rejected the offer. Ambrose Hoff saw the closure of a local manufacturing company, employing fifty people, as potential. He told the realtor of the manufacturing company, “You’ve taken enough out of our town and I’d like it to become something again,” which developed into Amber Waves—a company that makes hopper-bottom bins for grain and fertilizer, builds hopper tanks for frac-sand for the oil fields, cow-cake bins for cattle ranches and electronic circuit boards. Hoff’s oldest son, Jody, and a nephew, Doug Hauck, run the business of nearly 50 employees (Pates 2013).

In 1987 Hoff started Stone Mill Inc., a processing plant for garbanzos, soybeans, oats, rye, spring wheat and quinoa, which employees 15 workers. In 2005, Hoff and corn seed salesman Mark Erickson decided they should build an ethanol plant in Richardton. “We decided we’d propose it until we ran into problems and we never did, so we never quit,” Hoff says (Pates 2013). Red Trail Energy now produces 60 million gallons of ethanol per year and created 50 jobs. It had been seven years since Richardton’s only grocer closed its doors, so in 2013, Hoff and his daughter built the 10,000-square-foot Springfield Market; not your average rural grocer. It is a full-service market with a bakery and deli supplying 23 jobs for the local community. A year earlier Dickinson was the closest grocery store (30-miles away), and now Dickinson residents are driving to the Springfield Market to escape the saturated supermarkets of what feels like a “big city” for a small town grocer supplied with urban amenities. “I think in North Dakota, we have so many people with ingenuity and creativity,” Hoff says. “I think that’s why we do so well for ourselves” (Pates 2013).

For the past 100 years, Richardton has been regionally famous for its Catholic abbey and German sausage, but the Bakken oil boom is on the western horizon. Town Mayor Frank Kirchenheiter referenced his community of 619, counted in 2010, as enjoying the trickle-down effect without being inundated but that is shifting (Donovan 2013). Historically, Richardton has served as a bedroom community for Dickinson, 20 minutes away, but the new dwellers are shifting from families to oil field workers, five-guys-to-a-house. Recently, a few duplexes and homes were developed in town but the demand for housing remains.

Similar to many western rural communities, Kirchenheiter stated he wishes towns like his were more visible in the statewide oil development radar, “We feel overlooked to some degree. We’re all overlooked in these small communities,” said Kirchenheiter (Donovan 2013). Richardton faces a similar challenge of an aging infrastructure. The consequences of the previous coal boom and bust are evident along the rundown and neglected main street. Boarded-up storefronts, abandoned buildings, and underutilized lots have resulted in the dismal appearance of a feckless main street, unlike the uplifting social character of Richardton citizens.

In order to provide a benchmark of recognizable community institutions, thematic questions about town’s legacy, past/present cultural traditions, tangible built resources (e.g. building, groups of building, areas), and unique identifiable forms, were asked of Richardton, North Dakota citizens. The participants included community residents, city officials, and planning professionals, in collaboration with a local preservation expert and used to initiate a direct discussion of basic community institutions to be examined. The list includes; churches, agriculture receiving and distribution, schools, banks, retails stores, sidewalks, boulevards, street trees, alleys, parks, cemeteries, band shells and community event spaces.

Historically, modest industrial economic growth has sustained this town through past busts, but economic cycles of the Bakken carry the greatest potential for change. While many residents are eager for change, others are campaigning for development that is cautiously conservative.

4 APPLICATION FOR RICHARDTON, ND

The town of Richardton, population 524, was founded in 1883 as a result of the Northern Pacific Railroad’s western expansion. Like many rural cultural landscapes, it has experienced the devastation of fire, depression, coal boom and bust, and the outmigration of recent agrarian generations. The physical and spiritual presence of Assumption Abbey (Figure 6), completed in 1910, and Sacred Heart Priory (1960) provides this rural community with distinctive cultural and social resources uncommon in many communities of this size (Figure 5). The rise and fall of the town through cycles of development can be attributed to dedication and devotion of long-term residents embracing the challenges of each generation. Main Street in Richardton is composed of a dwindling stock of abandoned buildings – banks, grocers, drugstore; however, within the last few years, a new convenience store and grocery store have been built immediately off the Interstate 94 exit, well south of Richardton's town center. An ethanol plant can be seen looming east behind a deserted barn, and a Halliburton sand plant completes the juxtaposition between these historical and contemporary factors, making Richardton an exemplar case study for the suggested heritage preservation process.

This plan is intended to encourage preservation by the owner, as primary stakeholder to these properties, through local, county and state incentives. The city's role is to encourage the plan by providing information, guidance, technical support, and incentives to private property owners. The county's role is to coordinate preservation partnerships with municipalities and state agencies and organizations, while promoting public awareness for historic preservation and creating livable, sustainable and healthy communities. Finally, at the state level, the State Historic Preservation Officers (SHPOs), appointed by the Governor, supports the Federal Historic Preservation Program, while creating programs specific to the cultural identity within their state.

Citizens investing in the renewal of existing built heritage plays a significant role in the cultural, social and physical identity of their town. Simon Thurley (2015) described heritage as being cyclical: "By understanding [cultural heritage], people value it. By valuing it, people want to care for it. By caring for it, it will help people enjoy it. From enjoying it, comes a thirst to understand it" (p. 26).

Figure 4. Richardton, North Dakota Heritage map (2015). Map by the authors.

4.1 Develop Vision and Goals: Create a platform for a balanced discourse

There were constraints to a balanced discourse. Based on personal interviews, the consensus among stakeholders including local leaders, government agencies, policy makers, clergy, owners, community leaders and entrepreneur's remains divided between heritage versus growth agendas to direct preservation, planning and development. The intentions of local entrepreneurs and others toward developing economic and job growth tend to focus on developing the town toward the highway-rather than seeing the future and significance of investing in cultural renewal along main street. Monks and other locals are interested in revivifying the town center but lack personal assets to do so, while the city officials remain conservatively cautious toward any substantial changes.

4.2 Take Inventory of the community's cultural institutions and resources.

In order to pursue a sustainable process, all stakeholders should be considered during the physical and cultural inventory phase of the process. In the past, preservation was seen as the maintenance and protection of one building. Stakeholders should understand that the frame of cultural heritage preservation is widening to include larger spatial units, physical landscapes, and comprehensive evaluation of local cultural values as it pertains to Richardton. Identifiable forms that embody the town's legacy should categorize the community resources. The recommended strategy for classifying resources is through community engagement/feedback with focus given to civic buildings and space. The community of Richardton focused on agricultural receiving distribution, schools, banks, train depot, retail stores, grain elevators, recreation and culture (parks, cemeteries, band shells and ruins), sustainable industries, job creating commercial ventures providing opportunities for the next generation, and community events.

4.3 Educate and connect stakeholders with appropriate consultants and resources

Implementing a preservation-planning project may be daunting and confusing for local owners, but the charted process can encourage it. If a key stakeholder (owner) were intent on investing toward the renewal of historic fabric, the city would provide them with Heritage Preservation Chart (Figure 5) as a tool. This will guide investors and interested publics through the local Heritage Preservation Plan process. The chart serves as recommendations for the key stakeholder. It will provide guidance toward what economic resources are available at the local, state, and federal level, who are the stakeholders, who are the consultants, advocacy groups, when community input is necessary, and finally through the final plans and construction of the project. The Heritage Preservation Chart, with further development, could be hosted on a website for easier and updated links to the necessary resources for completing a preservation project. It could also be distributed by the State Historic Preservation Office as a proactive initiative now or during the next wave of development.

4.4 Mapping: Existing land and potential projects

This stage provides focus to preserve key buildings that fit the cultural and economic criteria. The community context map indicates cultural resources that fit cultural and economic criteria (Figure 4). Although the current building collection fronting Richardton's Main Street has lost vitality and become disconnected from necessary and attractive daily activities, the existing building fabric provides potential opportunities that can be catalyzed by the historic preservation of key buildings, site and facilities. Assumption Abbey (Figure 6) maintains a unique presence near boomtown growth; there is, however, a persistent threat to the Main Street.

4.5 Link advocacy groups to local/state policy-makers

Many of these rural communities are in need of a "Call to action" for focus group interaction. An advocacy group may facilitate the anticipatory planning process of these rural communities through guidance of local policy-making, available economic resources, strategic planning and defining a sustainable decision-making process. An advocacy group will provide the backbone to initiate such planning efforts and provide a platform of consensus seeking within the local community in order to guide local policy/decision-making. The group is meant to promote the importance of incorporating Heritage Preservation Planning as an integral piece of sustainable boomtown growth, while exerting influence through channels of public opinion campaigns and networking. It is imperative that all stakeholders, primary, key, or secondary, are represented through the policy/decision making process.

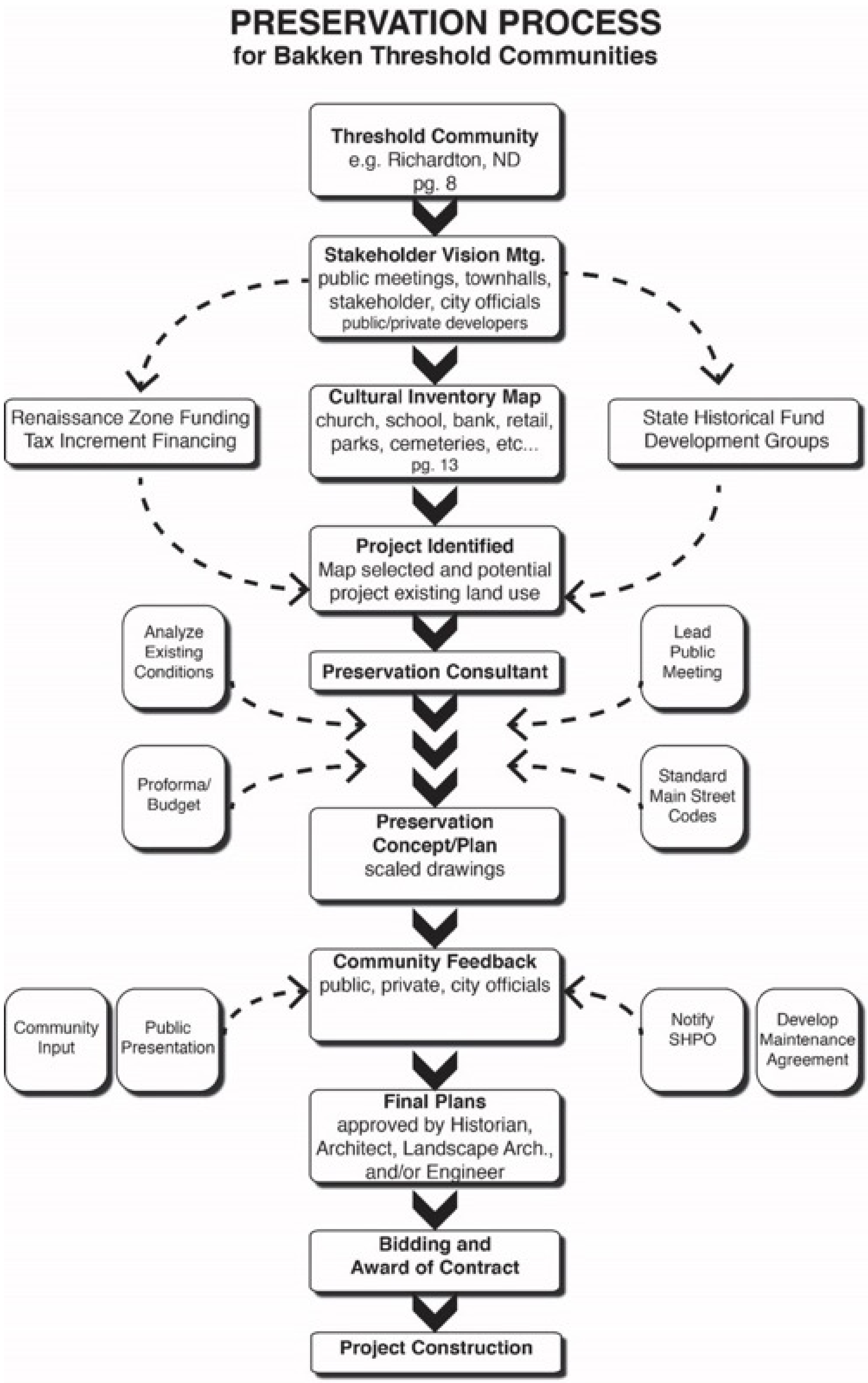

Figure 5. Heritage Preservation Process for Threshold Communities (2015). Diagram by the authors.

The State Historic Preservation Office (SHPO) may serve as a gateway for distributing resources to these communities. Also, the SHPO should direct municipalities, such as Richardton, interested in preservation planning to North Dakota League of Cities. The League, established in 1912, was organized to build a body of knowledge by sharing experiences with one another. It may serve as a platform for rural communities to encourage local leaders by providing educational opportunities and services to city officials. The coalition connects resources with needs, and represents the interests of municipalities in state and federal public policy discussions (North Dakota League of Cities 2014). Further resources, (i.e. webinars, educational materials, graphics, and GIS maps) should be provided to the League for more readily available distribution of preservation planning resources statewide. Rural areas and townships rarely have the financial, technical and staff resources available in order to respond to pressures of growth. The advocacy group will encourage communities to work together in alliance to gain economic and community funding at the local, state and federal level.

Figure 6. View of Assumption Abbey (2015). Photo by the authors.

5 CONCLUSION

Most rural communities want to maintain their rural character. The new challenge for many North Dakota rural communities is maintaining their rural character, especially in older town centers, through boomtown growth while strengthening their local economy. The balance of this new growth must promote prosperity with long-term sustainability, including aesthetic qualities that maintain local identity. Rural communities should identify planning strategies they are able to implement with resources available. Local governments should invest in main street leaders and projects by providing financial incentives toward main street renewal. Investment in developing local interest in and dependence on main street businesses helps shift reliance from corporate patronage and helps secure the survival of small town lifestyle beyond boom times.

Livable communities can be sustained by distinctive characteristics found through the Heritage Preservation Planning model. Through this approach a successful livable town should foster a downtown core servicing their citizens with their local restaurant, retail, and civic functions. The main street is the core of the community that creates its identity and personality and sets the tone to instigate memories of such places. The city center is perceived through the legacy of roots experienced in the style of building and the layout of streets and public spaces. The current community interests and pride is reflected in the development of amenities to attract people to live in, visit and enjoy small cities.

Many of these rural towns began as a result of the railroad. The initial growth and development was along main street parallel to the railroad. This typically, provides a concentration of historic buildings and landscapes at these locations. Implementing preservation planning strategies organized around improving the quality of life for residents while keeping their rural values promotes stability of main streets. This growth can attract and support new opportunities for jobs and businesses. By investing in the growth and renewal of historic town centers to ensuring new growth and development can reinforce traditional patterns, the rural community lifestyle may also by preserved concurrent with boomtown economic growth and opportunities.

Further time, research and case studies are needed to fill an existing gap in preservation research related to the effects of the recent phenomenon of horizontal fracking on rural communities. The rapid and unfettered growth will continue to impact rural communities for generations to come. Currently, a significant amount of preservation literature focuses on preservation related to urban areas, or suggesting "urban managers," which is not relevant to these communities and the length of these studies often span years. Although the boom has been in full swing for the past five years, it still remains unpredictable, which contributes to the need of sequential research and case studies.

The most recent North Dakota boom of oil and natural gas development left cities like Watford City, Williston, and Dickinson struggling to keep up with the physical growth necessary to meet population growth. Their reactive development consists of sprawling developments along the outer periphery, away from the civic core, can eliminate or endanger characteristics main streets once evoked. The growth model of development has nearly erased the unique cultural identities and characteristic of each town, which inspired the investigation of how rural cultural landscapes, not yet affected by extraction development, may consider a valid method of anticipatory preservation planning with the growth of their communities.

The social factors of each rural community will never be duplicated. Applying general blanket social values to counties, region, or even states will stifle the cultural diversity of each town. It is imperative that time is spent understanding the development trends of each particular town throughout time. The present local identity, culture and values are equally important as past generations. The preservation professional must be aware of how local people view the opinions and recommendations from an "outsider." Significant time must be spent within each community, speaking with a range of residents, and engaging them in conversations about their past, present and future visions for their community.

Located on the eastern fringe of the Bakken oil fields, Richardton has already experienced signs of growth with an increase in residents, a new grocer, an ethanol plant, and construction businesses servicing the oil fields. The process recommended here focuses on communities anticipating the imminent growth of oil development but aware of the effects of reactionary growth on these rural landscape. A proactive municipality interested in preservation planning must recognize and prioritize properties common to their shared values, culture, and heritage through distinctive built features that inherently preserve the identity of each town. Focusing on renewing and preserving the form of existing main street corridors and developing infill of existing infrastructure can minimize long-term cost, maintenance, and disruption. The unfettered growth of the early 1980's boom left many rural towns with a large amount of property back in tax default. By focusing on revitalizing the historic town center, long-term costs savings can be passed on to local governments by pro-actively mitigating the impacts of very rapid growth that has already strained planning capacities. This can happen due to the town's ability to support through financing, public protection, and maintenance.

Utilizing financial resources through the state's Legacy Fund can provide potential funding for these rural cultural landscapes. Richardton serves as an initial model for a heritage preservation-planning project in hopes that the successful application of anticipatory preservation planning for this rural community is recognized and rewarded. By meeting the needs of growth while fostering the built heritage of each town, if successful, direct fund allocations for anticipatory preservation planning may be generated.

The preservation needs of Richardton can be anticipated for similar communities where rapid expansion will occur in the wake of extreme resource extraction. Following the Heritage Preservation Process can provide rural communities on the threshold of critical disturbance with the guidance necessary to utilize boom time resources for a sustained legacy model of development able to persevere in economic downturns.

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THE EFFECTS OF PARTICIPATION OF COMMUNITY GARDENING ON THE DEVELOPMENT OF SENSE OF COMMUNITY

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1 ABSTRACT

Community gardens play a significant role in not only addressing food issues but also more importantly in facilitating social connections among community members. This study investigated the effects of participation in community gardening on developing Sense of Community (SOC), which represents a combined feeling of belonging, concern for others, and shared faith among members. Therefore, SOC emphasizes citizen's psychological bond with their communities to maintain and conserve the society.

The hypotheses are as follows: (a) the participation in community gardening will have a meaningful influence on creating sense of community; (b) SOC will represent differences according to the various categories of the participation, which include types, level, and duration of the participation. To verify the hypotheses, the survey on both 34 participants, who has cultivated the products at Hale Y community garden in Blacksburg, Virginia operated by the YMCA, and 31 non-participants of community gardening, who were randomly selected in Blacksburg community, was conducted and analyzed by T-test, F-test, and multiple regression analysis. The study concluded that the more active and longer they participate in community gardening, the higher the SOC.

This study has significance in proving the benefit of community gardening for sense of community quantitatively, which was rarely examined in previous studies. Based on the results of this study, we are able to verify the effectiveness of community gardens as a means of community vitality. Besides, the implication in this paper suggests that community garden-related policies need to be established to facilitate local communities.

1.1 Keywords

Community Garden, Sense of Community Index, Participation

2 INTRODUCTION

The increasing number of research articles regarding various aspects of community gardening proves community gardening is receiving global recognition in terms of its multiple and integrated personal, social, and environmental benefits. Hou et al summed up the role of community gardens clearly; “connection to nature, physical exercise, health and nutrition, self-esteem, environmental education, personal growth, companionship, skill development, cultural expression, income generation, empowerment” (Hou et al, 2009, 23). Owing to these enormous benefits, the number of community gardens have been increased across the world, thus expanding its influences on individuals, families and society in general.

Community gardening movements in the late of 19th and early 20th centuries were prompted by organized plans of governments and social reformers in the face of unemployment and poverty in urban area as well as two World Wars and the Great Depression. Community gardening in these periods focused primarily on food production. Recent community gardening movements are different from the past. There have been local residents’ indigenous efforts to revitalize their declining urban environments by transforming vacant lots into valuable urban green spaces. Thus, community development, which refers to practices where community members identify their own issues and come together to take collective action to generate solutions, through gardening has recently gained much attention (Saldivar-tanaka & Krasny, 2004). Many scholars such as Troy D. Glover and Jonathan ‘Yotti’ Kingsley have explored the values of contemporary community gardens as potential sites for social capital (Glover, 2004; Kingsley & Townsend, 2006). Led by grassroots neighborhood groups, community gardens are proving significant venues to facilitate social capital, where people voluntarily are connected and cooperated in order to gather resources, address neighborhood issues, and promote friendship. In addition to social capital theory as a lens through which to explore community gardening movements, collective efficacy theory defined by Robert J. Sampson and his colleagues in 1997, which refers to “social cohesion among neighbors combined with their willingness to intervene on behalf of the common good”, has been applied to explain community gardening (Teig, Amulya, Bardwell, Buchenau, Marshall & Litt, 2009). They argue that the creation as well as the operation of community gardens require trusted relationship and collaboration among gardeners, related organizations, and many stakeholders, which can be seen as neighborhood’s collective efficacy.

Even though previous scholars have demonstrated community gardens are more about the “community” than they are about “gardening” because community gardens involve interaction between gardeners inevitably (Kurtz, 2001; Glover, 2004), there have been few studies to prove how much community gardening engagement helps to improve community vitality quantitatively. Thus, this study aims to examine the effects of community gardening on the development of sense of community (SOC) according to the roles, periods, and levels of participation using quantitative analysis. It will figure out the determinants to enhance SOC. The contributions of this research encourage communities to take part in gardening in order to vitalize them.

2.1 Sense of Community

Sense of community, often referred to as psychological sense of community, has been predominantly associated with the McMillan and Chavis model (1986). As demonstrated by McMillan and Chavis (1986), sense of community refers to “a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together” (p. 9). The following four components are essential to the definition of sense of community: (a) membership, feelings of emotional security, belonging, and identification; (b) influence, by which the community influences the individual and in turn the individual influences the community; (c) integration and fulfillment of needs, physical and psychological needs met, thereby reinforcing one’s commitment to the group; and (d) shared emotional connection, positive affect and shared history related to community membership (McMillan & Chavis, 1986).

Measurement of sense of community has been studied by a wide range of people. Buckner (1988) developed an instrument to measure neighborhood cohesion. Buckner’s instrument is classified into three scales, which are attraction-to-neighborhood, degree of neighboring, and psychological sense of community. Nasar and Julian (1995) also focused on sense of community in a neighborhood setting. Given that urban problems resulted from a lack of sense of community, Nasar and Julian tried to develop reliable and valid measurement to assess the sense of community and help establishing policies. In addition, Davidson and Patrick (1986) examined sense of community within the city where psychological cohesion is less than neighborhoods or local communities. A 17-item scale was produced for evaluation of homogeneity and external validity in three studies. Long and Perkins (2007) studied sense of community as community social and place predictors. They pointed out the roles of place and place attitudes have not received much attention in research studies. The sense of community index was classified into two levels; (a) block level, including collective efficacy, participation, neighboring, and place attachment and (b) individual level, composed of length of residence, informal social control, participation, and block satisfaction and confidence.

Since most of the previous studies dealt with urban community or neighborhood settings, for our research, Sense of Community Index (SCI) for community gardening was developed through literature reviews and surveys. At first, we sampled a series of sense of community indices (SCI) from literature associated with measurement of sense of community or neighborhood cohesion. Among 113 items from eight source materials, some overlapping ones and items regarded as unnecessary for community gardens were deleted and modified by means of consideration of researchers. From a pool of items, 37 were eventually selected for further evaluation from experts. The next step was to administer a questionnaire survey to 15 experts involved in the landscape architecture program at Virginia Tech and the Community Design Assistance Center in Blacksburg in order to estimate items for measurement of sense of community that could be used in local community gardens in America. Answer responses of each item ranged from strongly agree to strongly disagree on a 7-point Likert scale. The results from the survey were analyzed over two phases. The first phase utilized descriptive statistics to show the mean and standard deviation of each item. Through descriptive statistics, items having lower mean value or higher standard deviation value was removed. The remaining items were analyzed by exploratory factor analysis for categorizing them according to the common factors. The SOC index for community gardens are configured in a similar way to existing indices, which consisted of “reinforcement of needs”, “membership”, “influence”, and “shared emotional connection”. The factor of “reinforcement of needs” includes three indices, which are (a) this community has been successful in getting the needs of its members met; (b) when I have a problem, I can talk about it with members of this community; and (c) People here know they can get help from others in the neighborhood if they are in trouble. The factor of “membership” has four indices: (a) I feel connected to this community; (b) I can recognize most of the members of this community; (c) I put a lot of time and effort into being part of this community; and (d) I feel like I belong here. In the factor of “influence”, there are three indices which are (a) this community can influence other communities; (b) if there is a problem in this community, members can get it solved; and (c) this community has good leaders. Lastly, “shared emotional connection” factor is composed of five indices: (a) it is very important to me to be a part of this community; (b) I am with other community members a lot and enjoy being with them; (c) members of this community care about each other; (d) members of this community have shared various activities together, such as holidays, celebrations, or disasters; and (e) I feel hopeful about the future of this community.

3 METHODOLOGY

The primary evaluation method is a single case study with surveys of community gardening participants as an experimental group and non-participatns as a control group. We attempted to select a representative sample of local community gardens which have more than 30 participants because 30 people was deemed as an appropriate number to draw valid results about the degree of SOC of gardening participants. Considering the accessibility of the site, the Hale Y community garden was chosen.

The main hypothesis of this study is as follows. (1) The participation of community gardening will have a meaningful effect on SOC. (2) SOC will be different according to the roles, period, and level of participation in community gardening.

3.1 Site and Participants

The target population of this study was identified as participants of community gardening. As a control group, we conducted survey of 32 residents who haven’t participated in community gardening. The site is Hale Y community garden in Blacksburg, which has been run by the YMCA at Virginia Tech (see Figure 1). The community gardening program at the Y at Virginia Tech started in 1978, in several places around town as small and backyard gardening. A senior gardening program by which students were assigned to elderly people to help them gardening in their backyard was its first program, which lasted until the1980s. After that, the gardening program moved to another location on Roanoke Street behind the cemetery. In 2009, a green house was built in the current donated place, and 2010 spring was the first growing year.

The Y community gardening program aims to accomplish community development by engaging Virginia Tech students, help community members and local organizations dedicated to the community, as well as improving ecological, environmental, and educational opportunities. In order to facilitate community engagement, the program provides several opportunities for residents including garden classes, organized neighborhood harvests, and regular potlucks. Currently, the program offers 72 plots for gardeners from 17 countries. In addition to the private plots, the garden has communal spaces for demonstration and voluntary works. The targeted participants in this study include all people who are involved in gardening at Hale Y community garden as either gardeners or volunteers; given volunteering is a big part of this gardening program.

Figure 1. The Hale Y Community Garden in Blacksburg, VA. (2015) Photo by K. Kim

3.2 Research Method

The survey of participants and non-participants of community gardening was conducted to determine any differences according to participation as well as type, level, and period. Frequency analysis was conducted to investigate general characteristics of test subject population. Through reliability analysis on each questionnaire item, we addressed predictability and accuracy. For the purpose of examining the difference of SOC depending on participation and its type, level, and period, T-test and F-test are conducted by using SPSS. Correlation analysis is used to ascertain the relationship between variables. Multiple regression analysis is used to measure how the independent variables predict and address the dependent variables.

3.3 Questionnaire and Subjects

35 subjects from Hale Y community garden and 33 subjects of non-participants in community gardening were randomly selected for the questionnaire. The instrument is a 21-question survey conducted face to face by researchers. The survey was conducted during the second half of 2015 at Hale Y community garden, Blacksburg community center, and a few parks located in Blacksburg. Independent variables include four factors: demographic, socioeconomic, residential, and community satisfaction. The dependent variables are the degree of SOC, which contains reinforcement of needs, membership, influence, and shared emotional connection. A 5-point Likert scale was used to measure the degree of SOC.

Though participants in this study of community gardening were a diverse range of people between the ages of 20 to 60 and older, more than 60% of the participants were in their 40s and 50s. The distribution of age in the group of non-participant in community gardening is similar to the experimental group. Female garden participants outnumbered male participants. In both groups, the rates of people who are highly educated are relatively higher. It is possible the result was strongly influenced by the characteristics of the site which exists in a campus town. The period of residency for participants varies widely, ranging from less than one year to over 20 years.

We identified three roles of garden participants. Gardeners, who rent a plot and garden regularly, make up nearly 40% of participants. Volunteers, who participate in community gardening irregularly without registration, occupy over 50% of the experimental group. As the YMCA at Virginia Tech is interested in volunteer work in order to help students bridge the gap between community and campus, there are a wide range of student groups and other community groups involved in gardening. There are two managers in charge of operating the program at the Hale Y community garden. The managers are responsible for coordinating various programs such as potlucks, education, volunteering and allocation of resources. Over 80% of garden participants responded they are taking part in it consistently, while a few people are involved only occasionally whenever they have spare time. Since garden membership is made on a yearly basis, people who have participated in the community garden less than a year make up the largest portion of the group. Participation level indicates how aggressively the people participate in community gardening, which is measured by the participants themselves. While only three participants responded they take part in gardening more or less passively, over 70% of those who responded said they are gardening actively.

Figure 2. Regular Community Gathering at the garden. (2015) Photo by K. Kim

4 RESULTS

Overall, the degree of the SOC is significantly different depending on the participation of community gardening. In order to compare the degree of SOC between gardening participants and non-participants, a T-test was conducted (see Table 1). The results of the T-test demonstrate a statistically significant difference between the two groups ($p<.001$). The average value of SOC in the group of gardening participants was 3.6 while the value of the control group was 3.12. Considering a 5-point Likert scale was used in the survey, a value of 3.6 can be regarded as reasonably high. In all factors in SOC, which are reinforcement of needs, membership, influence, and shared emotional connection, the gardening participants showed higher values than non-participants, which is statistically significant. In both groups, the factor of membership has the highest value (experimental group: 3.95, control group: 3.62).

Meanwhile, the degree of SOC according to demographic factors shows some interesting results. The older the participants are, the more they feel a sense of community. While the value of the SOC in the group of 20s was 3.06, the average value of a group of over 60s was 3.79 ($p<.001$). In addition, the value of SOC of the people who are married was higher than unmarried singles. Comparing the differences according to the educational background, the value of SOC in the group of highly educated people was higher than the control group. The value indicates a meaningful difference between those items as well ($p<.01$). The results of the T-test and F-test examine the degree of SOC according to the type of role, period and level of participation and show a statistically meaningful difference between variables (p<.05) (see Table 2).

Table 1. The comparison of the degree of SOC between participants and non-participants

Division	Participation	N	Ave.	SD.	t	p
SOC	Participants	35	3.60	.5963	5.720	.000
	Non-Participants	33	3.12	.5579		
Reinforcement of Needs	Participants	35	3.36	.6724	4.450	.000
	Non-Participants	33	2.94	.6795		
Membership	Participants	35	3.95	.6771	3.183	.000
	Non-Participants	33	3.62	.7697		
Influence	Participants	35	3.48	.6472	6.405	.000
	Non-Participants	33	2.90	.5848		
Shared Emotional Connection	Participants	35	3.61	.7674	6.011	.000
	Non-Participants	33	2.90	.6511		

*p<.1, **p<.05, ***p<.01

Table 2. SOC of participants of community gardening depending on roles, period, and level.

Division		Ave.	SD.
Type of Role	Gardener + Volunteer	3.31	.63
	Manager	4.00	.57
t (p)		5.549***	.000
Participation Period	Occasionally whenever I get a free time	3.27	.60
	Consistently under 6 months	3.36	.64
	Consistently 6 months – 1 year	3.87	.60
	Consistently 1 year – 2 year	3.99	.54
	Consistently 2 year	3.76	.52
t (p)		6.678**	.001
Participation level	Very Passively	3.01	.59
	Passively	3.19	.58
	Normally	3.56	.43
	Actively	3.83	.62
	Very Actively	3.88	.46
t (p)		8.320**	.000

*p<.1, **p<.05, ***p<.01

4.1 Reliability Analysis of the Sense of Community Index

In order to measure the stability, consistency and predictability of SOC index, which is composed of four factors, reliability analysis was conducted by using Cronbach's alpha. The value of Cronbach' alpha varies from 0 to 1 theoretically, where higher values are more desirable. However, most researchers and scholars in the field of social science agree if the value of Cronbach's alpha is over 0.7, the internal consistency might be acceptable. The results of the reliability analysis demonstrate the alpha in all factors of SOC index is over 0.7, which means the index is satisfied with the reliability.

4.2 Correlation Analysis

Correlation analysis was conducted in order to measure the correlation between the variables by using Pearson correlation coefficient by which it measures the strength of a linear relationship between paired data. This analysis illustrates the gardening participants' demographic characteristics and perception of their communities. In general, a correlation coefficient over 0.6 indicates a multicollinearity problem, which is highly problematic in construction of a correlation matrix among variables. The result of the analysis between the independent variables indicates there is no correlation between the participation in community gardening and other independent variables, including demographics, perception of local problems, and satisfaction, which means people might take part in community gardening regardless of their age, education, or income (see Table 3). Also notable is the correlation coefficient value between age and marital status, which is 0.734. This figure illustrates these two variables have high correlation due to a multicollinearity problem; however, these two variables could generate similar responses. Except for the relationship between age and marital status, the correlation among other variables is low.

Table 3. Correlation analysis between the independent variables

Division	Partici pation	Gender	Age	Marital Status	Edu	Income	Resi-period	Local problem	Local satisfaction
Participation	1								
Gender	**.143**	1							
Age	**-.034**	.094	1						
Marital Status	**.044**	.259**	**.734****	1					
Education	**.039**	-.148	-.345**	-.303**	1				
Income	**.081**	.133	-.150	-.003	.199**	1			
Residence period	**-.074**	.059	.274**	.234**	-.235**	-.101	1		
Local problem	**-.072**	-.077	-.078	-.178*	.094	-.052	.071	1	
Local satisfaction	**.096**	-.001	.017	-.039	.003	-.051	.034	.061	1

*p>.05, **p<.01

In the analysis of correlation between participation, demographic variables and their SOC, the roles, periods, levels of participation, age, and educational background represent a meaningful correlation with the dependent variables, which are SOC (see Table 4). The correlations among roles, periods, and levels of participation is shown high as well. In particular, the value of the correlation between periods and levels of participation illustrates the longer they participate, the more active they are.

Table 4. Correlation analysis between participation, demographical variables and SOC

Division	Roles	Period	level	Gender	Age	Marital Status	Edu	Income	SOC
Roles	1								
Period	**-.332****	1							
level	**-.074****	**.303****	1						
Gender	-.030	-.015	-.126	1					
Age	-.239*	.124	.211*	.091	1				
Marital Status	-.222*	.102	.067	.234**	**.711****	1			
Education	-.090	.056	.061	-.126	-.323**	-.311**	1		
Income	-.121	.211*	.044	.101	-.122	-.004	.113**	1	
SOC	**-.345****	**.383****	**.482****	.022	**.183****	.113	**.121***	.102	1

*p>.05, **p<.01

In addition, responses to the perception of local problems and satisfaction regarding their residential areas represent a meaningful correlation with the dependent variables, which are SOC. The correlation coefficient value between SOC and perception on local problem is -.160**, and the value between SOC and satisfaction toward their communities is .262**. That is, people who regard their communities' criminal, environmental, and traffic issues as serious are more likely to have lower degree of SOC. In contrast, people who are satisfied with the community's amenities are more likely to have higher degree of SOC, with high correlation.

4.3 Regression Analysis of Community Gardening Participation and SOC

Regression analysis can address whether two or more variables would be systematically connected by a linear relationship. According to the results of simple regression analysis, community gardening participation has meaningful relationships with all of SOC and the four factors (see Table 5).

We conducted multiple regression analysis with the four factors of SOC. Compared with the control group, the degree of SOC in experimental group measures higher (B=.479). More specifically, educational background, residential ownership, perception of local problems and satisfaction are found to affect the degree of SOC. The results of regression analysis illustrate independent variables predict dependent variables in 37% (R^2=.371), which represents a statistical significance ($p<.01$). Thus, the regression model is able to somewhat explain the effect of participation in community gardening on the development of SOC. In addition, as there are no values under 0.1 in the tolerance values and over 10 in the VIF values, which is the variance inflation factor, the results are thought to have nothing to do with multicollinearity. The effect of participation in community gardening on "reinforcement of needs" is measured higher than the group of non-participants (B=.324). Community gardening participants are more likely to feel they could get help from either their neighbors or community when they need it. We assume the Hale Y community garden successfully provides a venue to create social ties by which members receive or give support from other gardeners. Likewise, the participation in community gardening is likely to have influenced the "membership" factor more than the control group (B=.312). Many gardeners and volunteers perceive they feel more connected and belong to Blacksburg, and spend much time and effort to be involved in this community. A remarkable aspect in this analysis is if people do not regard local problems too seriously, they feel a stronger connection to the community (B=-.112). The regression analysis on the "influence" factor illustrates participation in community gardening has more of an effect on the formation of the "influence" factor than the group of non-participation (B=.533). Participants are likely to think the Blacksburg community might influence other communities, and residents are capable of solving community problems. We assume this result would be partly attributed to Jenny Schwanke, who is in charge of coordinating and managing the tasks in this garden, because she has earned the respect of gardeners. Like the result of the "membership" factor, serious participants thinking of local problems had a stronger feeling of "influence" (B=-.138). Lastly, the results of the analysis of the relationship between participation and "shared emotional connection" factors explains participation in community gardening has more of an effect on the formation of "shared emotional connection" for the experimental group than the control group (B=.538). Among four factors, the "shared emotional connection" factor is most relevant to participation. Given the factor includes some indices such as "I am with other community members a lot and enjoy being with them", and "members of this community have shared various activities together", this factor is able to illustrate how the gardeners and volunteers spend their time with other members at Hale Y garden.

Table 5. Simple Regression Analysis of Community Gardening Participation and SOC

Dependent Variable	Independent Variable	Unstandardization Coefficients		Standardization Coefficients	t	p	Model Summary
		B	SE	Beta			
SOC	(Constant)	2.897	.059	-	41.938	.000	R^2=.315,
	Participant	.481	.81	.384	4.728	.000	Adj. R^2=.302
Reinforcement of Needs	(Constant)	2.722	.069	-	49.105	.000	R^2=.389,
	Participant	.412	.84	.282	4.348	.000	Adj. R^2=.338
Membership	(Constant)	3.213	.065	-	42.215	.000	R^2=.136,
	Participant	.324	.111	.227	2.271	.000	Adj. R^2=.121
Influence	(Constant)	2.751	.057	-	41.852	.000	R^2=.441,
	Participant	.571	.089	.421	5.321	.000	Adj. R^2=.397*
Shared Emotional Connection	(Constant)	2.728	.064	-	37.203	.000	R^2=.432,
	Participant	.614	.111	.393	5.089	.000	Adj. R^2=.404

4.4 Regression Analysis of Participants and SOC

The levels and periods of participation in community gardening have meaningful effects on SOC and its four subcategories, while participation roles do not show influence on all of the dependent variables. The outcome is assumed to be caused by the unbalanced numbers of the three roles, which are gardeners, volunteers, and managers. As the number of managers is smaller than the groups with other roles, the P-value in the regression analysis between dependent variables and participation roles shows there is no significant relationship between them (see Table 6). Multiple regression analysis with each dependent variable also shows the same or similar results.

Table 6. Simple regression analysis of the participation of community gardening and SOC

Dependent Variable	Independent Variable	Unstandardization Coefficients		Standardization Coefficients	t	p	Model Summary
		B	SE	Beta			
SOC	(Constant)	2.938	.214	-	12.638	.000	R=.453, R^2=.208, Adj- R^2=.181 Std. Error of Estimate=.40740 F-Value=11.042***
	Roles	-.097	.135	-.062	-.545	.347	
	Levels	.238	.054	.370	2.169	**.001****	
	Periods	.470	.113	.342	4.390	**.001****	
Reinforcement of Needs	(Constant)	2.863	.276	-	6.214	.000	R=.327, R^2=.091, Adj-R^2=.051 Std. Error of Estimate=.52271 F-Value=5.110***
	Roles	-.098	.165	-.063	-.533	.365	
	Levels	.175	.066	.227	1.851	**.031****	
	Periods	.321	.138	.217	1.887	**.020****	
Membership	(Constant)	3.435	.275	-	10.141	.000	R=.339, R^2=.082, Adj-R^2=.224 Std. Error of Estimate=.43312 F-Value=13.421***
	Roles	-.092	.164	-.066	-.571	.387	
	Levels	.171	.066	.257	1.328	**.005****	
	Periods	.382	.138	.272	1.586	**.003*****	
Influence	(Constant)	2.608	.235	-	8.613	.000	R=.488, R^2=.248, Adj-R^2=.181 Std. Error of Estimate=.40722 F-Value=11.021***
	Roles	-.031	.141	-.015	-.172	.565	
	Levels	.271	.057	.387	4.013	**.000*****	
	Periods	.535	.118	.417	2.542	**.000*****	
Shared Emotional Connection	(Constant)	2.847	.303	-	7.321	.000	R=.402, R^2=.169, Adj-R^2=.187 Std. Error of Estimate=.58125 F-Value=7.783***
	Roles	-.111	.180	-.051	-.618	.362	
	Levels	.320	.073	.411	2.912	**.001*****	
	Periods	.433	.151	.331	1.129	**.017****	

5 DISCUSSION AND CONCLUSION

This paper pays attention to the quantitative value of participating in community gardening and the development of a sense of community, which represents reinforcement of needs, necessity of membership, influence, and shared emotional connection. Overall, the degree of SOC was significantly different depending on participation in community gardening. The result of the T-test, which compared degrees of SOC between participants and non-participants, showed the SOC score of community garden participants was higher, which was statistically significant. In addition, multiple regression analysis was conducted in order to examine the SOC degree depending on the participation of gardening. Our results showed that taking part in community gardening had a statistically meaningful effect on dependent variables which were SOC including "reinforcement of needs," "membership," "influence," and "shared emotional connection." More specifically, in order to investigate the SOC according to type of roles, level, and duration of the participation in community gardening, we conducted T-test and F-test by which the results showed significant difference in every category. In addition, the multiple regression analysis of the relationship between SOC and the participation, both of which were dependent variables, showed the variable of activeness of participation, defined as 'participation level' was only deemed statistically significant. We assume that how much participants are involved in community gardening might be closely related to their attachment to the Blacksburg community, as the Y garden program declares its mission as "a place to grow community, not just a place to grow food."

With regard to the effect of the participation on "reinforcement of needs, "there was no meaningful relationship among the independent variables of participation while independent variables of participation level and period were statistically significant in both "membership" and "influence". Considering the "membership" factor consisted of indices such as "I feel connected to this community" or "I feel like I belonging here", community gardening participants who are registered as members are more likely to feel a sense of belonging to the Blacksburg community as well as the Y garden. The fact the program has a dedicated leader, Jenny Schwanke, is assumed to have an impact on the “influence” factor.

Also notable is the fact that people who deem the residential environmental problems of Blacksburg as serious are more likely to have a lower degree of SOC. On the contrary, people who are satisfied with the community’s amenities have a higher degree of SOC. This result illustrates that satisfaction toward one’s whole living environment could affect the development of SOC in general.

The role of participation did not have a meaningful influence on SOC components because the number of managers was comparatively smaller than gardeners or volunteers. Briefly, the SOC degree of the group of community gardening participants was higher than the control group. The study concluded the more active a participant is and the longer they participate, the result is a higher SOC. As previous research has claimed an influence of community gardening on developing social capital qualitatively, this study demonstrates the social effects of community gardening more quantitatively.

This study has some limitations in terms of sample size and target area. Considering each groups’ sample size was around 30 and located only in Blacksburg, VA, it is necessary to expand the range of subjects and area in order to generalize the results. Another expected problem is that this study did not exactly figure out whether subjects rated the SOC considering the whole Blacksburg area or within the community of gardeners specifically. Thus, additional quantitative analysis with in-depth interviews is recommended. In order to provide precise reasons why the participants’ SOC is higher than non-participants, further research should be followed. Furthermore, since the fact that the SOC of gardeners was higher could be caused by other factors and people having high degree of SOC would take part in gardening actively, it is necessary to trace a causal link conversely.

Nevertheless, this study has significance as it confirmed empirically the objectives of community gardens as a way of enhancing community vitality. While previous studies have been dealing with the development of community through community involvement, this study focused more on the specific activity of community gardening. Through the result of this research, community gardens can be suggested as a means of prevention of disintegration of community. In this respect, a supporting policy regarding community gardens should be expanded for community revitalization.

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UNPACKING THE IMAGE OF THE WATER CITY WITH THE THEORY OF IMAGEABILITY

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1 ABSTRACT

This study investigated how to design imageable cities with water using Lynch's (1960) theory of imageability. It examined the contributions of imageability elements (landmarks, paths, nodes, edges, and districts) and components (structure, identity, and meaning) to the image of the water city. The author sampled 55 sketch maps from 60 participants in eight water cities and colored water elements blue to generate 55 colored maps. To measure uncolored map identifiability (UMI) and colored map identifiability (CMI) as dependent variables, raters 1 and 2 were asked to identify the city associated with each uncolored sketch map, and raters 3 and 4 were asked to identify the city associated with each colored sketch map. To assess the contribution of water (CW) to CMI, raters 3 and 4 were asked to indicate the extent to which the map's blue features helped the raters identify the city on a three-point Likert scale. The contribution of water (CW) was used to weight CMI to generate the dependent variable of water-based colored map identifiability (WMI). The author used cognitive mapping, photovoice, and nonvisual protocols to measure waterscape attributes using imageabilty components, waterscape mappability, identifiability, and attachment as potential explanatory variables for UMI, CMI, and WMI. Regression analyses suggest that only canal mappability (the structure of water-based paths) significantly contributed to all measures for the image of the water city (UMI, CMI, and WMI) while controlling for the potential effects of gender, environmental exposure, age, income, education, and aquaphilia sensitivity baseline, which measured people's attachment to water.

1.1 Keywords

Imageability, identifiability, sketch map, water cities, spatial anchor

2 INTRODUCTION

2.1 Water cities as imageable and resilient environments

In *The Image of the City*, Lynch (1960) speculated that Venice and Dutch polder cities were often highly imageable environments; specifically, he pointed out that Dutch urban designers created polder cities as “a total scene” that made it easy for residents and visitors to “identify its parts” and “structure the whole” (p. 13). Although Lynch foregrounded the aesthetic intention underlying these imageable water cities, Hooimeijer (2011) considered this urban design tradition a way to keep urban developments dry in a watery territory below sea level.

2.2 An emerging water-coherent approach to green infrastructure

Such systemic integration of man-made water bodies with public realm design has been regaining momentum among coastal cities seeking urban design interventions as mitigation and adaptation strategies for the impacts of climate change and rise in sea level (Backhaus & Fryd, 2012; Jacob, 2014; Ross, 2014; Ruggeri, 2015; Waggonner & Ball, 2013). This blue thrust in the green infrastructure movement has been considered the critical path through which biophilic urbanism contributes to livability and climate change adaptation (Beatley & Newman, 2013). However, the emergence of blue-green infrastructure has largely been driven by technocratic discourse. Hydrologic conditions have been discussed as the predominant generator of urban forms (Backhaus & Fryd, 2012). The systemic potential of water in enhancing the image of the city has been largely unexplored as a design theory by academics and as a siting strategy by practicing urban designers.

2.3. Contributions of structure, identity, and meaning to imageability

Lynch’s (1960) theory of imageability provides a point of departure for investigating how water-based aesthetics may contribute to the image of resilient cities. Lynch (1960) alluded to imageabilty as a pattern of high continuity with distinctive yet interconnected parts. This definition seems to suggest that imageability could be attributed to the combination of structure and identity provided by uninterrupted paths and landmarks. Although Lynch (1960) pointed out three components of imageability (structure, identity, and meaning), The Image of the City focused primarily on the contributions of structure and identity.

2.4 Waterscapes as spatial anchors

In an imageability study conducted with visitors and residents in three Dutch water cities, De Jonge (1962) observed greater detail in sketch maps drawn at closer proximity to water bodies. These results indicate the high likelihood that water-based elements may be higher-order spatial anchors, which the anchor-point theory defines as organizers of spatial information (Golledge, 1992). Jodelet and Milgram (1976) and De Jonge (1962) discovered that waterscapes seem to emerge first in sketch maps regardless of their cognitive forms, or, in Lynch’s (1960) terms, elements of imageability. It is likely that water-based elements surface early during spatial memory recalls because all other spatial information must be organized around them.

2.5. Influences of waterscapes’ elements of imageability on the image of the city

Lynch (1960) described the Charles River as an edge in Bostonians’ cognitive maps. Jodelet and Milgram (1976) found that the Seine River showed up first in participants’ sketch maps of Paris. The salience of the Seine River in the cognitive maps for Paris may be attributed to its cognitive form as an edge and/or to its simple presence as water. Though rivers pass through many cities, most of them would not have been described by Lynch as imageable cities like Venice and the Dutch Polder cities, which are often characterized by the presence of well-integrated water bodies within their urban fabrics. It is possible that canals or water-based paths, which have narrower linear water surfaces, may be more salient water-based spatial anchors than rivers or water-based edges.

2.6 Study objective and research question

This study intended to investigate possible ways to design imageable cities through a water-coherent approach to designing green infrastructure at the city level. To this end, the investigation sought to better understand Lynch’s theory of imageability in the context of water cities, particularly those that are similar to Venice or Dutch polder cities. Specifically, the proposed research design strove to answer the question of how the image of the water city could be attributed to waterscapes' imageability components (structure, identity, and meaning) and imageability elements (landmark, path, node, edge, and district).

3. METHODS

3.1 Sketch map identifiability as a measure of environmental imageability

In observing the ways the Dutch polder cities were designed, Lynch (1960) pointed out that an identifiable environment could potentially contribute to the imageability of these water-centric cities. However, Lynch's sketch map studies were conducted in three land-based cities with rivers rather than water-centric cities with water bodies integrated within their urban fabrics. De Jonge's (1962) study of visitors' and residents' sketch maps from three Dutch water-centric cities suggests that an identifiable sketch map is possibly a reflection of an identifiable environment. According to Lynch (1960), imageability also encompasses environmental affordance for spatial comprehension. Kim and Penn (2004) found that certain parts of sketch maps were more identifiable because their corresponding environmental configuration was more conducive to wayfinding (Kim & Penn, 2004). To assess spatial abilities, Beck and Wood (1976) and Evans (1980) used sketch maps to study the extent of spatial knowledge required to form a cognitive map of a physical environment. These empirical sketch map studies indicate that sketch map identifiability is a promising measure of environmental imageability. To better understand imageability, this study utilized sketch maps as a data source. Participants were asked to draw sketch maps only once because Blades (1990) found that sketch maps had sufficient test-retest reliability for evaluating spatial knowledge.

3.2 Deriving imageability-based dependent variables from sketch map identifiability

To assess the influences of waterscapes' imageability elements and components on the image of the city, the study developed three regression models using three sketch map identifiability measures as dependent variables. To account for the impact of blue color typically used for water bodies on cartographic maps, their water elements were colored blue. Then, to generate scores for uncolored map identifiability (UMI) and colored map identifiability (CMI), independent raters assessed the identifiability of the cities represented by uncolored and colored sketch maps, respectively. UMI and CMI were used as dependent variables for the first two regression models. In addition, the CW was also assessed and used as multiplier for CMI to derive the value for water-based map identifiability (WMI), the dependent variable for a third regression model. Each regression model included a final set of nine explanatory variables composed of three explanatory variables selected from 15 waterscape attributes (Section 3.3) and six confounding variables (Sections 3.4, 3.5, 3.6) selected from literature review.

3.3 Waterscape structure, identity, and meaning as potential explanatory variables

To explore the interrelationships of various imageability concepts in the context of water-centric cities, the investigator conducted stepwise regression analyses to examine how imageability related to any of the 15 waterscape attributes generated from the combinations of five waterscape types (water landmarks, canals, lakes, rivers, and harbors), as water-based counterparts of five imageability elements and three imageability components (structure, identity, and meaning). A water landmark is an iconic feature or salient scene along and/or across a body of water. Both additive and subtractive regression analyses were used to identify a final set of explanatory variables that resulted in a significant change in the regression model's F value (Burkholder & Lieber, 1996). To measure waterscapes' structure, identity, and meaning, to the extent to which they are mappable, identifiable, and memorable, the investigator employed the top-down, eye-level, and emotional perspectives for probing the participants' spatial memory recall sequence through interview instructions and questions (Section 4.3).

3.4 Aquaphilia sensitivity baseline as confounding variable

Coss (1990) attributed people's preferences for water scenes and the optical properties of water, especially glossiness, to the evolutionary advantage of being able to identify clean drinking water. These observations suggest a possible association between the CW to imageability and aquaphilia. This study defines aquaphilia as an innate emotional bond with safe, clean water or water-centric environments. Aquaphilia sensitivity baseline is likely to have an impact on the image of the city because emotion has been found to affect spatial cognition (Tucker, Hartry-Speiser, McDougal, Luu, 1999). The association between emotional bonding and proximity seeking (Scannell & Gifford, 2010) suggests that the aquaphilia sensitivity baseline can be measured through participants' desire to live close to water.

3.5 Socioeconomic variables accounting for group differences in spatial cognition

Montello, Lovelace, Golledge, and Self (1999) and Lawton (1994) discovered gender differences in environmental spatial abilities and wayfinding strategies. Levine, Vasilyeva, Lourenco, Newcombe, and Huttenlocher (2005) revealed that income level mediated the gender difference in spatial skill. Age has been found to be a significant factor influencing environmental learning and wayfinding behaviors (Kirasic, 2000). Ishikawa and Montello (2006) discovered that some participants' spatial knowledge developed with increasing environmental exposure while others either demonstrated accurate metric spatial knowledge from the first navigation session or never developed this survey knowledge, even after several navigation sessions. These previous studies suggest that gender, income, age, and environmental exposure are potential confounding variables.

3.6 Education as a proxy for the influence of exposure to map and information

Despite little evidence, Olkun (2003) suggested that specific training materials, such as engineering drawing activities, could potentially improve spatial abilities. However, more education could potentially be associated with a greater exposure to maps and secondary information sources. Previous studies that investigated the influence of map exposure on sketch maps and spatial comprehension were inconclusive. Some found no correlation between map exposure frequency and sketch-map accuracy (Devlin, 1976), while others noted spatial performance improvement due to map exposure (Devlin & Bernstein, 1995). Kreimer (1973) discovered that specific elements in environmental cognition were emphasized, possibly due to the extensive use of secondary information sources, such as television, newspapers, and radio, as opposed to direct environmental exposure. In order to better examine the influence of direct environmental experience, the author proposed education as a rough proxy for controlling the potentially confounding effect of map and information exposure.

4. DATA COLLECTION

4.1 Selection of water cities

A Google search indicated that 12 cities have been referred to as "Venice of the North" because of their water-based appeal to visitors and residents. Wikipedia provides a list of 10 such cities: Amsterdam, Bruges, Copenhagen, Giethoorn, Hamburg, Henningsvær, Manchester, 's-Hertogenbosch, Saint Petersburg, and Stockholm. Berlin (MacLean, 2011) and Ghent (Raplee, 2010) have also been compared to Venice. Among this shortlist of alluring water cities, the author chose six as study sites based on precipitation pattern similarity and geographical proximity for cost of sampling as selection criteria. These first six cities selected were Amsterdam and Giethoorn in the Netherlands, Ghent and Bruges in Belgium, and Berlin and Hamburg in Germany. Only Amsterdam and Hamburg are coastal cities with harbors in proximity; the other four are inland water cities. Rotterdam and Almere, the two fastest-growing polder cities in the Netherlands, were also appealing water cities with easily accessible harbors. (Kwadijk, Haasnoot, Mulder, Hoogvliet, Jeuken, van der Krogt, & van Waveren, 2010; Tao & Zhengnan, 2013). These two coastal polder cities were thus added to the selection of study sites, for a total of eight cities.

4.2 Recruitment of field participants

A simple and obvious sampling frame for residents and tourists in these eight cities does not exist, because tourists enter and exit the cities constantly; these tourists typically do not have permanent addresses. Sampling sites were thus randomly sequenced to recruit participants in order to create an approximation of a random sample derived from a theoretical sampling frame, which assumes it is possible to include all residents and tourists in all eight cities during the sampling time frame. The investigator used a randomized order to sequence the eight cities. Each city's nine sampling sites always included major entry points (such as airports, intercity train stations, and bus stations), city halls, and tourist bureaus, as well as various hotels, cafés, ethnic stores, and universities. The author chose these sites to sample a representative mix of residents and visitors, high- and low-income populations, environmental design experts and non-experts, and immigrants and visitors from various countries of origin. Each sampling site was sampled for 5 hours, for a total of 45 hours for each water city.

4.3 Field interviews

The author recruited 60 semistructured interview participants from sampling sites in all eight cities. As shown in Table 1, during each interview, the investigator conducted cognitive mapping (item 1), photovoice (item 3), and nonvisual protocols (item 4) to prompt the participant to recall the city as the first five features to emerge from a two-dimensional, top-down cognitive map, the first five photograph-like eye-level cognitive images to surface from spatial memory, and the five elements that would be most missed if the participant had to leave the city the next day.

Table 1. Interview items and coding for environmental factor variables.

Variables	Interview items for field participants
sketch map identifiability[c]	2. Sketch map protocol: Please draw a map of your city on the next page. Include as many features as you can recall. Number the features directly on the map to indicate the sequence in which they emerged from your memory.
waterscape identifiability[ab]	3. Photovoice protocol: If you were to take 5 pictures of the city to describe it to someone who has never been there, what would you take pictures of?
waterscape attachment[ab]	4. Non-visual protocol: What are the 5 things you would miss about the physical environment if you had to leave the city tomorrow?

a. Code each answer 1 or 0 based on whether it contains a target waterscape, assign a weight from 5 to 1 to account for the sequence of recall, and use a weighted average to create variable measures.
b. A targeted waterscape can be a canal, river, lake, harbor, or a water landmark (a landmark along and/or across a body of water).
c. The sketch map was used to three generate sketch map identifiability measures (Section 2.7).

The author used these three recall protocols to assess the mappability, identifiability, and attachment of the five waterscape types as measures for their imageability components (structure, identity, and meaning). The targeted waterscape types included canal, river, lake, harbor, and water landmarks. Immediately after the cognitive mapping protocol, the investigator conducted the sketch-map protocol (item 2) to instruct each participant to draw a map of the city while keeping track of the sequence in which each feature appeared in his or her memory. Some 60 interviews resulted in 55 sketch maps because five participants could not draw their cognitive maps from recall, although they confirmed their ability to draw maps before the interviews. Table 2 illustrates other interview questions for measuring the following six confounding variables: aquaphilia sensitivity baseline, gender, income, age, length of stay, and education or implied map and informational exposure.

Table 2. Interview items and coding for individual factor variables.

Variables	Interview items for field participants (coding)
age	5. In what year were you born? (convert to age)
aquaphilia sensitivity baseline[a]	6. If you could live anywhere, would you choose to live? □ Right on the water (5) □ With easy access to water (4)□ With visual access to water (3) □ Far away from water (2) □ As far away from water as possible (1)
education[a]	7. What is the highest level of education you have completed? □ Graduate degree (5) □ Higher education (Bachelor's degree) (4) □ Some college (3) □ Secondary school (2) □ Elementary school (1)
gender	8. Which sex or gender do you identify with? □ Female (0) □ Male (1)
income[a]	9. Approximately what was your total household income for 2012? Please include all income sources for every member in your household. □ Less than €15,000 (4) □ €15,000–€30,000 (3) □ €30,000–€45,000 (2) □ More than €45,000 (1)
environmental exposure	How many years/days have you lived in this city (altogether)? (convert to days)

a. Assume response categories as equally spaced points along a Likert scale to generate scores as shown above in parentheses.

5. DATA ANALYSIS

5.1 Coding for field data

For items 1, 3, and 4 in Table 1, the investigator assigned a base score of 1 or 0 to each response depending on whether it contained one of the five targeted waterscapes. The basis for classifying these waterscapes was on the literal use of the waterscape terms or the names of actual water bodies in participants' responses. When a waterscape type was unclear in a response, the investigator asked the participant to clarify before ending the interview. The author applied a weight of 5 to the base score for the first answer, 4 for the second, and so forth, to account for the significance of each waterscape type's recall sequence. As shown in the following formula, the investigator took a weighted average from the sum of all five weighted base scores:

Weighted average = (5 * *first answer base sco*re + 4 * *second answer base score* + 3 * *third answer base score* + 2 * *fourth answer base score* + 1 * *fifth answer base score*) / 5

This formula was used to derive the mappability, identifiability, and attachment measures, respectively, for canal, harbor, lake, river, and water landmarks from the results of the cognitive mapping, photovoice, and non-visual recall protocols in Table 1.

As shown in Table 2, the investigator used a five-point Likert scale to ordinate the score for aquaphilia baseline (item 6) and education (item 7) and a four-point scale for income (item 9). For gender (item 8), female and male were coded 0 and 1, respectively. Each participant's birth year was subtracted from 2016 to calculate age (item 5). Environmental exposure was converted to days.

5.2 Sketch map evaluation protocol

Several studies utilized two independent raters to analyze sketch maps to establish inter-rater reliability for measures that could be influenced by subjective judgments (Ferguson & Hegarty, 1994; Maguire, Burke, Phillips, & Staunton, 1996; Quaiser-Pohl, Lehmann, & Eid, 2004). Independent raters without previous exposure to either the study or the eight cities were recruited for evaluating the identifiability of 55 sketch maps. These 55 sketch maps were presented in a randomized sequence in Qualtrics, an online survey platform, for comparison with eight city maps.

During the first sketch map survey, raters 1 and 2 were guided by written instructions to glance at the eight city maps for no longer than 10 seconds to determine whether they could recognize the city represented in each sketch map by answering item 1 in Table 3. The author assigned a code of 1 or 0 to this item when each sketch map was identified successfully or not, respectively, to generate the measure of uncolored map identifiability (UMI).

The author colored the water elements in the same 55 sketch maps in blue for evaluation by raters 3 and 4, who also had no previous exposure to the study or the eight cities. They were asked to scan eight city maps for no longer than 10 seconds to identify the city associated with each colored sketch map using item 1 in Table 3. The author then assigned a code of 1 for correct and 0 for incorrect and unsure identification of each sketch map to generate the measure for the variable of CMI.

Raters 3 and 4 were also asked to assess the extent to which blue features contributed to the identifiability of each map by answering item 2 in Table 3. The item assumed its three response categories as equally spaced points along a three-point Likert scale to generate scores for CW. The measure for WMI was generated by multiplying CMI with the CW.

5.3 Inter-rater reliability tests

The investigator calculated the intraclass correlation coefficients (ICCs) of all map identifiability measures in Table 3 in SPSS 24, using a two-way mixed model and an absolute agreement definition, as suggested by McGraw and Wong (1996), to assess how reliable these map identifiability measures were between raters. Along with the Cronbach's alpha as a commonly used inter-rater reliability indicator, SPSS provided the ICC average measure to assess the proportion of a variance attributable to judges for the average ratings of two independent raters.

ICC values between 0.60 and 0.74 are commonly cited as cutoffs for good inter-rater reliability (Cicchetti, 1994; Hallgren, 2012). Several studies used 0.6 as an acceptable ICC threshold (Baumgartner & Chung, 2001) and as an acceptable threshold for determining internal consistency reliability with Cronbach's alpha (Hume, Ball, & Salmon, 2006). As the lower bound of a reliability coefficient, Cronbach's alpha does not require measures of precision, such as confidence intervals (Cronbach, 1951). This study used 0.6 as the cut-off value for both ICC and Cronbach's alpha to qualify reliability between raters.

Table 3. Survey questions and coding schemes for map identifiability measures.

Descriptive Name	Variable	Colored sketch map survey items and coding schemes
uncolored/colored map identifiability	UMI[ac]/ CMI[bc]	1. This is a map of what city? □ Almere □ Amsterdam □ Berlin □ Bruges □ Ghent □ Giethoorn □ Hamburg □ Rotterdam □ Not Sure
contribution of water	CW[d]	2. To what extent do the map's blue features help you identify the city? □ Very much (3) □ Somewhat (2) □ Not (1)
water-based colored map identifiability	WMI	3. The contribution of water to correct colored map identification. Colored map identifiability (CMI) * contribution of water (CW)

a. For raters 1 and 2 during the first sketch map survey using uncolored sketch maps.
b. For raters 3 and 4 during the second sketch map survey using colored sketch maps.
c. Code 1 for correct or 0 for incorrect/unsure responses.
d. Assume response categories as equally spaced points along a Likert scale to generate scores as shown above in parentheses.

5.4 Generating final scores for UMI, CMI, and WMI

As there was sufficient inter-rater reliability, the UMI, CMI, and WMI scores were averaged between raters to generate the final scores for UMI, CMI, and WMI. Five participants confirmed that they were capable of drawing maps before the interviews. However, during the interview, they could not recall enough spatial information to draw sketch maps. As UMI, CMI, and WMI attempted to measure the extent to which a city was imageable to a participant, for these five participants, 0 was used as the final scores for these three sketch map identifiability variables.

5.5 Data reduction

This study used stepwise (both additive and subtractive) regression analyses to identify the final set of explanatory variables from the 15 waterscape attributes. The data reduction process tested all possible sequences in which the candidate variables could be added to or omitted from the regression models. A candidate variable was selected when its elimination from or addition to each model resulted in a significant change in models' F-values (Seber & Lee, 2012). This smaller pool of candidate variables was used for another round of stepwise (both additive and subtractive) regression analyses to test the model fit. The variables used for the best-fitting models were included in the final three regression models, along with six confounding variables.

5.6 Data preparation

To normalize the different scales used for age, length of stay, income, education or assumed map and informational exposure, and aquaphilia sensitivity baseline, their means were subtracted from the original values, and then the remaining values were divided with their means. For waterscape mappability, mappability, and attachment variables, the original values were used because they were derived from the same cognitive map recall protocol and coded with a consistent weighting method based on the sequence in which they were called.

5.7 Power analysis and sample size

Each of the regression models had a total of nine independent variables: the three waterscape attributes derived from the data reduction process and the six confounding variables identified by the literature review. A power analysis conducted in G*Power 3.1.9.2 suggested that the sample size ($N = 60$) provided sufficient power and a medium effect size (Cohen, 1992 [$d = 0.805 > .08$, $\alpha = 0.05$, $f2 = 0.31$]) for regression models with one dependent variable and nine independent variables.

6. RESULTS

6.1 Inter-rater reliability of sketch map identifiability measures

Both uncolored map identifiability (UMI) and colored map identifiability (CMI), were reliable ($\alpha_{UMI} = .7 > .6$, $ICC_{UMI} = .7 > .6$, $p_{UMI} < .001$; $\alpha_{CMI} = .7 > .6$, $ICC_{CMI} = .7 > .6$, $p_{CMI} < .001$). Acceptable inter-rater reliability was also observed for WMI (α_{WMI} = .7>.6, ICC_{WMI} = .7 > .6, p_{WMI} < .001). The results suggest that the ratings for UMI, CMI, and WMI did not significantly differ between the raters.

6.2 Final independent variables

Among the 15 waterscape attributes, the first set of stepwise regression analyses identified the following 10 potential explanatory variables that significantly contributed to the model fit: canal mappability, water landmark mappability, river mappability, lake mappability, harbor mappability, canal identifiability, water landmark identifiability, river identifiability, and harbor identifiability, and canal attachment. A second set of stepwise regression analyses were conducted using these 10 variables. The results indicated that the models with canal mappability, harbor mappability, and harbor identifiability had the highest fit. These three waterscape attributes were included with the six confounding variables as the independent variables in each of the three regression models with UMI, CMI, and WMI as dependent variables.

6.3 Descriptive statistics

Table 4 and Figure 1 show that most participants were between 20 and 33 years old; the average age was 35.5 years old (*M* = 35.5) with a standard deviation of about 15 years (*SD* = 14.92).

Table 4. Descriptive statistics of confounding variables.

Independent Variables	N	Minimum	Maximum	Mean (*M*)	Std. Deviation (*SD*)
Age	60	18	80	35.500	14.916
Gender	60	0	1	.650	.481
Income	60	1	4	2.480	1.186
Education	60	2	5	3.900	.969
Environmental exposure (day)	60	0	17885	2643.750	4273.905
Aquaphilia sensitivity baseline	60	3	5	4.150	.732

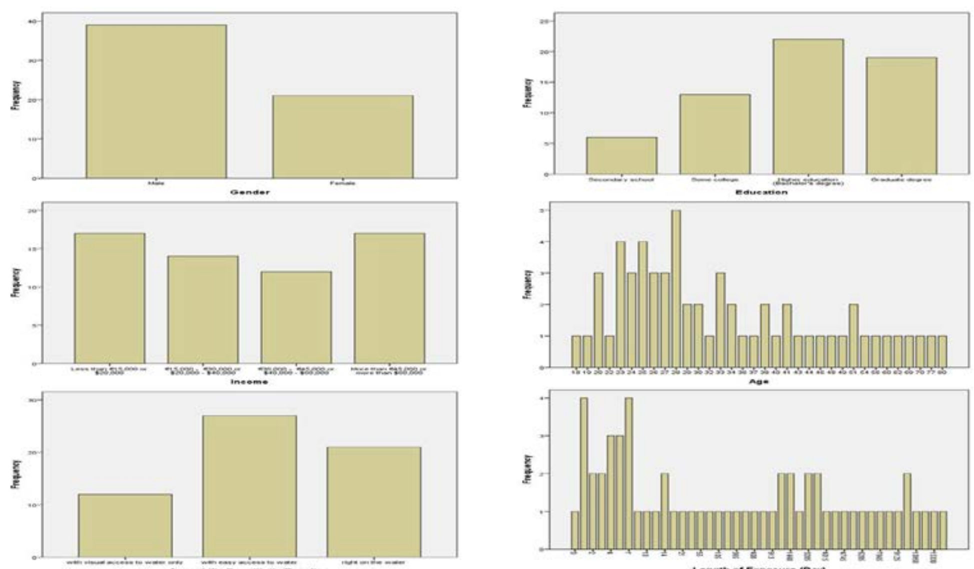

Figure 1. Frequency charts for confounding variables.

There were nearly twice as many male as female participants. The mean income for the sample is somewhere between €15,000–€30,000 and €30,000–€45,000. The participants' average level of education was slightly below higher education (bachelor's degree [*M* = 3.9, *SD* = .969]). Their average environmental exposure was 2,644 days with a standard deviation of 4,274 days. There is a cluster of participants with fewer than seven days of exposure. The other participants were rather evenly distributed across a wide range of environmental exposure, from seven to 17,885 days. On average, participants would like to live somewhere with easy access to water with a slightly upward trend toward living right on the water as opposed to having only visual access to water (*M* = 4.15; *SD* = .732).

6.4 Comparisons of regression analyses

WMI regression model had the highest model fit ($R_{WMI}^2 = .52$, $F_{WMI}[9, 50] = 6.05$, $p_{WMI} < .001$), followed by UMI ($R_{UMI}^2 = .47$, $F_{UMI}[9, 50] = 4.86$, $p_{UMI} < .001$) and CMI ($R_{CMI}^2 = .42$, $F_{CMI}[9, 50] = 3.93$, $p_{CMI} < .001$). Table 5 shows that canal mappability had the most significant positive influence on WMI ($\beta_{WMI} = .55$, $t_{WMI}[50] = 5.15$, $p_{WMI} < .001$), much less on UMI ($\beta_{UMI} = .47$, $t_{UMI}[51] = 4.21$, $p_{UMI} < .001$), and the least on CWI ($\beta_{CMI} = .45$, $t_{CMI}[51] = 3.86$, $p_{CMI} < .001$).

Table 5. Results of regression analyses.

	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	std. error	β	*t*	*sig.*	tolerance	*VIF*
dependent variable: uncolored map identifiability (UMI)							
(constant)	.205	.162		1.266	.211		
gender	.017	.100	.019	.172	.864	.871	1.148
age	-.397	.134	-.385	-2.967	.005	.634	1.578
Income[a]	.129	.114	.142	1.134	.262	.680	1.471
Education[a]	.180	.208	.103	.866	.391	.752	1.329
aquaphilia sensitivity baseline[a]	-.609	.281	-.248	-2.164	.035	.812	1.231
environmental exposure[a]	-.002	.030	-.008	-.073	.942	.858	1.165
canal mappability	.076	.018	.473	4.209	.000	.844	1.185
harbor mappability	.038	.025	.207	1.481	.145	.547	1.828
harbor identifiability	-.058	.038	-.215	-1.525	.133	.535	1.869
.040 - .076 - .517 .608 .535 1.869							
dependent variable: colored map identifiability (CMI)							
(constant)	.253	.171		1.483	.144		
gender	-.003	.105	-.004	-.031	.976	.871	1.148
Age[a]	-.029	.141	-.028	-.207	.837	.634	1.578
Income[a]	-.006	.120	-.007	-.051	.959	.680	1.471
Education[a]	.378	.219	.215	1.725	.091	.752	1.329
aquaphilia sensitivity baseline[a]	-.906	.297	-.366	-3.052	.004	.812	1.231
environmental exposure[a]	-.034	.032	-.127	-1.085	.283	.858	1.165
canal mappability	.073	.019	.454	3.859	.000	.844	1.185
harbor mappability	.023	.027	.123	.839	.405	.547	1.828

harbor identifiability	-.021	.040	-.076	-.517	.608	.535	1.869
.040							
- .076							
- .517							
.608							
.535							
1.869							
dependent variable: water-based map identifiability (WMI)							
(constant)	1.132	.337		3.359	.002		
gender	-.060	.237	-.027	-.254	.801	.871	1.148
age	-.191	.318	-.074	-.601	.551	.634	1.578
Income[a]	.045	.270	.020	.166	.869	.680	1.471
Education[a]	.783	.494	.179	1.586	.119	.752	1.329
aquaphilia sensitivity baseline[a]	-2.393	.669	-.388	-3.576	.001	.812	1.231
environmental exposure[a]	-.071	.071	-.106	-1.002	.321	.858	1.165
canal mappability	.221	.043	.549	5.152	.000	.844	1.185
harbor mappability	.085	.061	.186	1.408	.165	.547	1.828
harbor identifiability	-.048	.090	-.071	-.530	.599	.535	1.869
.040							
- .076							
- .517							
.608							
.535							
1.869							

a. Normalized by subtracting means from original values and then dividing the results with means.

Among the six confounding variables, aquaphilia sensitivity baseline had the most significantly negative contribution to WMI ($\beta_{WMI} = -.39$, $t_{WMI}[50] = -3.58$, $p_{WMI} < .001$), closely followed by CMI ($\beta_{CMI} = -.37$, $t_{CMI}[50] = -3.05$, $p_{CMI} < .01$), and much less for UMI ($\beta_{UMI} = -.25$, $t_{UMI}[50] = -2.16$, $p_{UMI} < .05$). Age had a significant negative effect on UMI ($\beta_{UMI} = -.39$, $t_{UMI}[50] = -2.97$, $p_{UMI} < .01$). Education or implied map and informational exposure had a marginally significant positive influence on CMI ($\beta_{CMI} = .22$, $t_{CMI}[50] = 1.73$, $p_{CMI} < .1$).

6.5 Regression Diagnostics

The models did not have serious multicollinearity problems because Table 5 shows that all tolerances were greater than 0.2, and all variance inflation factor (VIF) values were less than 5 (O'brien, 2007). Figure 2 indicates that the models did not violate the normality assumption for multiple regressions. Specifically, the regression standardized residuals followed a fairly normal distribution in the histograms and stayed fairly close to the reference line in the normal P-P plots. However, the scatterplots for all three models had a negative linear trend. The linear trend suggests that the models could have been improved with additional variables with a significantly negative influence on the map identifiability measures. Among all three models, the one using WMI as the dependent variable had best model fit, the least pronounced linear trend, and the most random scatterplot pattern. This suggests that accounting for the extent to which water contributed to map identification helped improve the model.

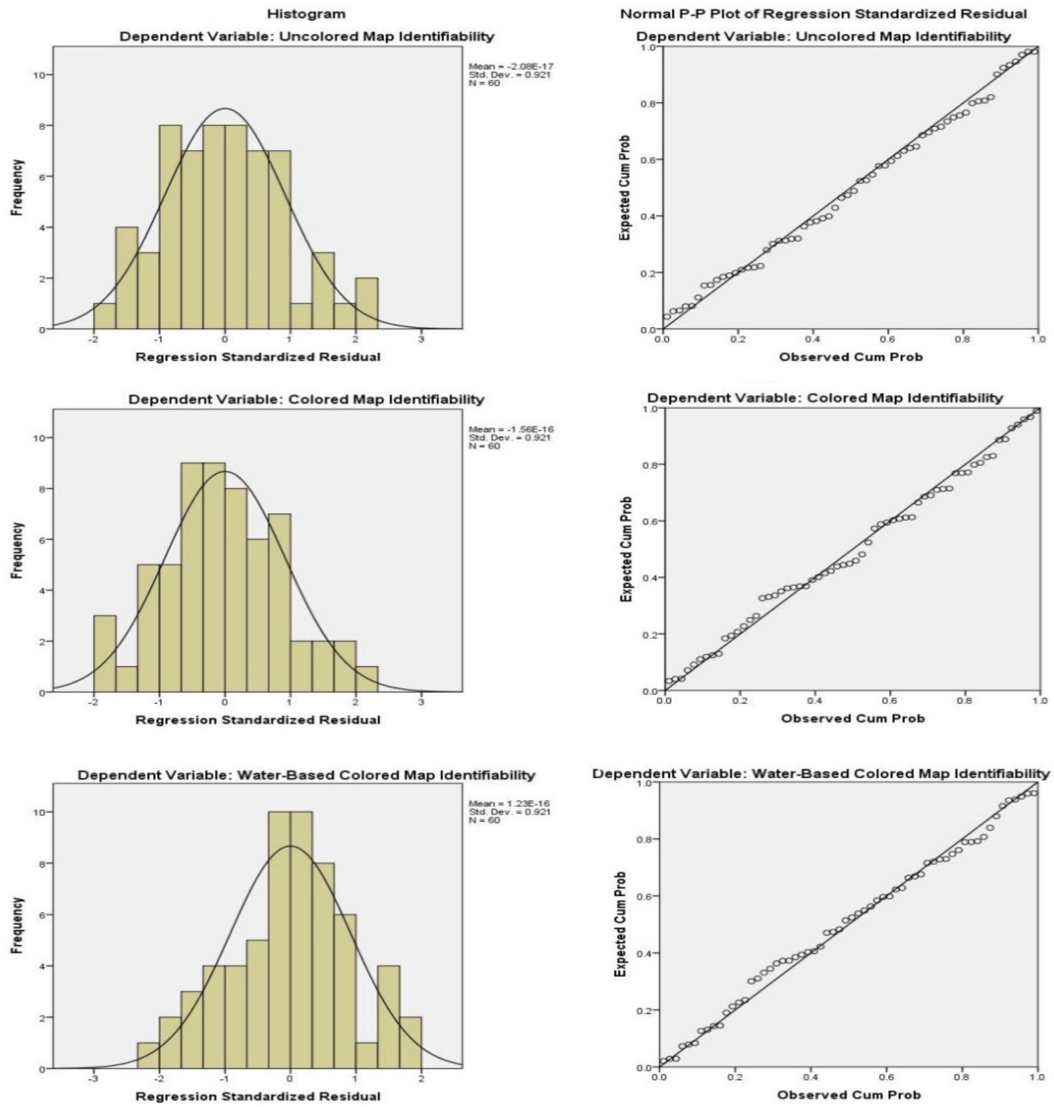

Figure 2. Histograms and P-P Plots for UMI, CMI, and WMI as dependent variables.

7 DISCUSSION

7.1 Differentiating aquaphilia from aquaphobia

A water city was more imageable to participants with less desire to be close to water. Several participants who preferred to have only visual access to water, as opposed to living right on the water or with physical access to water, mentioned they could not swim or were afraid of water. The findings suggest that fear of water might have contributed to the saliency of water elements in participants' cognitive maps. A more clear distinction between aquaphilia and aquaphobia may be necessary in future studies.

7.2 Including psychophysiological baselines in spatial cognition studies

Participants who sought a greater proximity to water might have relied on water to a greater extent for different reasons, such as stress reduction or emotional regulation. As both arousal and emotion have been found to affect spatial abilities (Brunyé, Mahoney, Augustyn, & Taylor, 2009), future studies may investigate whether participants' familiarity with water or less arousal-resilient psychophysiological baseline might have been potential explanatory variables for their less legible sketch maps.

7.3 Studying the interactions between imageability elements and water

A more direct investigation of the relationships between cognitive forms and aquaphilia will be important for confirming whether water-based imageability is entirely independent of or does interact with the five conventional imageability elements. If such interactions do exist, the extent to which water contributes to the saliency of the five imageability elements in cognitive maps will require further investigation. This investigation may involve studying aquaphilia as the extent to which water helps with stress reduction or emotional regulation on smaller sites, such as plazas and parks, possibly through recording environmental experience, eye-tracking data, and psychophysiological measurements. In addition to measuring participants' psychophysiological baselines, researchers should obtain pre- and postexperience behavioral measures using the same cognitive mapping, photovoice, and emotional recall measures for triangulation. By simultaneously recording participants' psychophysiological measurements and eye-tracking data, researchers can better differentiate changes in psychophysiological measurements due to visual fixations on water-based versus non-water-based environmental features. By triangulating this data with cognitive mapping, photovoice, and emotional recall measures, it may be possible to better understand the relative contributions of water and cognitive forms to the recall sequences of environmental features.

7.4 Designing a wayfinding-enabling city for a pluralistic society through water

Consistent with Kirasic's (2000) finding, older participants had significantly fewer identifiable sketch maps when they were not colored. After the sketch maps were colored, better-educated participants, with a marginal statistical significance, had more identifiable colored sketch maps. Education was used as a proxy for measuring participants' exposure to maps and other informational sources about the city. It is possible that participants' greater exposure to colored maps or other informational sources might have a marginally significant correlation with their ability to draw identifiable sketch maps using water elements that were colored blue on colored maps. However, when the CW to map identifiability was factored into water-based colored map identifiability as a weight, none of the confounding variables had significant effects on water-based map identifiability. The findings suggest that water elements might be more cognitively powerful than the conventional elements of imageability. Specifically, water elements could potentially mediate differences in spatial comprehension among different populations, which are, for this particular sample, age groups and groups with different levels of exposure to maps and other informational sources. Future studies may consider the use of mediation analyses to see if salient canal structure mediates the differences in sketch map identifiability among various groups to enable spatially challenged populations to obtain the same level of spatial comprehension.

7.5 Designing for waterscape visibility

Figure 3 shows that the sketch maps from Amsterdam participants were more homogeneous than those from Berlin participants. Tourists with only days of exposure to Amsterdam developed an image of Amsterdam that was rather comparable to mental images from residents who had lived in the city for years. Even residents with years of exposure to Berlin did not have consistent images of Berlin. Both cities have attractive canals frequented by tourists and residents. However, the canals in Amsterdam are highly visible from the street because they are mostly within the right-of-ways, with little freeboard. In contrast, the canals in Berlin tend to be bordered by parks or the backs of public facilities. When they are located within the right-of-ways, they are rarely visible from the street due to their much lower elevation than the street level. The locations of canals and the extent of their freeboard may be critical factors to consider for examining how to make canals more salient eye-level scenes.

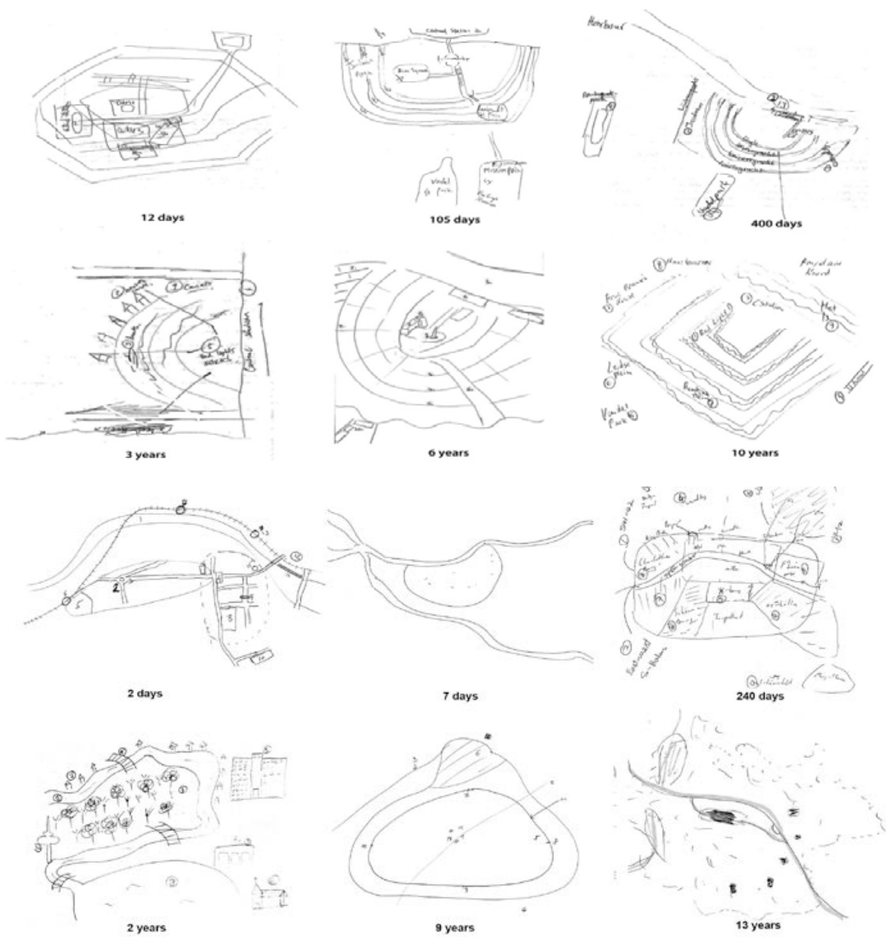

Figure 3. Sketch maps from participants sampled in Amsterdam (top 6) and Berlin (bottom 6).

7.6 Creating imageable cities with salient canal structures

All three models revealed that the earlier and the more frequently canal structures emerged in participants' sketch maps, the easier it was to identify the cities represented by these sketch maps. In the case of cities similar to Venice and Dutch polder cities, structure and path were the imageability component and element with significant positive influences on the participants' mental image of the city. The findings suggest that introducing waterscapes as linear paths that form a salient structure in cognitive maps can significantly improve residents' and visitors' mental image of the city.

7.7 Aligning the city resilient movement with the city beautiful movement

Urban waterways, including daylit streams and canals, have been proposed for many coastal cities, such as Copenhagen, Oslo, Boston, New York, and New Orleans, as mitigation and adaptation strategies for the impacts of climate change and sea level rise (Backhaus & Fryd, 2012; Jacob, 2014; Ross, 2014; Ruggeri, 2015; Waggonner & Ball, 2013). This emerging city resilient movement in coastal cities could potentially be a renaissance of the city beautiful movement to engender more alluring water cities like Venice and the Dutch polder cities. This potential synergy requires engineers and designers to engage in a dialogue on how to maximize these waterways' hydrological and aesthetic performances through the use of an intentional citywide structure to organize these waterways. This study has demonstrated that cognitive mapping could be a helpful tool for identifying salient canal structures as inspiration for cities in the process of reintroducing water into their urban fabrics to better address the impacts of climate change and rise in sea level.

7.8 Mainstreaming the city resilient movement through the city beautiful movement

Compared to downstream, upstream water retention is more cost-effective for mitigating flood risks downstream (Hartmann, 2009). However, upstream cities are not as motivated to participate in water retention if flooding is not an immanent issue. As all reservoir sites have been put to use (Sahagian, 2000), water-based imageability may help encourage upstream water retention within the public realm through a revival of the city beautiful movement. For example, the Riverwalk in San Antonio, the Bricktown Canal in Oklahoma City, and the Canal Walk in Indianapolis are extremely successful downtown revitalization projects. However, they are rather limited in their geographic extents and hydrological performances. These canal projects could potentially be expanded into citywide networks and retrofitted with smart water systems. The smart water systems can be wirelessly connected with weather stations to discharge water from the canals before large storm events to maximize their water retention capacities. They can also help dispatch water within the networks to facilitate coordination between various decentralized water reuse projects. Creating imageable inland cities through citywide water networks could help these cities become better prepared in the face of more intense rainfalls and more sustained droughts as impacts of climate change. Furthermore, this approach promotes a growing trend in upstream water retention within urban fabrics to help reduce downstream flood risks for coastal cities, which are the most vulnerable to the impacts of climate change and rise in sea level.

8 CONCLUSION

The study can be poetically concluded in Dreiseitl's words in the preface for *Recent Waterscape* (Dreiseitl, 2009):

> Coping with ever greater amounts of stormwater run-off from increased urbanization and fierce heavy downpours does not mean endlessly multiplying the number and capacity of technical facilities. . . . Rather, the networking of the city structure as an interactive infrastructure, publicly visible and also aesthetically attractive, is needed. The next generation of networked city infrastructures is habitat, urban and recreational space all in one while at the same time fulling a structural function. (p. 9)

Lynch's (1960) definition of imageability, a pattern of high continuity with distinctive yet interconnected parts, has parallels in many fields, including the notion of mosaics composed of continuous corridors with interconnected patches in landscape ecology (Dramstad, Olson, & Forman, 1996) and the use of smart grid to network decentralized infrastructures at the district level (Sood, Fischer, Eklund, & Brown, 2009). The greenway literature utilizes connectivity as a similar system-based concept that helps enhance the well-being of humans and wildlife (Searns, 1995; Shafer, Scott, & Mixon, 2000). Waterways have also been proven to help stimulate economy, encourage tourism, and promote compact developments (Wagner, 2007). In addition to being conducive to compact developments and connectivity, such imageable water-based structure has also been regarded as the most resilient urban form for responding to the impacts of climate change (Hamin & Gurran, 2009). An imageable citywide network of blue parkways has tremendous potential to enhance a city's infrastructural, aesthetic, recreational, ecological, and economic performance in an age of climate change and rise in sea level.

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Landscape Research Record No. 5

SERVICE LEARNING AND COMMUNITY ENGAGEMENT

Edited by Malika Bose

RURAL INTERDISCIPLINARY SERVICE-LEARNING PROJECTS: FRAMEWORKS FOR ENGAGEMENT WITHIN REGIONAL RURAL DEVELOPMENT CENTERS

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1 ABSTRACT

In recent decades, design programs have engaged communities' tangible needs through service-learning, civic engagement, and participatory action research. These approaches offer experiential learning opportunities for students and provide services to underserved communities (Lee, 2008). Recognizing these benefits, academic programs employ these models of engagement in their pedagogical approaches at the project, course, or program levels. In the current era of urbanization, rural communities and their landscapes represent an array of large-scale design challenges. While landscape architecture maintains a body of work in the planning, design, and management of large-scale and rural landscapes, opportunities for allied design disciplines also exist. Relatedly, the urbanist paradigm that dominates the state of the art of contemporary design education has resulted in a reticence to equally engage in rural projects within the university studio setting. This paper showcases an alternative focus to the dominant urbanist paradigm by suggesting opportunities for university design programs to engage in rural projects. Land-grant institutions were originally conceived for applied teaching, research, and outreach, much of which was focused on rural and agricultural-based issues. Design programs situated at land-grant institutions are uniquely positioned to advance this mission. Using a content analysis of publicly available publications, we identify potential strategic opportunities for the design disciplines located at land-grant institutions within the region of the Western Rural Development Center (WRDC). We recommend ways in which design programs based in all four United States Department of Agriculture (USDA)-funded Regional Rural Development Centers (RRDCs) can enhance their engagement in rural issues while fulfilling the land-grant missions.

1.1 Keywords

Rural, service-learning, interdisciplinary, civic engagement

2 INTRODUCTION & BACKGROUND

What role could design programs housed in land-grant universities play in addressing rural design problems? How can existing university-community partnership frameworks facilitate involvement of the design disciplines in engaging rural issues? This exploratory study evaluates university landscape architecture, interior design, and architecture design programs' involvement in one of the four regionally located United States Department of Agriculture (USDA)-funded Rural Community Development Centers (RDCC), as reflected in the center's quarterly publication, *Rural Connections*, and recommends ways in which the four centers can provide an organizing framework for interdisciplinary service-learning endeavors. Through greater engagement of the design programs with rural issues, benefits may be realized for three constituencies: rural communities that would benefit from the creative resources of university design faculty and students, design faculty who would benefit from the availability of collaborative design and research opportunities around shared projects, and university design students—who through experience with rural-based design problems—might develop greater understanding of the unique design challenges of rural settings and empathy for those who inhabit these dynamic and critical built environments.

2.1 Rural Issues as Design Problems

Due to globalization, shifting demographics, and economic changes precipitated by the decline of natural resource based economic sectors, rural communities experience a unique set of challenges. These challenges include rapid growth and change within natural amenity-rich areas (Howe, McMahon, and Propst, 2012), shifting economic conditions, decline of natural resource extraction employment opportunities, depopulation in many areas, changes in food and energy production, and interdependent relationships between significant public lands and the communities that adjoin them (Winkler et.al, 2007). While these challenges often reflect economic and cultural dimensions (Smith and Krannich, 1998), they present in a geographic and spatial context that comprises a built environment ripe with design opportunities (Bartuska and Young, 2007). These challenges are not merely social or economic in nature—rather they are impacted by and manifested within the physical environment. The spatial dimensions of rural challenges present unique engagement opportunities for the design disciplines—landscape architecture, interior design, and architecture—particularly those situated at land-grant universities. As publicly funded universities founded for the purpose of furthering agricultural and technical knowledge, land-grant universities have a heritage of applied teaching, research, and outreach that is geared toward the unique challenges and well-being of rural places. Due to their complexity and scale, meeting these challenges often requires an interdisciplinary approach.

2.2 University Design Response

Many university design programs have responded to these challenges by offering collaborative service-learning models that synthesize the creative expertise of their faculty and students with community members' local knowledge to improve the physical conditions of rural communities—thereby facilitating positive economic and social change (Angotti, Doble, and Horrigan, 2012). Typically, these endeavors employ a co-design process (Lee, 2008) that collaboratively engages those who will use the space, place, or product of design in the design process itself. This partnership model differs from traditional design models in which designers assume the role of expert and design for, rather than with the client. The design team serves the client by sharing their professional knowledge, while their community partners share their expertise of the values and identity of their community. When successful, co-design involves generous knowledge sharing between two groups of experts. By identifying community members as experts, their contributions are empowered. In the same vein, participatory action research (Reardon, 2000) offers methods to engage community residents and designers in the identification and planning for community-defined issues. Although the specific steps of this process may differ depending on the type of issue being addressed and the unique context in which engagement occurs, participatory action research brings together diverse stakeholders to collaboratively identify and solve community-based problems. Notable examples include the East St. Louis Action Research Project (Reardon, 1998), which involves design students from the University of Illinois in urban issues and the Rust to Green NY Action Research Initiative (Horrigan, 2014).

Other notable collaborative models of design engagement in rural settings include the Rural Studio at Auburn University (Hinson, 2007), The Rural Communities Design Initiative at Washington State

University, and Extension Landscape Architectural endeavors at Utah State University, University of Kentucky, Cornell University, University of California Davis, and North Carolina State University, in which landscape architecture faculty fulfill extension roles (Evans and Anderson, 2016). Due to the scale and uniqueness of rural design challenges, some have even proposed that rural design should be defined as a new and distinct design discipline (Thorbeck, 2013). Many university design initiatives engage tangible design problems in urban communities; however rural-based design problems have fallen out of fashion among some design faculty (Ryan, Krikac, & Sleipness, 2015). Reflective of national demographic trends and urbanization, most academic design programs are instead oriented toward urbanism and there is much greater interest in engaging urban issues through design (Sleipness, Ryan, & Krikac, (2013, 02-07). Phone interview with T. Barrie). From the point of view of using design to impact large populations of people in their immediate physical context, an urban focus is a laudable and rational response to demographic patterns. However, vibrant urban areas still require functioning rural hinterlands to supply the food, energy, and other natural resources necessary to sustain large urban populations. Furthermore, rural communities provide urban dwellers respite and access to surrounding natural amenity-rich recreational landscapes. Consequently, the physical qualities of rural built environments must be holistically considered as part of an interrelated regional system of human settlements situated on a continuum of urban to rural. But independent of their relationship to urban populations, rural areas also possess intrinsic values, with meaning, significance, and senses of place that cannot be replicated elsewhere. The economic value and vitality of rural places is a central goal of the USDA and promoted through its system of land-grant universities.

Land-grant universities were first enabled by the Morrill Acts of 1862 and 1890, which allowed states to sell federally controlled land for endowment of public higher education. These land-grant institutions were originally purposed for teaching, research, and outreach of applied subjects, much of which was focused on rural economic development and agricultural-based issues. The USDA established four regional rural development centers (RRDCs) with the goal of aggregating common research initiatives conducted at individual member land-grant institutions in order to maximize their regional impacts. The RRDCs are housed at land-grant universities within each region in four regions of the United States; member land-grant universities for each of the RRDCs are illustrated in Table A1. The Western Rural Development Center (WRDC), housed at Utah State University, has 12 member institutions represented by land-grant universities in the western region of the United States. The Northeast Regional Center for Rural Development (NRCRR), housed at Pennsylvania State University; Southern Rural Development Center (SRDC), housed at Mississippi State University; and North Central Regional Center for Rural Development (NCRCRD), housed at Michigan State University, all mirror this organizational model. Tasked with providing economic and community development guidance to rural communities, the centers "form a one-stop shop to connect to the nationwide network of land-grant college and university researchers, educators, and practitioners to provide sound information and hands-on, community-level training. The trainings help rural communities make science-based decisions about their community and economic development investments” (WRDC, 2014 p17).

Influenced by unique rural dilemmas in the western, southern, north central, and northeast regions, the four RRDCs are a potential mechanism for connecting design programs at land-grant institutions with pressing rural issues within their respective regions. How can university design programs be more engaged in rural contexts? This study identifies ways in which design programs can increase their engagement with rural issues through collaboration with RRDCs, with an emphasis on the western region.

3 METHODOLOGY

An interdisciplinary team of faculty representing landscape architecture, interior design, and architecture used a grounded theory approach to analyze the content of publicly accessible publications of the four RRDCs to illuminate regional foci and to identify opportunities corresponding to each of these three design disciplines. The team assessed the apparent involvement of design disciplines in the RRDCs based on published materials available on the websites for each of the four centers. Based on the results of this initial assessment, the team identified opportunities for each of the three design disciplines to engage in the projects described in the examined publications. A preliminary review of the publications representing each of the four RRDCs revealed that while their foci often engage the built environment, design disciplines at each center’s member schools were not overtly engaged within regional development center initiatives, as reflected in the publications.

Initial review of WRDC, NRCRR, SRDC, and NCRCRD public materials also revealed that each of the centers maintains distinct formatting of annual reports, publications, and presentations and emphasize unique information ranging from the number of website visits, listings of board members, and project highlights. Due to the wide variance and overlapping thematic content of each center's publication archives, the research team focused in-depth analysis on one center. We determined that the WRDC maintained the most prolific and extensive collection of online published materials describing its activities and the work of contributing institutions.

Due to its relatively high level of detail and thematically organized content, the research team selected the WRDC's publication *Rural Connections* for further detailed content analysis. According to the WRDC (n.d.), *"Rural Connections*, the magazine of the Western Rural Development Center, is published to inform the nation on timely research and activities by the West's land-grant institutions and regional/national agencies as it relates to rural development issues in the region. Contributors include researchers, faculty, extension researchers, specialists and agents, practitioners, and professionals from throughout the West with occasional contributions from outside the region."

3.1 Overview of Process

Archived issues of *Rural Connections* for the previous seven years (see table 3-1) were reviewed and closely examined for initial content themes and the presence of descriptions of the following design disciplines—landscape architecture, interior design, and architecture—particularly those housed at WRDC member institutions. Subsequently, each of the 125 articles within these issues of *Rural Connections* was searched for the presence of keywords associated with the three design disciplines. The presence of keywords within an article triggered in-depth analysis of the context surrounding these keywords. This contextual analysis highlighted opportunities for design engagement.

Table 3-1. Issues of *Rural Connections* and Thematic Content

Issue	Topical Theme
June 2015	*Extension in the West: Team Building*
May 2014	*Extension's Role in Sustainability*
Nov 2013	*Immigration*
June 2013	*Our Energy Future*
Jan 2013	*Drought and Wildfire in the West*
May 2012	*Local and Regional Food Systems Boost Local Economies*
Sept 2011	*The Rural West: Daring to Innovate Job Creation*
June 2011	*Climate Change Adaptations in the Rural West*
Sept 2010	*Healthy Communities*
May 2010	*Water in the Western U.S.*
Nov 2009	*Food Security in the Western U.S.*
April 2009	*Creating Sustainable Communities in a Changing America*

3.2 Initial Content Analysis and Keyword Search

Within each thematic issue of *Rural Connections*, subthemes were mapped out to determine where design disciplines could potentially engage. Following this initial thematic mapping, each volume of *Rural Connections* was analyzed for inclusion of keywords associated with the design disciplines. These keywords were derived from disciplinary descriptions published by professional organizations affiliated with each of the three design disciplines—landscape architecture, interior design, and architecture. Specifically, the research team surveyed the words each professional organization used to define and describe their respective design discipline in their webpages. These keywords were subsequently reviewed and augmented with additional keywords as deemed appropriate by the interdisciplinary research team (see Table 3-2). A preliminary keyword search was conducted to illuminate the relative frequency of keywords associated with each of the three disciplines. However, some of the keywords affiliated with each discipline were found to overlap and may be interpreted as more closely aligning with one of the other three disciplines; the research team determined these characteristics reflect the professions' overlap of project types and contested territories found within professional practice. To mitigate this effect, all keywords were thereafter treated as a collective list for all three disciplines, rather than specific to any one discipline.

Table 3-2. Keywords by Discipline

Landscape Architecture	Interior Design	Architecture
Landscape architecture	Interior design	Architecture
Landscape	Interior	Façade
Garden	Residence	Office
Exterior	Tenant improvement	Open space
Land	ADA	Downtown
Planning	Accessible	Infrastructure
Land use planning	Space planning	Motel
Parks	Education	Housing
Recreation	Institution	Sports
Site	Multi-family	Industrial
Streetscape	Design*	Design*
Public space	Sustainable*	Sustainable*
Urban design	Adaptive reuse*	Adaptive reuse*
Water resources	Retail*	Retail*
Greenway	Commercial*	Commercial*
Path	Residential*	Residential*
Trail	Building*	Building*
Campground	Transportation*	
Ecology		
Parking		
Storm water		
Pedestrian		
Design*		
Sustainable*		
Transportation*		

*Keywords overlap with at least one of the other design disciplines' self-descriptions

Each volume of *Rural Connections* was searched for presence of the keywords. Their presence within particular articles was noted and corresponding articles were flagged for in-depth content analysis. Articles containing keywords were then analyzed for potential engagement of the three design disciplines. During this analysis, potential projects were identified in which design disciplines could be involved to enhance an existing project, advance its progress in subsequent phases, or provide service-learning opportunities for design students.

3.3 Contextual Analysis

Following determination of the presence of keywords, these keywords were analyzed in the context of the individual articles and thematic volumes to illuminate potential for design engagement. Through a close reading of the contextual text and imagery, the research team assessed the applicability of the article content to the three design disciplines. These opportunities were evaluated rated on a scale ranging from low, medium, and high in terms of the strength of their potential relationship to one or more of the design disciplines in a service-learning context. Members of the research team first identified these opportunities during their individual evaluation of the articles. Subsequently, the team reviewed, corroborated, or challenged and collectively revised these ratings and developed recommendations for how university design disciplines might engage each of the opportunities highlighted in the *Rural Connections* articles. The research team's assessments of these potential relationships were informed by each member's knowledge of their respective discipline and pedagogical requirements and experience with interdisciplinary service-learning projects within academic settings. The applicability of the design disciplines to each reviewed article is presented in summary (see Table 4.1), along with discussion of selected design opportunities generated by the interdisciplinary research team. The intersection of two emerging trends in design education: participatory design as a tool for service-learning through civic engagement and efforts to integrate the work of design disciplines at the university level are identified for each selected *Rural Connections* article.

4 RESULTS

4.1 Keyword Frequency

Initially, each issue of *Rural Connections* was searched for keywords by disciplinary category. Of the three design disciplines, landscape architecture keywords were used most frequently (55%), followed by interior design (14%), architecture (13%), and overlapping combinations (18%). Their presence within the articles triggered in-depth contextual analyses of the articles for potential design engagement opportunities for landscape architecture, interior design, and architecture.

4.2 Content Analysis and Design Opportunities by Thematic Issue

The following are analyses of each of the thematic issues of Rural Connections from June 2015 to April 2009. For each thematic issue, selected articles determined to have particular design relevance are discussed and arrayed in summary (see Table 4.1). The research team's assessments of potential design engagement for each article are also displayed in the Appendix, organized by thematic issue (see Tables A-2 through A-8). Design relevancies for each article were identified within the context of how they could be engaged by design programs, with emphasis on service-learning projects.

4.2.1 Extension in the West: Team Building

Colorado River Basin Agricultural Water Conservation Clearinghouse

Drought is becoming heightened in the Colorado River Basin and without adaptation, water will eventually be directed away from agriculture to meet other water demands (Plombom, Kallenberger, Waskom, & Smith, 2015). The design disciplines would be integral to the formulation of solutions, especially in reducing domestic water needs that will demand the use of agricultural water. These would be in the form water saving strategies, especially in the design and installation of drought resistant landscapes, which would provide service-learning opportunities for students within and outside the design disciplines.

Nevada's Living with Fire Program

Nevada has a high wildfire risk along the wildland-urban interface but risks can be minimized through building and site design strategies (Smith, Sistare, & Miller, 2015). The described program relies on educating landscape workers, who then share their knowledge on wildfire risk management. Design disciplines can work with authorities to develop strategies that reduce the risk of damage to sites and structures through landscape design, specification of materials, building design, zoning and codes.

4.2.2 Extension's Role in Sustainability

Extension Sustainability Outreach: Rising to Meet Public Sustainability Demand

This article discusses sustainability publications, programs, and an Extension Sustainability Summit. According to the article, the summit achieved benefits including educating "local officials and communities in fundamental principles of land use planning and zoning" (Brain, 2014 p4). Design disciplines would be a valuable asset in bringing clarity to principles of land use planning and zoning by providing graphic visualizations of different land use planning and zoning strategies, site development, building design, and materials selection. Service-learning opportunities could include engagement with the public during the summit, or design and implementation of sustainability demonstration projects.

Land Use and Sustainability in the West

"Extension educators from around the West gathered to present and discuss the relationship of land, air, food, water, and energy" (Apel, 2014 p11). This article focuses on land use and how it engages with sustainability as we face population growth, diminishing water, and climate change. "Extension agents are in a position to facilitate, consult with, and educate stakeholders on land use planning…" (Apel, 2014 p14). Examples of resources for these include GIS mapping and other web-based collaborative planning tools. The article identifies landscape architects and planners as a collaborative resource for helping extension educators engage these complex issues.

4.2.3 Immigration

LIFE (Local and Immigrant Farmer Education) in Hawaii

Underrepresented agricultural areas need education on responsible and sustainable farming, business, risk management, and environmental protection stewardship. In Hawaii, these are offered through the Local and Immigrant Farmer Education (LIFE) program (Sugano, Fukada, & Swift, 2013). The program in this article was determined to have a high potential for design involvement, particularly if these programs include design disciplines to help educate clients on spatial awareness.

4.2.4 Our Energy Future

The Energy Future of Rural America.

The article outlines large-scale multi-dimensional and complex problems dealing with energy scarcity, population growth, and food production amid a changing and urbanizing western U.S. (Oliver, 2013). Design disciplines have critical roles in addressing these issues, due to their emphasis on systems thinking. While the article does not define a specific project in which the design disciplines could engage, the broader issue of energy provides a framework within which multiple design and service-learning engagements could occur.

10-Year Energy Vision- Western Governors' Association Energy Initiative

The article on the Western Governors' Association Energy Initiative describes the array of conventional and renewable energy resources including coal and oil, wind, solar, geothermal, and biomass, and their role in a national energy policy (Herbert, 2013). The topic has great applicability to landscape architecture, particularly in visual analysis work inherent in siting and routing power transmission lines and pipelines.

In the Good Times and the Bad: Shale Gas Development and Local Employment

Housing shortages in shale gas development areas and the effects of gas infrastructure on landscape aesthetics and property values are described in the article (Weber, 2013). Design disciplines should be integral players in assisting energy development companies and the communities affected by booms to develop strategies for providing worker housing. Potential options include housing that could be quickly constructed, easily relocated, re-purposed, or recycled and sites that could be readily adapted for alternate uses after the boom has passed.

4.2.5 Drought and Wildfire in the West

Fire and Drought in Paradise- Say it Isn't So, Smokey

The article describes the relationship between native versus non-native invasive plant species, drought conditions, and wildfire in Hawaii (Cram et al., 2013). Design disciplines, especially landscape architecture would be valuable allies in promoting the planting of native species and illustrating a variety of options for using native species to obtain effects similar to the allure that leads to planting invasive non-native species.

Community Wildfire Planning as a Tool to Enhance Trust: Case Studies from Western Montana

This article details the study of wildfire in communities in the wildland-urban interface. Results of survey data are directly applicable for designers of residential communities, especially landscape architects and architects (Lachapelle & McCool, 2013). Siting of structures, selection of building materials and vegetation, and perhaps most importantly, areas where development should not be constructed are fundamentally design issues.

Extension Disaster Education Network Responds to 2012 Drought and Wildfires

The economic and financial costs of wildfire and other natural disasters are outlined in the article (White, Cain, & Cassel, 2013). Public awareness of wildfire and other natural disaster risks is key to preventing loss of life and loss of property. The Extension Disaster Education Network (EDEN) would have direct design relevance, particularly if the design disciplines were involved in the design of educational exhibits.

4.2.6 Local and Regional Food Systems Boost Local Economies

A Food Hub Challenge

Systems thinking, particularly the infrastructure necessary to produce, transport, process, and distribute food for human consumption is the focus of this article (Merrigan, 2012). Designers' routinely apply systems thinking to problems—especially landscape architecture and land use suitability analyses. Consequently, designers are naturally situated to think holistically about food systems. Also, the physical components of the food infrastructure system—such as gardens, transportation systems, warehouses, and markets—are opportunities for architecture, interior design, and landscape architecture.

Land Use Planning and Spatial Configuration Benefit Community Agriculture

Coordination of urban agriculture with recreational and green infrastructure development is the topic of this article by University of Idaho landscape architecture professor, Gary Austin (2012). The topic presents many opportunities for design, particularly in landscape architecture, planning, and development of underutilized land. While land suitability analyses provide clear opportunities for landscape architecture, interior design and architecture can also play critical roles in the development of urban agricultural systems, particularly in the design of buildings and other structures associated with agricultural production, processing, and sales.

Developing a Healthy Food Hub in Rural Nevada

Community gardening in the context of public schools and how the practice of sustainable gardening extends into the greater community are described in detail (Lakes, 2012). Naturally, the design of gardens and associated facilities is an opportunity for landscape architecture, and could also include interior design and architecture.

Rebuilding Alaska Foodsheds: No shortage of good ideas

Local food production and local food consumption in Alaska are described in the context of the biophysical challenges of growing food in harsh climates. The authors note "a striking lack of infrastructure for butchering, processing, and marketing the end products" (Gerlach and Loring, 2012 p24), as well as contributions of food infrastructure to communities' social functioning. The lack of supporting infrastructure is challenging for sustainable food production. While possibly unconventional, the infrastructure for butchering, processing, and marketing food products are clearly design opportunities for interior design and architecture, particularly to promote the humane treatment of animals.

Table 4.1. ***Rural Connections*** **Thematic Issues and Selected Articles***	Planning Scale Projects and Broad Scale Topics	Focused and Site Scale Projects	Service-Learning Opportunities	Landscape Architecture	Interior Design	Architecture
Extension in the West: Team Building						
Colorado River Basin Agricultural Water Conservation Clearinghouse		•	•	•	•	•
Nevada's Living with Fire Program		•	•	•	•	•
Extension's Role in Sustainability						
Extension Sustainability Outreach: Rising to Meet Public Demand	•	•	•	•	•	•
Land Use and Sustainability in the West	•			•		
Immigration						
LIFE (Local and Immigrant Farmer Education) in Hawaii		•	•	•	•	
Our Energy Future						
The Energy Future of Rural America	•		•	•	•	•
10-Year Energy Vision- Western Governor's Association Energy Initiative	•			•		
In the Good Times and the Bad: Shale Gas Development	•	•	•	•	•	•
Drought and Wildfire in the West						
Fire and Drought in Paradise- Say it Isn't So, Smokey		•	•	•		
Community Wildfire Planning as a Tool to Enhance Trust	•	•		•		•
Extension Disaster Education Network	•	•		•	•	•
Local and Regional Food Systems Boost Local Economies						
A Food Hub Challenge	•	•	•	•	•	•
Land Use Planning and Spatial Configuration	•	•	•	•	•	•
Developing a Healthy Food Hub in Rural Nevada		•	•	•	•	•
Rebuilding Alaska's Foodsheds		•			•	•
The Rural West: Daring to Innovate Job Creation						
Creating Value for Place-Based Businesses		•		•	•	•
Agricultural Tourism and Rural Development	•	•	•	•	•	•
Climate Change Adaptations in the Rural West						
Assisting Arctic Inhabitants in Responding to a Changing Climate	•	•	•	•	•	•
Healthy Communities Improving Health and Well-Being						
Mental Health Outdoors: the Benefits of Nature		•	•	•	•	•
Poverty Reduction Project Increases Social and Natural Capital		•	•	•	•	•
Investigating Places for Active Recreation in N.C. Communities	•		•	•		
Health, Economy, and Community: USFS Managers' Perspectives	•		•	•		
Community Recreation and Healthy Living in Rural Settings	•	•	•	•		
Thermus aquaticus and You: Biodiversity, Health, and Interpretation		•	•		•	
Water in the Western U.S. Is There Enough?						
Constructed Wetlands for Wastewater Treatment as Landscape Amenities		•	•	•		
Food Security in the Western U.S.						
Food Insecurity and Stress Among Children in the West		•	•	•	•	•
Creating Sustainable Communities in a Changing America						
Providing Workforce Housing While Preserving Natural Character in N.H.	•	•	•	•	•	•
Local Decision Maker	•			•	•	•

*Titles of selected articles are abbreviated for efficiency.

4.2.7 The Rural West: Daring to Innovate Job Creation

Creating Value for Place-Based Businesses

Extension economic development agents advocate for small business clients in a broad range of business models and outcomes (Falen, Gray, Sluder, & Westerndorf, 2011). The authors emphasize that working with small business owners is an organic process. Because of the open co-learning process, extension and small-business owners were able to collaborate. Business models that require physical facilities would benefit from early input from the design disciplines so that they are not caught off-guard by the requirements associated with new construction or renovations.

Agricultural Tourism and Rural Development— Developing Value-Added Farm and Ranch Resources to Diversify Operations Beyond Agricultural Production

Evolution of rural agricultural economies from conventional farming to agricultural tourism are described in the article (Burr, 2011). "Agritourism" is identified as providing a rural experience for those living in urban centers. The allure of agritourism relates to urban-dwellers' desires to have immersive experiences in a rural lifestyle (Phillip, Hunter, & Blackstock, 2010). In their efforts to improve their economic stability, agricultural entrepreneurs participate more heavily in alternative business models. In developing branded products that fit into the gourmet food market, agricultural entrepreneurs provide on-site experiences for tourists, and greatly increase the diversity of their product development. Many modifications are necessary to accommodate tourism in existing agricultural operations. Many of these modifications are site and structure issues such as parking, signage, restrooms, and creative ways of illuminating agricultural processes while providing visitors with a positive experience. Consequently, design disciplines should be involved in the early planning stages so that business plans include necessary physical modifications. Additionally, if students had exposure and experience in preparing business plans for the enterprises for which they design, they would develop empathy for future clients and enhance their design skills.

4.2.8 Climate Change Adaptations in the Rural West

Assisting Arctic Inhabitants in Responding to a Changing Climate

The effects of climate-change have already impacted coastal village locations, and promises to impact many economic sectors. Authors (Gamble, Trainor, & Fresco, 2011) identify collaboration efforts between governmental agencies and residents in Alaska as they confront increasingly warmer winters. Design disciplines could be involved in helping plan new communities in danger of becoming submerged or developing strategies to protect existing communities from rising waters. Additionally, the design disciplines could contribute valuable visualization skills during envisioning of new economic opportunities.

4.2.9 Healthy Communities Improving Health and Well-Being

Mental Health Outdoors: the Benefits of Nature

Biophilia and Kaplan's Attention Restoration Theory (ART) are described in conjunction with other recommendations for improving mental health. This project defines the classic use of ART and biophilia to support environmental psychology benefits of nature (Beil, 2010). The benefits of the natural environment can be supported through both activities outside, and through development of architectural and interior design that support humans' intrinsic desire for exposure to the natural environment. There are multiple opportunities for the design disciplines to develop opportunities in the built environment—including site and interior design—that promote human interactions with nature and views to the outdoors.

Poverty Reduction Project Increases Social and Natural Capital

The author (Kollock, 2010) describes a project that involved community clean-up efforts. These efforts were successful in bringing residents together in a dedicated effort to improve the townscape. The successes encouraged the community to tackle larger design issues in town, including a marina. The design disciplines could partner with the community restoration efforts to upgrade local site resources such as the marina, community garden, and other site improvements.

Investigating Places for Active Recreation in Rural North Carolina Communities

The authors reported a lack of clarity in standards about what features to include in local recreational areas (Henderson, Edwards, Casper, Bocarro, & Floyd, 2010). This provides a clear opportunity for the design disciplines, particularly landscape architecture. The importance of forming partnerships was a main finding from rural recreation directors in order to achieve goals. Design disciplines are typically structured to function best as a part of a team assembled to address issues related to the built environment. Design disciplines' involvement beginning early in the process of problem identification, using participatory or co-design methods, would help identify a range of options for recreational opportunities to assist stakeholder subsequent decision-making on standards of recreation provisioning.

Health, Economy and Community: USDA Forest Service Managers' Perspectives on Sustainable Outdoor Recreation

This project primarily focused on a survey of USDA Forest Service managers on "perceptions of sustainable recreation" (Bricker, Winter, & Schultz, 2010 p39). The authors identified that Forest Service managers indicated that residents should be involved in the process. Most felt that there was poor communication between the Forest Service and residents. Design disciplines are versed in participatory or co-design methods that include stakeholder input early in the development process, and provide graphic and written communication material that is easily disseminated to garner public feedback.

Community Recreation and Healthy Living in Rural Settings

This project addressed Louv's (2008) "nature-deficit disorder" regarding rural children, sedentary lifestyles, dependency on technology, and limitations for bicycling or walking long distances. The project refers to the "recreation road - a rural route to planning" as an important resource for rural community planning related to recreation activities (Goodwin, 2010 p45). The author notes that many recreation planners do not gather input from recreational users and recommend ways of generating greater involvement from residents. Design disciplines are well versed in participatory or co-design methods. These present excellent opportunities for involving stakeholders in identifying and prioritizing recreation amenities.

Thermus aquaticus and You: Biodiversity, Human Health, and the Interpretive Challenge

Interpretation of scientific principles behind geologic factors at Yellowstone National Park are described in the article. The authors identify the importance of employing "creative approaches to interpretation" (Dustin, Schwab, & Bricker, 2010 p50). With their emphasis on graphic communication, the design disciplines would be natural partners for scientists who desire to communicate scientific information to the general public in an engaging format. The design disciplines have experience in partnering with experts to interpret complex issues in interpretive centers, museums and other public educational venues. Development of graphic visuals and texts would tell the story of these complex scientific concepts to a general audience through exhibit design.

4.2.10 Water in the Western U.S.: Is there enough to meet the region's needs?

Constructed Wetlands for Wastewater Treatment as Landscape Amenities in Rural Communities

According to the article, small communities with populations fewer than 2,000 residents can use biological treatment systems such wetlands or tanks in greenhouses for sewage. (Austin, 2010). These constructed wetlands can not only treat wastewater but also provide public amenities. The article describes in detail how constructed wetlands are implemented and conceptually illustrates how their principles could be applied. Opportunities for the design disciplines are apparent in the design of constructed wetlands as well as in the educational illustration of their benefits.

4.2.11 Food Security in the Western U.S.

Food Insecurity and Stress Among Children in the Western U.S.

According the authors (Gunderson & Garasky, 2009), children from rural areas are at greater risk for obesity due to the stress brought on by poor quality housing. Housing stressors including living in low quality accommodations, moving in with others, and being sent away from parents, are correlated with issues of food insecurity. Quality housing for seasonal and year-round workforces are suitable design problems for both architecture and interior design.

4.2.12 Creating Sustainable Communities in a Changing America

Providing Workforce Housing While Preserving Natural Character in New Hampshire Communities

Legislation in New Hampshire requires the provision of workforce housing that is affordable and conserves land (Gagne, 2009). This legislation requires that communities consider affordable housing while preserving the natural character of the land. Design disciplines have a clear role in teams collaborating to achieve these complex goals through design of housing and impacted landscapes. The topic provides clear opportunities for design engagement with rural stakeholders as well as interdisciplinary collaboration opportunities for university design programs.

Local Decision Maker

A program developed by Purdue University assists planning decision makers in developing comprehensive plans. It uses assessment of existing conditions, development of a vision for the future, development and comparison of development strategies, and selection and implementation of the preferred strategies. The program is focused on informing and integrating natural resource and economic development decisions (Farnsworth, Kumar, & Nolan, 2009). The article describes database and planning workshop programs, which could benefit if designers could assist community planners in identifying potential design opportunities. This could include the development of solutions with various options that can be easily assessed for impacts on quality of life as well as economic impacts.

4.3 Summary of Research Findings

Content analysis of the *Rural Connections* articles revealed a wide variety of opportunities for design to engage with rural issues. Selected articles revealed opportunities for all three disciplines to engage in broad scale topics and planning-scale projects, as well as focused site-scale projects. Many service-learning opportunities were observed throughout each thematic issue. A graphic summary of these opportunities is presented in a matrix (see Table 4.1).

5 IMPLICATIONS & DISCUSSION

Many of the rural dilemmas engaged by the RRDCs—and embodied within the rural built environment—would benefit from the creative and technical expertise of landscape architects, interior designers, and architects. Within these rural dilemmas, there are opportunities for design to be involved in the projects described, either immediately or in subsequent steps that further develop the project in the future. Concurrently, incorporating rural service-learning projects into design studios promotes several pedagogical benefits including valuable real-world learning experiences for students, and potential for instilling empathy in students for populations and communities with which they would otherwise lack experience. Within land-grant universities, rural community design projects provide opportunities for students to engage with issues of community participation, green infrastructure, regional connectivity, and food security, all while involving students in the institutional mission of service and outreach (Cameron, Forsyth, Green, Lu, McGirr, Owens, & Stoltz, 2001).

Given their expertise in collaboration, visualization, and design thinking, one may wonder why design programs housed within member land-grant institutions are not more apparently involved in these featured projects? One possible explanation resides in previous research indicating the persistence of challenges for engaging in interdisciplinary rural design engagement in an era of urbanization (Ryan, Krikac, and Sleipness, 2015). As urbanism draws research funding and faculty interest, one may reason that rural design issues seem less alluring in academic design cultures, even in programs housed within land-grant universities. Or perhaps those engaged in rural issues from a non-design discipline perspective have not considered how design thinking could be leveraged within a project that may seem unconventional—or even inappropriate—for landscape architects, interior designers, or architects.

5.1 Frameworks for Engagement

If university design programs were more involved in rural issue-based activities of the RRDCs, both rural communities and design programs' faculty and students could realize a range of benefits. As discussed earlier, rural issues are inherently design opportunities; involving design programs within the context of interdisciplinary teams could substantially advance the RRDC's aims for collaboration and aggregation of project benefits on a regional scale. Design could help the RDDCs achieve their goals of maximizing projects' regional impacts through interdisciplinary collaboration. Additionally, shared service-learning and research projects could catalyze collaboration among faculty within and across academic institutions. Design involvement would mutually benefit both students and those who inhabit rural places. Due to their urban and suburban upbringings, many university students do not have familiarity of rural communities and are unaware of the challenges, and unique assets that rural communities provide.

Because of the complex and interdisciplinary nature of professional practice, university design programs wrestle with how to equip their students with a comprehensive foundation of knowledge and experience. Through rural design service-learning experiences, students will have opportunities to develop empathy for those who inhabit rural areas and the challenges they face. By engaging in rural design issues, at the level of academic programs, future and emerging design professionals would be initiated into a culture of professional service to communities in need. While we do not anticipate nor recommend that design programs shift their priorities to the exclusion of urban issues, engagement with the RRDCs is one potential way that programs may educate more well-rounded future design professionals.

5.2 Study Limitations

This study is not without limitations. First, while the WRDC promotes *Rural Connections* as a showcase of its highest priority projects, it is possible that engagements among extension, design programs, and communities do occur, but were not showcased in this publication. Relatedly, this study does not evaluate design programs' involvement in rural issues at non land-grant universities. Additionally, due to the overlapping nature of professional design practice, opportunities assessed as most appropriate for one discipline may not preclude the involvement of additional design programs.

While this study evaluated opportunities for interdisciplinary engagement by landscape architecture, interior design, and architecture, it does not explicitly assess the potential for other allied design disciplines such as environmental design, bioregional and community planning, industrial design, art, construction management, or engineering. Future studies could further the exploratory research of this study by including these disciplines in a similar evaluation of collaborative opportunities.

5.3 Directions for Future Research

Given that topical priorities engaged by the RRDCs can originate from Extension directors, agents, and faculty, future research might include a survey of Extension individuals to more completely assess their familiarity with the expertise of design faculty and students, and their receptiveness to collaborating with design. Concurrently, future research could also include an in-depth inquiry into the urbanist inclinations of contemporary design education at land-grant institutions in order to assess levels of interest in engaging in rural projects among design faculty. While design programs' urban emphases are apparent and corroborated by previous exploratory research (Ryan, Krikac, & Sleipness, 2015), a more comprehensive review of this issue would contribute to the literature and potentially illuminate willing rural design collaborators at the regional level.

In addition to these future research directions, design programs and their faculty should self-reflect on whether they are missing opportunities for rounding out their students' learning experience and building capacity for empathy. Design programs should evaluate how they can effectively market their core skills to unconventional design partners and projects. Through exposure and networking with Extension directors and staff, design programs and their faculty might build relationships and establish professional rapport with rural partners.

As universities place greater emphasis on funded research, design disciplines must adjust to this new paradigm. The four RRDCs are a potential organizing framework for design disciplines to engage in nationally recognized and funded research and engagement priorities through service-learning studio projects. For landscape architecture, interior design, and architecture to fully engage human settlement on a regional scale, rural built environments must be holistically considered as part of an interrelated system of design challenges. While rural settings present an intriguing array of opportunities for design thinking, the greatest challenge may be to shift conventional conceptions of the work designers can do.

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URBAN DESIGN

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CYCLING-FRIENDLY COMMUNITY DESIGNS: COMPARATIVE CASE STUDIES OF CITIES IN GERMANY AND TEXAS, USA

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1 ABSTRACT

Cycling has been increasingly recognized for its various environmental, human health, and economic benefits. Supportive built environments and policies are essential to promote cycling. European countries, such as Germany, Denmark, and the Netherlands, are known for their many exemplary efforts. Cycling levels in these countries are at least 10 times higher than those in the US. While empirical studies have examined various cycling policies and interventions, most of them are individual case studies. Studies comparing the differences between European cities and American cities are limited. This study is designed to use two German cities (Berlin and Bonn) and one American city in Texas (Austin) for comparison, and identify opportunities and challenges in improving cycling environments in Austin. Assessments of multiple evaluation components showed that cycling was much safer and more convenient in German cities than in Austin, due to more supportive bicycle policies and infrastructure/facilities. Both national and city-level bicycle policies existed in German cities, and those policies were geared toward integrating cycling into the overall transportation system, including transit. Austin, on the other hand, only had the city-level policies, and most of its streets are still dominated by automobiles. In terms of the community design, German cities feature mixed land use, high density, and complete cycling networks making cycling highly attractive, contrasting to segregated land use, low density, and discontinuous cycling networks in Austin.

1.1 Keywords

Cycling, urban design, policies, community designs, infrastructure and facilities

2 INTRODUCTION

During the past few decades, the importance of cycling to environment, human health, and economic development has been increasingly recognized in many European countries and in some parts of the United States (US). At the same time, several scholars have conducted empirical studies examining benefits of cycling and exploring ways to promote cycling-friendly environments. Specifically, John Pucher and Ralph Buehler carried out many studies on the contributions of daily cycling to public health (Bassett, Pucher, Buehler, Thompson, & Crouter, 2008; Pucher & Buehler, 2010; Pucher, Buehler, Bassett, & Dannenberg, 2010), ways to make cycling safe and attractive (Pucher & Buehler, 2008a, 2008b, 2009; Pucher & Dijkstra, 2000, 2003), and sustainable transportation in European countries (Buehler & Pucher, 2009; Buehler & Pucher, 2011). Many European cities, such as Amsterdam, Copenhagen, Hamburg, Munich, Berlin, etc., have paid attention to people-oriented developments to create more sustainable and livable communities. A wide range of strategies such as traffic regulation, traffic education, traffic calming, cycling infrastructure, and cycling oriented urban design have been implemented to increase cycling safety (Pucher & Dijkstra, 2000, 2003). Urban designers like Jan Gehl has used social science based research methods (e.g. observations, surveys, mapping) to implement evidence-based strategies to promote people-oriented public spaces (Gehl, 1987, 2010; Matan & Newman, 2012). His work has been widely applied to many cities worldwide especially in European and Australian cities, but also in several American cities including Yew York, Detroit, and Los Angeles. Despite the growing interest and investments in pedestrian and cyclist facilities in the US, especially in large cities such as New York, Washington DC, and Portland, the prevalence of cycling still remains very low compared to many European countries. Cycling infrastructure involving bicycle lanes, trails, and bicycle parking facilities are far from being adequate in the US. Compared to 27% share of trips bicycles make up in the Netherlands, only approximately 1% of trips in the US are by bicycle. Germany and Denmark are both at the high end of the spectrum with 10% and 18% of cycling mode share, respectively (Pucher & Buehler, 2008b).

The cycling levels vary across the regions in the US. As of 2014, the level of cycling to work is only 0.3% in Texas, which is much lower than the national average 0.6%, resulting in higher dependence on automobiles (McKenzie, 2014; US Census Bureau, 2010-2014). Automobile dependency has been shown to be a major contributor to physical inactivity and sedentary lifestyle, which has been linked with many public health problems such as obesity (Jebb & Moore, 1999; Wen, Orr, Millett, & Rissel, 2006). By 2010, Texas was one of 12 states in the US with a prevalence of obesity equal to or greater than 30 (Centers for Disease Control and Prevention, 2011). Lack of physical activity and poor diet lead to obesity which is among the leading causes of death in the US accounting for 400,000 deaths or 16.6% of total deaths in 2000, immediately following tobacco (18.1%) (Mokdad, Marks, Stroup, & Gerberding, 2004). The estimated annual medical cost of obesity in the US could amount to $147 billion in 2008, accounting for approximately 10% of all medical spending (Finkelstein, Trogdon, Cohen, & Dietz, 2009). In addition to walking, cycling is a convenient way to incorporate healthy physical activity into people's daily routine as an efficient travel mode. Compared to the dramatic increase in efforts to promote walking, efforts on cycling promotion have been limited. Significant gaps remain between research and practice on cycling. Even though many empirical studies have indicated the significance of cycling, most practices of urban design focus more on pedestrians and motorized vehicles, sometimes overlooking the potential conflicts between cyclists and pedestrians or vehicles (Forsyth & Krizek, 2011). Moreover, compared to many studies on cycling safety in European cities and in several large cities in the eastern and western regions of the US, studies on cycling in Texas are scarce. Therefore, more studies are needed on cycling-friendly community designs in an effort to promote cycling, which can help counteract the spread of sedentary lifestyles and obesity in Texas and beyond. The purpose of this case study is to explore cycling-supportive strategies used in German cities and compare cycling related policies, community designs, and infrastructure between the selected German and US cities. It aims to draw lessons from German examples and discuss the challenges and potential for their implementation in US cities.

2.1 Benefits of cycling

Cycling, as a healthy and sustainable transportation mode, can bring significant environmental, health, and economic benefits. First of all, cycling generates no air or water pollution and little noise, and it does not consume any non-renewable energy resources; secondly, compared to cars and other motorized transport modes, parking spaces needed for bicycles are quite small; and thirdly, cycling is much more economical and affordable than motorized transport modes, making it acceptable for and available to everyone including those with limited economic resources (Pucher & Buehler, 2008b, 2010). Besides, cycling is an active transportation mode that can bring significant health benefits. Cardiovascular exercise, as a valuable outcome of cycling, can help restore, maintain, and improve both emotional and physical health (Pucher & Buehler, 2008b). Oja et al. (1991) conducted research about physiological influences of walking and cycling to work, which demonstrated that improved cardiorespiratory and metabolic fitness could be achieved by low-intensity walking and cycling to work at least 3.5 days per week. Huy, Becker, Gomolinsky, Klein, and Thiel (2008) argued that cycling could directly improve older adults' health. Bassett et al. (2008) carried out a study on the effects of walking and cycling on obesity rates in Europe, North America, and Australia, and reported that walking and cycling was negatively associated with obesity. Wen and Rissel (2008) studied relationships between active modes of commuting to work and obesity rates in Australia and revealed "cycling, in particular, had a strong inverse association with being obese" for men (p. 31). Pucher et al. (2010) studied influences of walking and cycling on health, which indicated that self-reported obesity had statistically significantly negative relationships with active travel.

2.2 Cycling trends in Germany and the US

The cycling level in Germany has not been consistently high. Due to the widespread use of private cars, cycling fell dramatically from 1950 to 1975, resulting in increasingly harmful environmental and safety problems. In the mid-1970s, German cities started to establish transportation and urban planning policies to restrict car use by making it more expensive, slower, and less convenient while encouraging environmentally friendly alternatives to cars. Cycling, as one of the most important alternatives, gradually became a popular means of transportation for people's daily routines. Strategies to promote cycling-friendly environments fostered the recovering and thriving culture of cycling in Germany (Pucher & Buehler, 2008b, 2009).

Over the past few decades, the overall cycling level in the US had increased as well because of the realization of its benefits and of the harms of automobile dependence. Cycling to work grew from 0.4% in 1990 to 0.6% in 2014 (City of Austin, 2009; US Census Bureau, 2010-2014), and the bicycle share of total trips rose from 0.6% in 1977 to 1.0% in 2009 (Pucher, Buehler, & Seinen, 2011). When compared to 10% of the bicycle mode share in Germany, bicycle use in the US is still quite low. Cycling rates are unevenly distributed in the US due to the differences in climate, environmental supports for cycling, and socioeconomic characteristics. Cycling levels are commonly higher in the western part of the US and areas near city centers, with the elderly and women cycling far less than young men (Pucher et al., 2011). In contrast, cycling in Germany has become a mainstream mode of transportation for both recreational purposes and practical and daily travel needs to get around cities. Cycling is fairly evenly distributed in Germany across groups with various incomes and genders, but the cycling rate declines slightly with the increase of age (Pucher & Buehler, 2008b).

2.3 Factors related/contributed to cycling

Based on the cycling trends during the past decades, significant differences can be observed between the US and Germany. The fact that cycling in the US is a less accessible and attractive transportation mode is primarily attributed to the neglect of cycling safety and cycling supportive facilities. In Germany, a diverse range of policies such as traffic regulations and related programs, community design solutions, and supportive infrastructure and facilities have been implemented to make cycling safer and more popular (Pucher & Buehler, 2008b; Pucher et al., 2011).

German governments have played an essential role in planning policies and interventions to create cycling-friendly environments and to fund cycling infrastructure and facilities. Since at least the 1970s, local governments in Germany have been funding and implementing cycling related policies, programs, and plans that are tailored based on the local contexts and needs. More recently, since approximately the 1980s, federal/central governments have been providing research supports, design guidelines, model projects and funding for cycling (Pucher & Buehler, 2008b). The German National Cycling Plans were first proposed in 2002 and updated in 2012 to promote cycling safety by specifying relevant goals and strategies/measures, which included restrictions and regulations on the use of motor vehicles and an increased supply of facilities for cycling including cycling lanes, cycling crossings at intersections, and bicycle parking spaces (Federal Ministry of Transport, 2012).

The roles of urban design including overall community design and detailed design of bicycle supportive infrastructure and facilities are of equal importance. Efficient and comprehensive design solutions can make the cycling experience more pleasant and fun, as well as safer. Compared to comprehensive, integrated, and coordinated cycling route systems covering in both rural and urban areas in Germany, cycling supportive infrastructure and facilities are far from adequate and efficient in the US with incomplete and disconnected systems in most communities (Pucher & Dijkstra, 2000).

3 METHODS

This case study aims to compare cycling-friendly environments between two German cities (Berlin and Bonn) and one American city in Texas (Austin), and is carried out in two major phases. Lessons from German best practices are summarized as guidelines, strategies, and implications for promoting cycling environments in Texas. The first phase focuses on each of the three target study areas – policies, community designs, and infrastructure/facilities – in greater detail to discuss how they contribute to promoting cycling. In this phase, assessments of each study area were made based on relevant information from the previous studies and policy documents from local and federal governments. Further, casual direct observations from the visits were used to further confirm the actual features implemented in the study communities. To guide the evaluation of the community design component, six dimensions of urban design including functional, morphological, perceptual, social, visual, and temporal dimensions are further explored to take the experience of cycling from the cyclist's viewpoint into the discussion of urban design requirements/preferences (Forsyth & Krizek, 2011). The second phase contains a more detailed evaluation of community design and cycling supportive infrastructure and facilities within a 1,200 meter by 1,200 meter (0.75 mile by 0.75 mile) area covering part of a university campus and the surroundings in each of the three cities. This particular study location was selected to ensure some comparability across the three cities with widely varying environmental characteristics. The presence of a major university was a common feature of all three cities. This size of area was selected to ensure feasibility of the direct field observation and to reflect on a 5-minute cycling distance. The selected areas are located around the main buildings of the major university located in each of the three study cities, including Humboldt University of Berlin and University of Bonn in Germany, and University of Texas at Austin in the US.

4 FINDINGS

4.1 Policies

A variety of policies, including both nationwide and citywide policies on a broad range of issues related to land use, transportation, urban development, environment, housing, parking, and taxation, have been implemented in Germany to facilitate safe and convenient cycling. Nationwide or statewide policies and design guidelines regarding cycling are not available in the US. Therefore, this study discussing cycling policies in the US city is based on the city level, while discussions on the cycling policies in Germany involve both national and city levels.

The city of Austin has the best overall cycling environment and the highest level of cycling to work in Texas with 1.4% in 2014, which is much higher than the national average (City of Austin, 2009; US Census Bureau, 2010-2014). Austin is the leading city in Texas in taking actions to promote sustainable transportation including cycling. Cycling has become increasingly important in people's daily life in Austin. The Austin Bicycle Plans including a series of cycling related polices have been adopted and updated periodically since 1972 to achieve the vision of making Austin one of the best cycling friendly communities in the US. Promoting cycling environments guided by the city's Bicycle Plans makes Austin a valuable example for other cities in Texas to follow. By comparing cycling related policies and design guidelines in Austin with those in German cities, potentials and challenges of promoting cycling in Austin as well as in other Texas communities can be better identified.

Compared to Germany, cycling related policies in Austin are still far from being adequate, especially for those regarding the restrictions of car use. Car use in Germany is much less convenient and far more expensive because of high taxes, high parking prices, limited parking spaces, etc. Table 1 summarizes a list of cycling related policies to compare specific strategies and measures in German cities and Austin, in terms of (a) land use and housing, (b) transportation, (c) parking, (d) taxation, and (e) traffic law.

Table 1. Cycling related policies in German cities and Austin, Texas.

Categories	Specific strategies German cities	 Austin
Land use and housing policies	• Limitation of new developments beyond already built-up areas • Mixed use developments to make short distance trips by bicycle or on foot available	• Low density land use (major destinations are not within a 5-minute biking distance)
Transportation policies	• Traffic education and training • Complete street: multi-modal transportation to integrate the bicycle system with transit • Traffic regulations (e.g. restrictions on the use of motor vehicles, limited car access to neighborhoods, etc.) • Speed limitations of motor vehicles (e.g. 30 kilometers/hour [19 miles/hour] or less in residential neighborhoods, 7 kilometers/hour [4 miles/hour] in home zones, etc.) through traffic calming, home zones, car-free zones, deliberately narrowed roadways, etc. • Shared bike bus lane to promote bike use while limit car use • Well maintained and separate circulation systems for cyclists versus motorists • Priority traffic signals and crossing intersection improvements for cyclists	• Traffic education, cycling training, and cycling promotion (e.g. cycling to school, cycling to work, etc.) • Complete street: multi-modal transportation to integrate the bicycle system with transit (underway) • Little restrictions on car use with complete road networks for cars • Speed limitations of motor vehicles (e.g. 48 kilometers/hour [30 miles/hour] or less in residential neighborhoods, 32 kilometers/hour [20 miles/hour] or less in school zone, etc.) through signage, traffic calming, etc. • Incomplete and discontinuous cycling networks (limited bicycle lanes and crossings)
Parking policies	• Limited car parking spaces in cities • Large supply of bike parking facilities throughout cities • State-of-the-art bicycle parking facilities at train stations • Strict time limit for parking or residents-only parking in urban neighborhoods • High parking prices in city centers (e.g. €1-4/hour in Berlin city center)	• Large supply of parking spaces for motor vehicles including ground parking lots and parking garages that are convenient and user-friendly throughout the city • Available parking hours based on specific locations • Low parking prices (e.g. $1/hour for metered parking and free during some time)
Taxation policies	• High taxes/fees on private car ownership and use including high gas price • More than €1,500 to obtain a driver's license for fees and strict training requirements	• Much lower taxes/fees on private car ownership and use including lower gas price compared to Germany • Less than $50 to obtain a driver's license
Traffic laws	• Cyclists' rights enforced by polices and courts including special protection for children and elderly cyclists • Motorists assumed legally to take charge of almost all crashes with cyclists	• Same rights and responsibilities as motorists

Sources. City of Austin (2009); Pucher and Buehler (2008b), p.512 & 522

4.2 Community designs

Overall land use patterns and arrangements of cycling path networks are the two major factors that influence cycling levels. Cycling levels are higher in communities with more diverse land uses, higher density, and greater connectivity of street and cycling path networks, than communities with segregated land uses, low density, and poor connectivity (Saelens, Sallis, & Frank, 2003). Among the keys to the high level of cycling in Germany are the mixed-use developments and complete and continuous cycling networks for cities/towns/neighborhoods.

Even though the cycling level in Austin has increased greatly through a series of cycling policies and promotional programs during the past years, overall land use patterns and bikeway networks still make Austin cycling-unfriendly. Major destinations are too far for bicyclists because of segregated land use patterns and lower density developments. City street networks are designed for motorists, and incomplete cycling networks make cycling less convenient and more dangerous. Table 2 compares community design features related to cycling in Austin with those in German cities based on the six dimensions of urban design.

Table 2. Community designs for cycling in German cities and Austin, Texas.

Dimensions	Specific approaches	
	German cities	Austin
Functional	• Complete cycling systems/networks	• Incomplete cycling systems/networks with gaps and barriers
Morphological	• Appropriate land use to make major destinations close enough for cycling (shorter distance than auto-oriented developments while longer distance than pedestrian oriented developments)	• Segregated land use and low-density developments appropriate for automobile transportation (major destinations often not within a cycling distance)
Perceptual	• Clear and logical hierarchies with easy wayfinding for cycling network	• Unclear hierarchies of cycling networks that increase uncertain and unsafe feelings of cycling
Social	• Various destinations for different social groups of cyclists conveniently connected by cycling lanes	• Uneven distribution of cycling rates across different socioeconomic groups due to inconvenient and disconnected cycling networks
Visual	• Legible and attractive medium scale environments that can be optimally experienced at cyclists' speed	• Large scale environments that are not attractive for cyclists
Temporal	• Potential change of cycling networks over time	• No information/data available

Note. Adapted from " Urban Design: Is there a Distinctive View from the Bicycle?" by A. Forsyth & K. Krizek, 2011, *Journal of Urban Design*, 16(4), p.538

4.3 Infrastructure and facilities

According to Pucher and Buehler (2008b), cycling supportive infrastructure and facilities in Germany expanded greatly from the mid-1970s to the mid-1990s, including an increase of bikeway network from 12,911 kilometers (8,023 miles) in 1976 to 31,236 kilometers (19,409 miles) in 1996. In 2004, Berlin had a total of 1,140 kilometers (708 miles) of bikeway network, including "860 kilometers of completely separate bike paths, 60 kilometers of bike lanes on streets, 50 kilometers of bike lanes on sidewalks, 100 kilometers of mixed-use pedestrian-bike paths, and 70 kilometers of combined bus-bike lanes on streets" (Pucher & Buehler, 2008b, p. 511). By 2015, Bonn had a total of 300 kilometers (186 miles) of bikeways (City of Bonn, 2015). The overall length of cycling facilities in Austin had almost doubled from 778 miles in 1998 to 1451 miles in 2008, with small portions that were separate bicycle lanes (City of Austin, 2009). Compared to 860 kilometers (534 miles) of completely separate bike paths in Berlin in 2004, only 211 kilometers (131 miles) of separate bicycle lanes were available in Austin in 2008 (City of Austin, 2009).

Currently, German cities have a comprehensive package of cycling facilities, including separate and shared cycling lanes, clear signage and signals, convenient and sufficient bicycle parking, appropriate lighting, advanced stop lines (bike boxes) and cycling crossings at intersections, etc. The four main types of cycling lanes depending on specific locations or needs of cyclists include: (1) completely separate circulation systems for cyclists versus motorized modes and pedestrians; (2) shared cycling lanes with motorized modes; (3) shared cycling lanes with pedestrians; and (4) shared cycling lanes with both motorized modes and pedestrians. Various types of bicycle parking are widely available in Germany, including both formal parking with racks at different scales and informal parking (e.g. street posts, poles, trees, etc.). Detailed designs are also essential to promote cycling-friendly environments. Detailed environmental features, such as signage, paving patterns, curb ramps, marked cycling crossings, and other artful cycling facilities, can improve safe, legible, and visually interesting built environments that are optimal when experienced at a speed of cyclists (Forsyth & Krizek, 2011). In contrast with German cities that have even distributions of cycling infrastructure and facilities, environmental supports for cycling in Austin is concentrated in city centers and areas around the universities. Table 3 shows a comparison between cycling infrastructure/facilities in Germany cities and Austin following the six dimensions of urban design.

Table 3. Cycling supportive infrastructure and facilities in German cities and Austin, Texas.

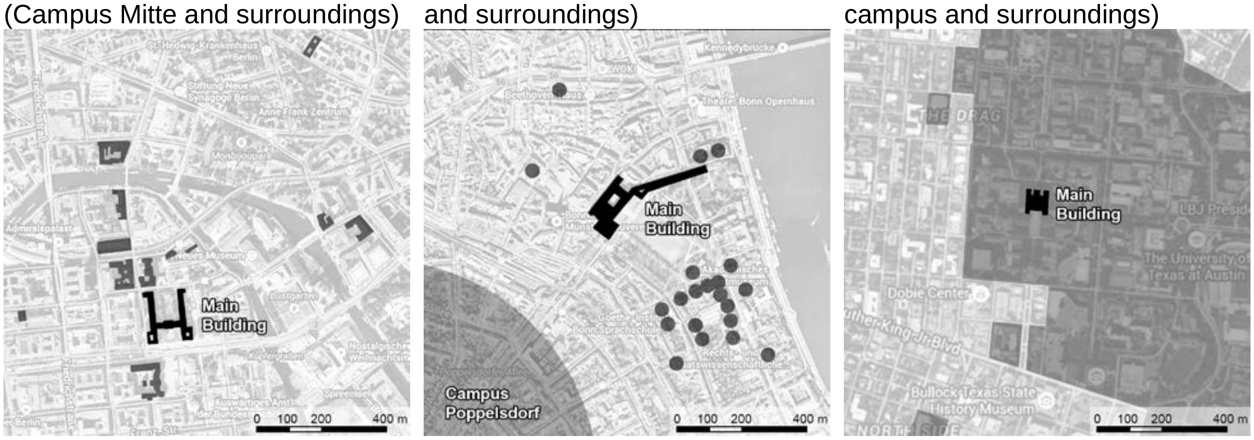
Dimensions	Specific approaches	
	German cities	Austin
Functional	• Safe, convenient and well maintained cycling lanes and parking spaces • Appropriately signed and well-lit cycling and parking spaces to maximize cycling safety	• Disconnected bikeway network for the whole city • Partially well maintained cycling lanes • Limited parking spaces for bicycles • Plenty of unsigned bikeways
Morphological	• Design goals concerning openness or enclosure maintained by cycling lanes or bicycle parking • Spaces defined at the scale of cyclists regarding height and speed	• Limited spaces defined at the scale of cyclists regarding height and speed (most spaces defined and maintained at the scale of motorists)
Perceptual	• Clearly perceived built elements/details for cyclists as well as pedestrians and/or motorists • Cycling lanes with safe and attractive views for cyclists • Pleasant landscape conditions (e.g. well-grown street trees, well-maintained cycling lanes with very gentle slopes, etc.) that make cycling more comfortable	• Lack of built elements/details and signage for cyclists • Narrow and unsafe cycling lanes in most area • Poor landscape conditions (e.g. lack of street trees, poorly maintained cycling lanes with moderate to steep slopes, etc.) that make cycling less comfortable
Social	• Some travel lanes that are wide enough for cyclists to ride side by side • Availability for groups of cyclists to temporarily park and interact	• Limited spaces for groups of cyclists to temporarily park and interact
Visual	• A balance of diversity to create legible, efficient and attractive visual cues (e.g. signage, marked cycling crossings, etc.) rather than visual clutter for cyclists	• Limited and unclear cycling visual cues (e.g. signage, marked cycling crossings, etc.) that lack diversity and clarify
Temporal	• Potential change and maintenance of supportive facilities over time (e.g. more parking spaces for bicycles, added cycling lanes, etc.) • Availability of snow removal during the winter season • Clear visibility of built elements/details during different seasons • Potential renewal of signage, paving patterns and colors, etc. over time	• No information/data available

Note. Adapted from “ Urban Design: Is there a Distinctive View from the Bicycle?” by A. Forsyth & K. Krizek, 2011, *Journal of Urban Design*, 16(4), p.538

4.4 Cycling environments around the university campuses

According to the aerial maps of the 1,200 meter by 1,200 meter (0.75 mile by 0.75 mile) study areas in Figure 1, the most significant difference between the universities in German cities and Austin is that there is no clear boundary for the university campuses in Germany. University buildings are scattered throughout the cities without a clear campus boundary and are mostly located near the city centers in Germany. A mix of university buildings with other land uses such as commercial, residential, and recreational makes major destinations within an easy biking distance from the university campuses in Germany. Table 4 shows a more detailed comparison of cycling environments regarding the two study areas of community designs and infrastructure/facilities among the three selected university communities. Cycling environments are consistently safe and convenient throughout the areas within and outside the universities in Germany, while cycling infrastructure/facilities are much more complete within the University of Texas in Austin compared to the surroundings. Figure 2-4 displays a photographic inventory of cycling infrastructure/facilities located within the three university campuses and in the surroundings, including cycling lanes, cycling crossings, and bicycle parking.

Humboldt University of Berlin (Campus Mitte and surroundings)	University of Bonn (main building and surroundings)	University of Texas at Austin (west campus and surroundings)



Note. All the main buildings are marked in black. For the Humboldt University of Berlin (left), the rest of the university buildings are marked in gray. For the University of Bonn (middle), buildings around the main building are roughly marked in gray dots, and the Campus Poppelsdorf is roughly marked in gray. For the University of Texas at Austin (right), the campus is marked in gray.

Figure 1. Aerial maps of the 1,200 meter by 1,200 meter (0.75 mile by 0.75 mile) study areas (2015). Diagram by the authors.

Table 4. Cycling environments around the university campuses in German cities and Austin, Texas.

	German cities	Austin
Community designs	• University buildings are scattered in the cities without a clear boundary between the universities and the surrounding communities. • Highly irregular city blocks and street patterns and orientations assist bicyclist and pedestrian movements through distinguishable visual cues and landmarks, while obstruct vehicle movements. • Mixed land use and high-density city development make major destinations easily reachable within a biking distance. • Safe, convenient and complete cycling networks are ramified all over the cities.	• Most university buildings are concentrated in a clearly delineated university district (less mixed land use compared to the universities in Germany). • More regular city blocks and grid street patterns facilitate movements of vehicles. • Segregated land use and low-density city development make major destinations within a driving distance rather than biking/walking distance. • Incomplete and discontinuous cycling networks make cycling unsafe and inconvenient all over the city.
Infrastructure and facilities	• A mixed level of cycling lanes including completely separate cycling lanes and shared cycling lanes with vehicles or/and pedestrians are provided as appropriate. • Bicycle parking spaces for both informal and formal facilities are available along streets, in major entrances, in courtyards, etc. • Bike boxes and marked cycling crossings at intersections increase cycling safety and promote bicyclist movements. • Marked cycling tracks, distinct paving patterns for cycling, and curb ramps improve cycling environments. • Cycling facilities such as bicycle racks are combined with artful designs to help create interesting and attractive built environments. • Well-lit cycling and parking spaces enhance cycling safety at night. • Pleasant landscape conditions (e.g. well-grown street trees, well-maintained cycling lanes with very gentle slopes, etc.) make cycling more comfortable.	• Cycling related infrastructure and facilities are much more sufficient within the university than the surroundings, especially for bicycle parking spaces (unevenly distributed cycling infrastructure and facilities throughout Austin compared to even and wide distribution of cycling infrastructure and facilities in the German cities). • A mixed level of cycling lanes including completely separate cycling lanes and shared cycling lanes with vehicles or/and pedestrians are partially provided. • Bicycling parking spaces are largely supplied throughout the campus while limited cycling parking spaces are provided for the surroundings. • Lack of bike boxes and marked cycling crossings at the intersections make cycling unsafe and unattractive. • Cycling lanes are poorly and partially marked. • Austin B-cycle stations (automatic bicycle rentals) are located throughout the Austin city center. • Poor landscape conditions (e.g. lack of street trees, poorly maintained cycling lanes with moderate to steep slopes, etc.) make cycling less comfortable.

Berlin | Bonn | Austin


Separate cycling lane


Separate cycling lane


Separate cycling lane


Separate cycling lane


Separate cycling lane


Separate cycling lane


Shared cycling lane with pedestrians


Shared cycling lane with vehicles


Shared cycling lane with vehicles

Figure 2. Cycling lanes in German cities and Austin, Texas. Photos by the authors.

Berlin

Marked cycling crossing

Intersection with spatial textured pavers

Bonn

Marked cycling crossing

Bike box at intersection

Austin

Shared cycling crossing with pedestrians

Bike box at intersection

Figure 3. Cycling crossings at intersections in German cities and Austin, Texas. Photos by the authors.

Berlin

Bicycle parking near back entrance of building

Bicycle racks with artistic details

Bonn

Bicycle parking in the plaza

Bicycle parking near main building entrance

Austin

Bicycle parking on the street to restrict vehicles

B-cycle station

Figure 4. Bicycle parking in German cities and Austin, Texas. Photos by the authors.

5 CONCLUSIONS

The lower level of cycling in Austin compared to German cities is attributed to insufficient governmental policies and interventions, inadequate cycling facilities/environments, and the widespread automobile dependent lifestyles and culture. Table 5 summarizes major differences between German cities and Austin in terms of policies, community designs, and infrastructure and facilities. Drawing from the lessons learned from the German cities, important strategies that Austin may explore to promote cycling include: (a) comprehensive cycling system and improved cycling environments with more pleasant landscape conditions, (b) cycling related education and promotional programs/events, (c) restrictions on car use, and (d) promotion of cyclists' rights.

Table 5. Summary of major variations in cycling environments between German cities and Austin, Texas.

	German cities	Austin
Policies	• Complete street: multi-modal transportation to integrate the bicycle system with transit • High level of speed limitation (e.g. 30 kilometers/hour [19 miles/hour] or less in residential neighborhoods) • Strict time limit for parking or residents-only parking in urban neighborhoods • High parking prices • Cyclists' rights more strongly enforced than the motorists' rights	• Complete street: multi-modal transportation to integrate the bicycle system with transit (underway) • Low level of speed limitation (e.g. 48 kilometers/hour [30 miles/hour] or less in residential neighborhoods) • Little time limit for parking • Low parking prices • Same rights and responsibilities as motorists
Community designs	• Mixed land use • High-density development • Complete and continuous cycling network • Clear hierarchies of cycling networks • Legible and attractive large scale environments at cyclists' speed	• Segregated land use • Low-density development • Incomplete and discontinuous cycling network • Unclear hierarchies of cycling networks • Unattractive large scale environments at cyclists' speed
Infrastructure and facilities	• High maintenance • Limited vehicle parking spaces • Large supply of bike parking facilities throughout the city • Legible, efficient and attractive visual cues/details (e.g. marked crossings at intersections) • Pleasant landscape conditions (e.g. well-grown street trees) for more comfortable cycling	• Low maintenance • Large supply of vehicle parking spaces throughout the city • Limited bike parking facilities except for city center and university areas • Lack of visual cues/details (e.g. unmarked crossings at intersections) • Poor landscape conditions (e.g. lack of street trees) for less comfortable cycling

6 DISCUSSIONS

6.1 Challenges for Texas cities

Even though there is an urgent need for promoting cycling environments in Austin as well as in many other cities in Texas and beyond, challenges regarding existing city layouts and infrastructure, landscape conditions, climate and topographic conditions, and traditional lifestyles and culture make cycling related strategies difficult to be implemented in American communities. Current city zoning and land use patterns in Texas cities follow motor-oriented urban design/plan solutions, making automobiles necessary for people to get around in cities. Automobile dependent lifestyles and culture are widely accepted, which leads citizens in Texas to view cars as the only or most convenient way to make their daily trips. Most existing streets in Texas cities are designed for vehicles, without adequate accommodation of bicyclists. Cycling related infrastructure and facilities (e.g. cycling lanes, cycling crossings, signage, etc.) are poorly maintained without timely repairs due to limited budget from governments. Building facades and streetscape are often boring without sufficient visual interests or wayfinding guidance for cyclists. The high temperature and humidity in many months of the year and topographic changes with moderate to steep slopes in some Texas cities make cycling even less feasible or attractive. Poor landscape conditions with limited supplies of street trees and/or overhead structures make cycling in hot weather far from being comfortable.

6.2 Cycling-friendly community design principles for Texas cities

Due to the challenges mentioned above, promoting cycling in Texas cities is a long-term process that needs support from governments, urban designers/planners, and other related professionals. Governmental policies and interventions should emphasize the importance of cycling and provide measures and funding to promote the cycling environment, improve the cycling experience, and encourage bicycle use. Cyclist-friendly urban design approaches are needed to take cycling experiences more seriously during the policy decision-making processes. The following cycling-friendly community design principles may be considered to encourage cycling in Austin and other Texas cities:

1) Create complete cycling systems with sufficient supplies of cycling lanes, cycling crossings, bicycle parking, signage, and other cycling supportive facilities and details;
2) Encourage complete streets with efficient multi-modal transport systems to incorporate bicycle with transit;
3) Encourage cycling related programs (e.g. tree planting program) that support cooler cycling environment;
4) Ensure timely repairs supported by related policies to maintain cycling supportive infrastructure and facilities;
5) Promote landscape conditions (e.g. well-grown street trees) for better and more comfortable cycling environment;
6) Provide policies and interventions to restrict private vehicle use while encourage public transportation and cycling; and
7) Promote diverse and mixed land uses and high-density developments with better connectivity of street and cycling path networks.

This is a case study and has several limitations. First, the study communities in Germany and in Texas are selected for the feasibility of carrying out the study given the ability to visit the cities and collect the necessary data. While the 1200m by 1200m site selected for the detailed analyses were selected to ensure some comparability, it is possible that additional/different findings could be extracted if other or more areas were used in the assessments. Second, due to the limited data availability, some of the discussions were made based on the personal observations of the authors and subject to different interpretations. Third, another related limitation is the reliance on the use of primarily qualitative methods. Future work utilizing more objective data and additional sites/communities or analysis dimensions can further contribute to understanding cycling environments that are appropriate for promoting cycling in different countries, communities and/or populations.

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Theme Track
DILEMMA : DEBATE

Edited by Keith Christensen

DESIGN AND EXPERIENTIAL LEARNING IN POST-INDUSTRIAL LANDSCAPES

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1 ABSTRACT

Landworks is an experiential learning based workshop in Sardinia that annually brings together practitioners and students from across the globe to engage with remote and sensitive landscapes and to problematize the current and future standing of post-industrial sites across the Mediterranean. This is done through the production of in-situ installations over a 10-day period to highlight key cultural, ecological and economic factors, inciting debate about the nature of both existing conditions and potential future directions. This paper documents the methods and outcomes of the 2015 LW workshop that took place in the post-industrial former mining town of Agentiera.

1.1 Keywords
Design, Experiential Learning, Education, Post-Industrial, Environmental Art

2 INTRODUCTION

Landworks (LW) is an organization based in Sardina, Italy that uses abandoned sites of resource extraction around the Mediterranean as experiential-learning staging laboratories for landscape, architecture and environmental design students. Through 10-day summer workshops LW annually brings together 10-20 practitioners and 60-100 students from across the globe to engage with remote/sensitive landscapes and to problematize the current and future standing of post-industrial sites across the Mediterranean. This is done through the production of in-situ installations to highlight key cultural, ecological, and economic aspects that incite debate about the nature of both existing conditions and potential future directions in these particularly sensitive locations. The program's intensive team-building projects enable students to get firsthand experience working in the field on interdisciplinary and international groups, however, with the organization still in its developing stages the constructive impact of these workshops on these communities and their environments remains debatable. This paper examines Landworks through a critical lens, unpacking the successes and failures of the 2015 Landworks workshop in Argentiera, Sardinia to engage both students and community members in the collaborative reimagining of their environment. Ultimately the paper provokes debate about short-term operational workshops as effective experiential learning tools for students as well as a constructive ideation tactic in the early stages of reconsideration or possible redesign in these complex and storied post-industrial landscapes.

3 ARGENTIERA

Landworks was held in Argentiera in May of 2015. Translated as "the land of silver," Argentiera is a small, windswept village in a remote territory that caps an abandoned silver mine in the northwest corner of the Mediterranean island of Sardinia. The local memory in Argentiera is framed through post-industrial stories of both ancient and modern silver mining; the city was first a source of silver for the making of Roman coins. After an extended hiatus, the mine was reopened by a Belgian company in the nineteenth century. During this time the population swelled to an estimated 2000 inhabitants, with houses, a cinema, and Church built on the highest stretch of land overlooking the settlement. When its resources were exhausted after World War II, the mine finally closed its doors in the mid-1960s. Argentiera's employment capacity and subsequent economic base boomed when the silver was plentiful. Like most sites of resource extraction, when the silver ran out the mining city went bust - rendering the city what some would now consider a ghost town. Like Detroit or another skeletal version of a former great industrial system, Argentiera is still alive, with a hostel, several Airbnbs, and an active beach destination during the warm summer months (figure 1). In 1997, Argentiera was recognized by UNESCO as an important site of geological and cultural heritage, and designated as part of a global network of UNESCO Geological and Mining Parks. This status, which continues to provide assistance in the remediation, recovery, and preservation of its mining structures, remains controversial. When the local government opposed UNESCO and placed the mining facility in liquidation, Regional Councilor Giampiero Pinna protested by occupying the mine for 366 days. Since 2014, the city has embarked on a multi-million-dollar waterfront project to build retaining wall and amphitheater where the beachfront ridge had begun to collapse due to repetitive storm surges. Although this current project has been framed as a necessary precaution to quell the threat of impending landslides and to ensure wheelchair access to the beach, critics have argued that the massive concrete structure now dominates the "wild nature that contributed to the unique charm of Argentiera" (La Nuova Sardegna, June 12, 2015). Taken together, when compared to its past, the village feels absent of its core economy and purpose. With that void Argentiera officials opened the dialog with Landworks on a key question: How can the community acknowledge its productive heritage, improve the ecological function of the landscape, and meet the rising demands of citizens and tourists in a synthetic and constructive balance?

Figure 1. Argentiera viewed from above. Photo: Simon Bussiere.

Beyond its historical and environmental significance, Argentiera was selected for Landworks 2015 because its abandonment renders it a unique educational environment where students can study and explore. Far from a sterile classroom, Landworks students were witness to the clearly visible distinction between the lush green native hillsides, deep blue water and sandy beaches, and the hard, crumbling colorless surfaces left by human hands. This distinction between nature and the centuries of problematic resource extraction challenged student participants to wrestle with the role of future inhabitants and communities by reconsidering their own ability to design such places.

4 LANDWORKS

With Landworks in its fifth year of operation, Program Directors Stefan Tischer and Annacaterina Piras selected and negotiated terms and conditions for access to Argentiera. The 10-day workshop was then organized into a three short stages that culminated in a group tour and final exhibition of the team's projects for the Argentiera community. This process can be examined through a framework of experiential learning theory, beginning with a site survey, design charrette, and project construction, along with daily evening lectures and presentations from local experts in the field and team leaders. In addition to the creation of tangible products, Landworks teams employed a fixed set of design criteria in an effort to ensure unity in intention, delivery and communication. These criteria included the following attributes: 1. Operational 2. Ephemeral 3. Low Budget 4. Respect 5. Site Specific 6. Extemporaneous 7. Participative 8. International and 9. Interdisciplinary. While largely adhering to these design qualities, final projects varied widely and captured vastly different cultural and ecological concepts in their landscape art installations.

The physically intensive and intellectually stimulating nature of this workshop provided a constructive experiential learning opportunity for the international design students – many of whom had never been able to critically and materially engage with and reimagine post-industrial landscapes firsthand. Students who participated were not only exposed to the community's point of view, but through lectures and supplemental fieldwork led by local experts, were introduced to important economic, cultural, social and ecological issues specific to the place. Through this collection of experiences and viewpoints, students had the ability to uncover an overwhelming amount of educational and socially relevant content to work from. This process of what Stephen Temple (2011) calls "making thinking" revealed how "designing happens not simply from an inspired moment but as a result of rigorous transformative interactions between thinking and making in which concepts are discovered, transformed, and realized in concrete form." Students at Landworks were guided to employ this type of constructionist approach through which they could engage full-scale materials in real places that enabled knowledge and experience to become concrete for the learner. However, work in the field cannot be measured by the enlightenment of students alone but must be grounded in the context to create truly resilient solutions. Ultimately, this paper reflects on the impact of Landworks on the community of Argentiera, and offers suggestions for future iterations of Landworks that might build upon this partnership to produce a coalition that will advocate for experiential design as a tool for both pedagogical and social change.

Figure 2. Students Anna Hooker and Katie Klug survey Argentiera's landscape as part of the preparatory design phase of Landworks 2015. Photo: Simon Bussiere

4.1 Phase One

The initial period of site survey, selection, and negotiation resulted in the building of key relationships on the ground with local agents and important constituent groups. In addition to contact with the community and local experts, students and team leaders also roamed freely throughout the site for the first two days, with groups spreading out and exploring the terrain to study its materiality and better understand the context. Teams looked for and documented hidden interesting spaces, determined significant points of spatial convergence in terms of circulation and enclosure, and sought out ways to frame views to and from these important features (Figure 2). On one particular team, these excursions were reinforced by drawing exercises that enabled students to obtain a deeper reading of the existing conditions. Students' sketches and photographs highlighted the site's diverse textures and materials. One team focused their early studies on the wind in an effort to highlight the significant sculpting power of its forces as described by Gyorgy Kepes as petinatta or the moment "when wind traces its impact on the sand into waves and drifts, the sand is not only a passive record of the wind's activity; it is an active "contour" which both separates and connects the force of the wind and the resistance of the sand. It is not wind, nor is it sand; it is something new." Interested in the opposing forces of wind and water, and trying to find a way to visualize and communicate that relationship, students created an ephemeral installation using hundreds of bright pink bougainvillea flower petals concentrated in a single ball, then dropping them in a shallow coastal pool. With time-lapse photography, students traced a pattern of movement created by the wind along the water's surface (Figure 3). Ultimately, this initial stage familiarized students with the physical place and sparked the first moments of collaboration between teammates. As students grew more comfortable and more aware of their common surrounding, personal connections were forged through collective storytelling and shared experiences.

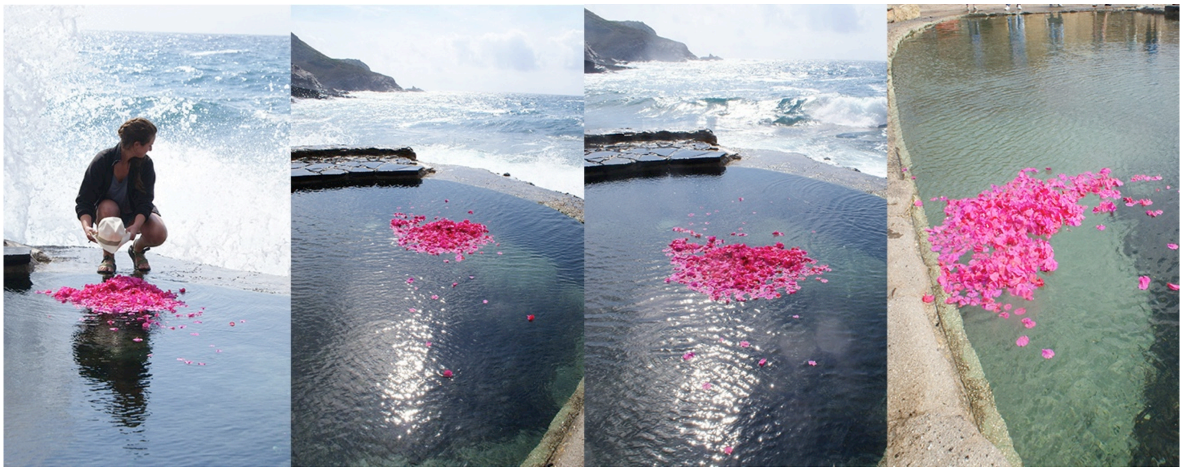

Figure 3. Student participant Katie Klug placed flower petals in a coastal pool to highlight intense winds on site. Photos: Simon Bussiere

4.2 Phase Two

While the first stage encouraged student teams to gain a better understanding of the physical context of the site, the second phase was aimed at generating focused site-dependent experiments. Teams gathered together to share assumptions and generate dialog about their initial findings. Next, they collectively began discussing possible design and implementation strategies through drawings and working concepts. Short bursts of design thinking were evidenced by sketches and conversations between teammates and project leaders, with informal presentations of ideas shared throughout the course of two or three days. These ideas transformed into tasks that were delegated among the members of the team. Students also began building full-scale prototypes as design inquiries, shaping and making decisions about their projects directly though materials found on site. These often self-initiated and exploratory interactions with the physical site evidenced important moments of learning that proved cyclical as students collaborated with their teams to interrogate their initial assumptions and the field. Students that had traced petinatta through photographs of flowing flower petals now used reclaimed rebar as a raw material to sculpt these wind patterns on the beach (Figures 4. Having studied the site and tested materials for the first one to three days of the workshop, the teams went out en-charrette for approximately three days to quickly form sketch concepts to bring together the prototypes of their creative inquiry. This short but intense stage of idea prototyping was guided by a sense of creative urgency from the impending deadline.

Figure 4: Above: Student Anna Hooker installs reclaimed steel rebar strands in the sand as part of an exercise to communicate the intense coastal winds through sculptural forms. Below: A reclaimed rebar sculpture sways in the intense sea wind. As tides rise and winds increase, the installation will be swept into the bay. Photos: Simon Bussiere

4.3 Phase Three

In the final stage of the workshop, projects quickly came together across the landscape, taking on different forms and occupying a range of sites. Students were forced to consider their work in-situ and recognize how it fit together with other elements of the surrounding context. Because there is virtually no budget, they faced the challenge of gathering found materials, transporting them without the aid of heavy equipment over rugged land for later use – a process that consumed large amounts of time and energy. Several remaining days prior to the final exhibition were spent realizing the projects. Designs for these installations were kept secret to build a sense of camaraderie, mystery, and danger that, at times, functioned in stereotypically colonial terms. Students and team leaders defended their newly claimed turf while scavenging materials from the dilapidated mine, private properties, and other abandoned design experiments. Some teams drilled more deeply into social issues by emphasizing the use of oral interviews, while others drew more on internal or artistic reactions to the context through field sketching and analysis of spatial, material, and physical attributes. Despite access to the same landscape and materials, projects varied widely. Christian Phongphit's team produced a large coastal sculpture that brought together reclaimed burnt wood from an abandoned structure with extracted stones from nearby bedrock. (Figure 5.) In contrast, Ferdinand Ludwig's team harvested "invasive" bamboo – a new material to the site – and readapted it by constructing a hidden tower through which participants could climb and see the surrounding beachfront landscape from a completely new perspective. In different ways the divisions between nature and structure were blurred. (Figure 6.)

Figure 5: A figure stands next to this monumental installation by Chris Phongphit's team. The project is formed from long reclaimed burnt timbers gathered nearby from an existing structure, rising from a large square platform built of found stones that were excavated during mining activities. Photo: Landworks.

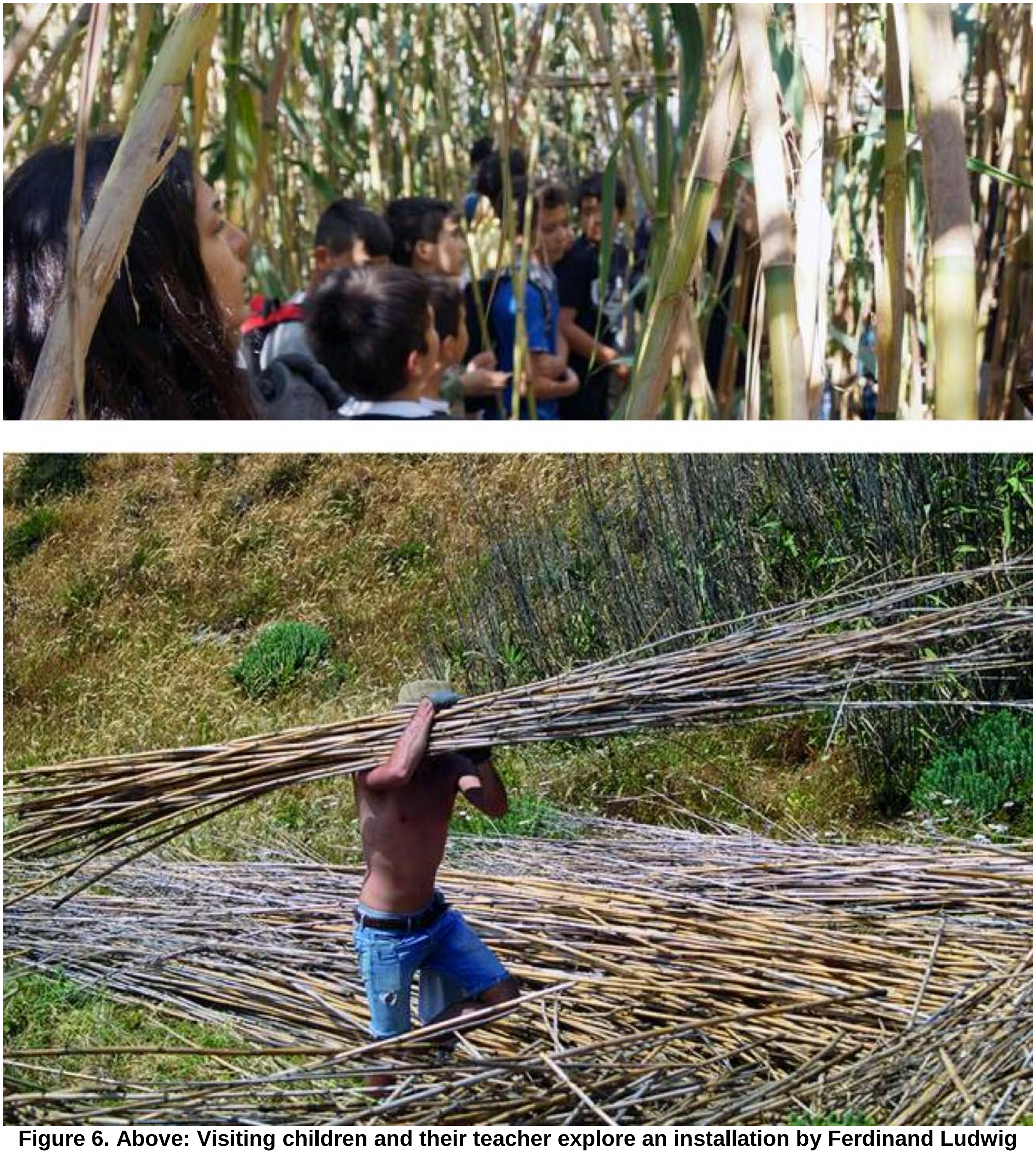

Figure 6. Above: Visiting children and their teacher explore an installation by Ferdinand Ludwig and his team inside a grove of invasive bamboo, it is difficult to ascertain where the grove ends and where the new structure begins. Below: A student on Ferdinand Ludwig's team gathers bamboo for their nearby installation. Photo: Landworks.

4.4 Exhibition

Landworks 2015 culminated in an all-day exhibition that included a group-led tour throughout the village and landscape. This event was heavily attended by local community members who comprised more than half of the spectators, including the Mayor of Sassari and local politicians, business leaders, and classes of school children. At each site, team leaders introduced their process and argument before encouraging participants to engage with the installations. Following the exhibition, visiting scholars and design critics offered an hour of benign critiques in a final ceremony that ultimately focused on honoring the contributions made by everyone, including students, team leaders, logistical support staff, chefs, videographers, and community members who volunteered their time. A noticeable absence from this ceremony were the dozens of local members of the community who had attended the exhibition and engaged with the final projects, resulting in an exclusive event that missed out on the opportunity to hear from public stakeholders. Because each work was ephemeral and lacked a direct or causal instrument for true change, speculation and experimentation were the strongest themes of the interventions with no formal solutions provided. There existed no grassroots or locally driven movement behind the program, with no significant effort at claiming power over space or in the creation of self-guided principles of design or implementation. Existing agents such as landowners and politicians controlled project direction after the installations were completed, and decided to use or simply remove the works. Because the projects were created by outsiders with little ownership or accountability from any members of the community, the projects were not intended to be maintained and quickly faded away with incoming tides. Now amongst the rubble of the dilapidated mining structures lay bits of sculpted rebar, hanging rocks from wire cable, plastic forks, and bamboo towers that remain as the material traces – the litter – of this site of design exploration.

5 CONCLUSION

While Landworks participants uncovered the site’s “working traces,” or the layered physical marks made by human hands on the land over time, this workshop also glamorized enclaves of extraction in ways that may read to some as “ruin porn.” According to Julie Bargmann (2014), “Ruin porn should be against the law. Erasure of these sites’ histories should be a felony because it robs the connection to that landscape that communities still have. Respecting those histories means respecting their generations of work. Wiping out working traces condemns the next stage of that site to be generic.” While Landworks participants did not erase the site’s histories per se, groups failed to fully draw on the site’s working traces in substantive ways that make visible possible future improvements. The project teams and their stimulating work offered no promises in terms of future commitment to the communities beyond helping recognize the potential for action. In positive terms, this resulted in highly creative works that were unburdened by numerous competing rational layers and political complexity that exist in the Mediterranean post-industrial landscape. It also regrettably resulted in few tangible constructive results beyond the temporary visual record provided by professional photography and video teams. The majority of productive outcomes were aimed at the participating students who received academic transfer credit and the opportunity to engage in a challenging international experience with leading landscape practitioners from around the globe.

Despite these problems, Landworks offers students an experiential learning opportunity and a set of tools for better understanding what is unique about a site – its cultural, economic and ecological heritage – the very qualities that distinguish it from everywhere else on earth. Improving upon this experiential learning method will facilitate a better relationship between students and the communities they should be serving. Reflections I received from student participants evidence meaningful takeaways. In particular, landscape architecture graduate student Katie Klug noted the positive impact of being immersed in and, at times, overwhelmed by the Sardinian landscape: *“After experiencing this place with a curious wonder, questions of all sorts begin to accumulate – questions of history, processes, people, value, and systems. The Landworks entourage does an exceptional job of providing the answers to these questions. Local experts share their knowledge, culture, and memories of the place. The Landworks participants are flooded with information about a complex, sensitive landscape, and they must decide what the most significant aspects of this landscape are in order to make a sincere and meaningful intervention, looking toward the rich history and the dilapidated, tainted, and curious present to create some THING; some-thing that would support and make a statement about this profound place, providing a threshold between its past and future” (Klug 2015).*

Today if you look past the aged bunker-like structures tucked into the verdant hills of Argentiera, you’ll find one struggling pub with a few local contractors who are repairing a sea-wall nearby, a few other partially renovated but mostly vacant or unattended structures, and one or two modest seasonal homes peppered in above a beach. There is a nominal population of card-playing local pensioners and a few lost-looking motorists who were understandably drawn to the turquoise and grey coastal intersection in a satellite image on their smartphone or tourism website. This represents the first impression one gains after 10 days on location. However, there is a much richer and more layered story beneath the surface that students like Katie tried to capture. While a pure historic-preservationist approach may, at times, look to design a solution nostalgically based on a frozen moment in time, the intention at the core of each Landworks workshop has been to rejoin the conflicting forces of old and new at work on a fallow and latent landscape in order to create something unique and contemporary. The process of collaborative analysis, study and making is undergirded in serious debate between past and future – amplifying the dialectic between both culture and environment as dynamic systems and frameworks for the continuous process of regeneration.

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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

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.

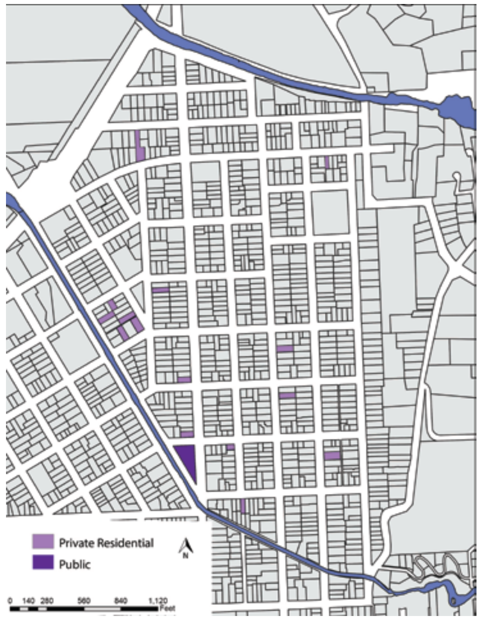

Figure 1. YardWorks I Community parcels (2016). Image by the author.

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.

Figure 2. YardWorks II Community neighborhood parcels (2016). Image by the author.

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 wider-spread 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.

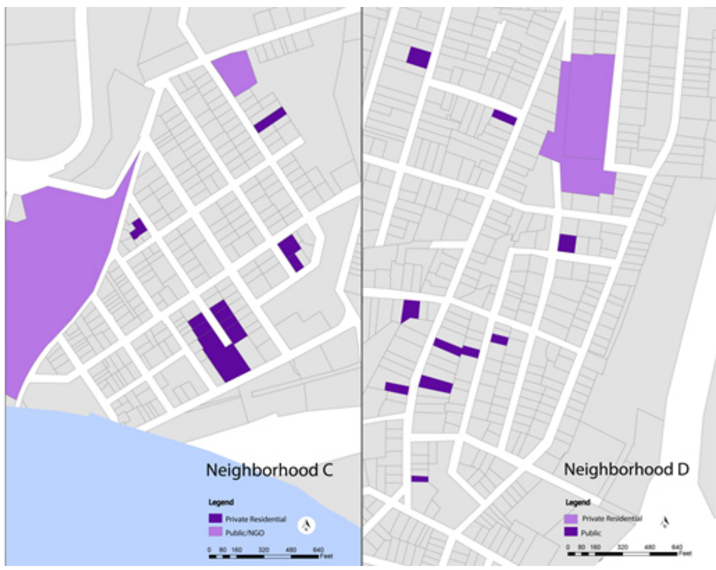

Figure 3. YardWorks III Community neighborhood parcels (2016). Image by the author.

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.

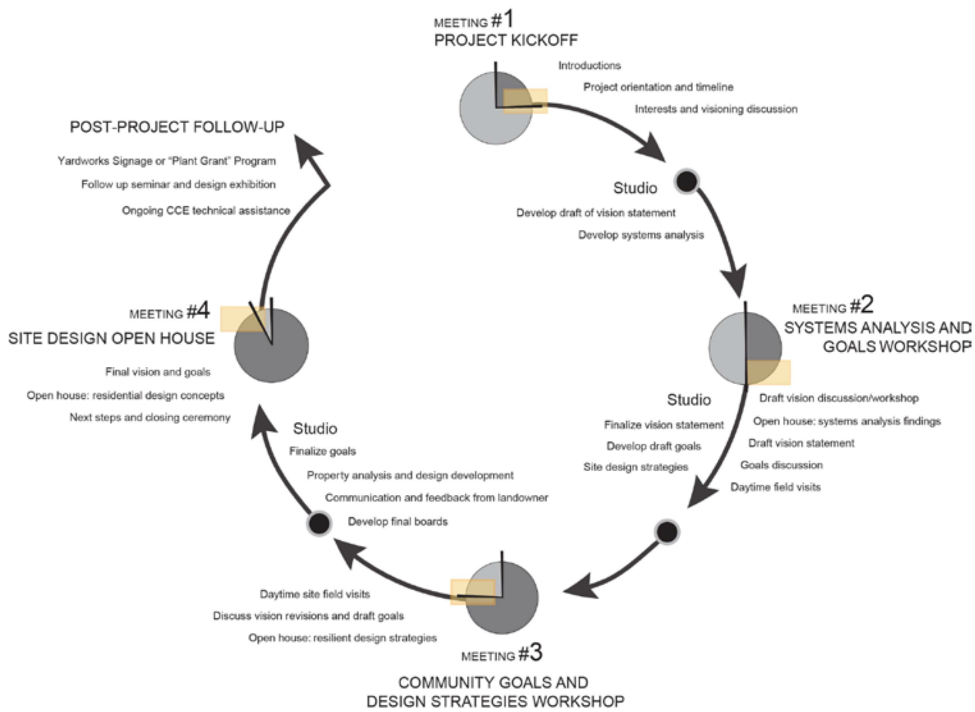

Figure 4. Diagram representing the YardWorks Studio process (2016). Circles represent community meetings and dots represent studio team work. Image by the author.

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.

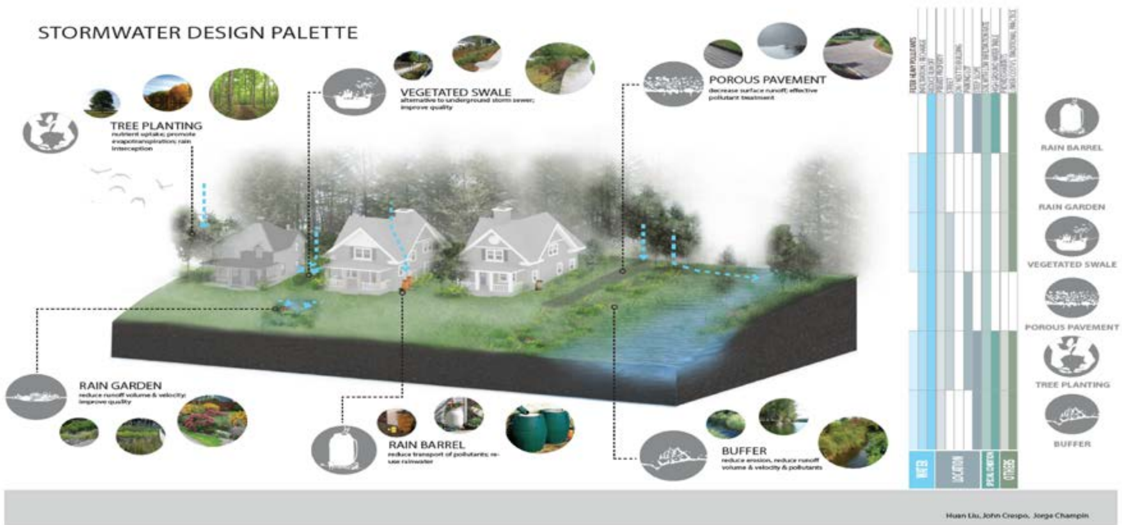

Figure 5. Example of design strategy board, this one part of a series of boards introducing types of stormwater infiltration practices (2014). Graphic by and reproduced with permission of Huan Liu MLA '16, John Crespo MLA '15, Jorge Champin MLA '15, 2014 LA6020 YardWorks Studio, Cornell Landscape Architecture.

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.

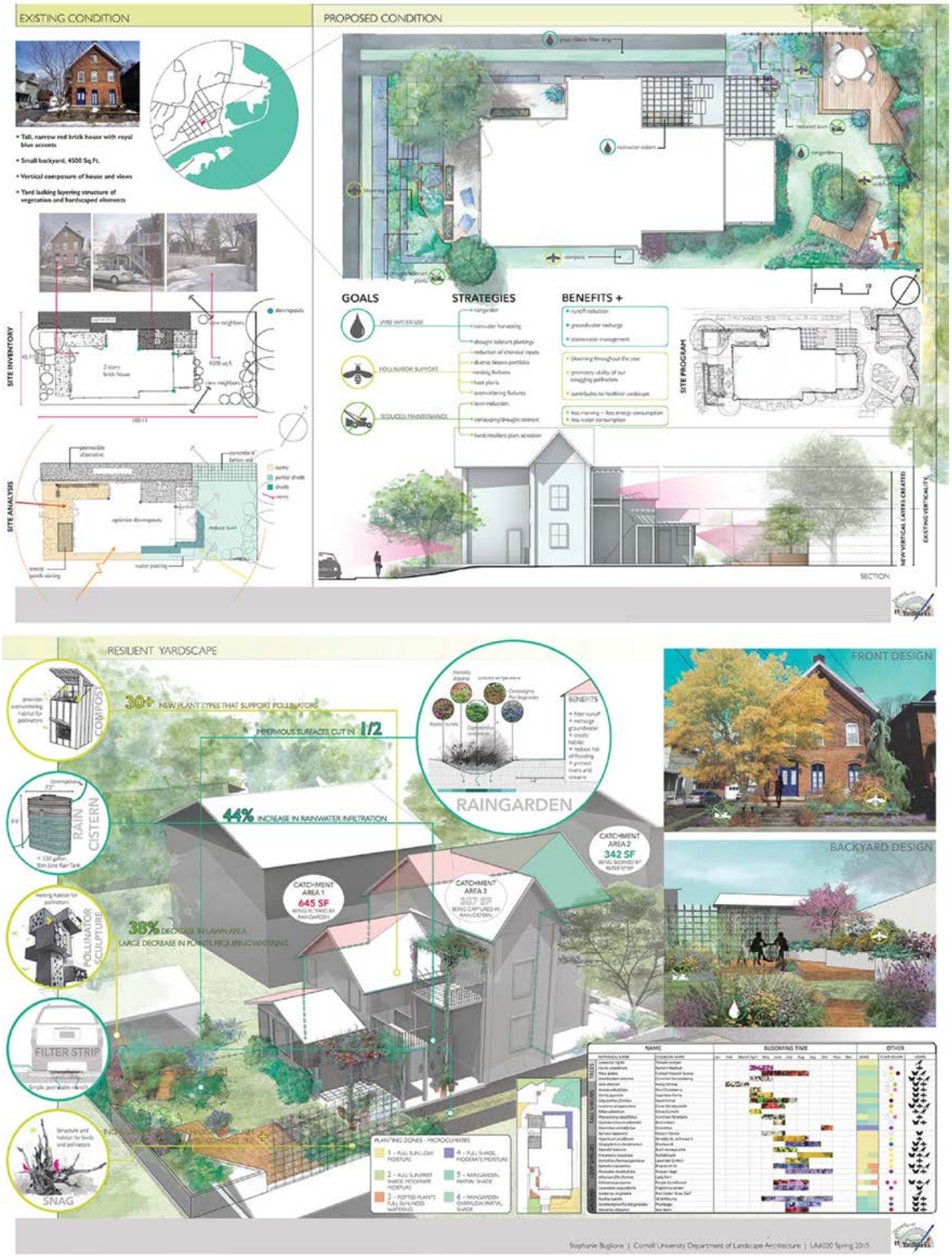

Figure 6. Example of student design board (2015). Graphic by and reproduced with permission of Stephanie Buglione MLA '16, 2015 LA6020 YardWorks Studio, Cornell Landscape Architecture.

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

	Parcel type					
	Private		*Public*		*Total*	
Community	*number*	*acres*	*number*	*acres*	*number*	*acres*
YardWorks I	15	2.6	2	0	17	2.7
YardWorks II	16	4.1	7	8.2	23	12.3
YardWorks III	19	3.6	5	23	24	26.6
Totals	50	10.3	14	31.3	64	41.6

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.

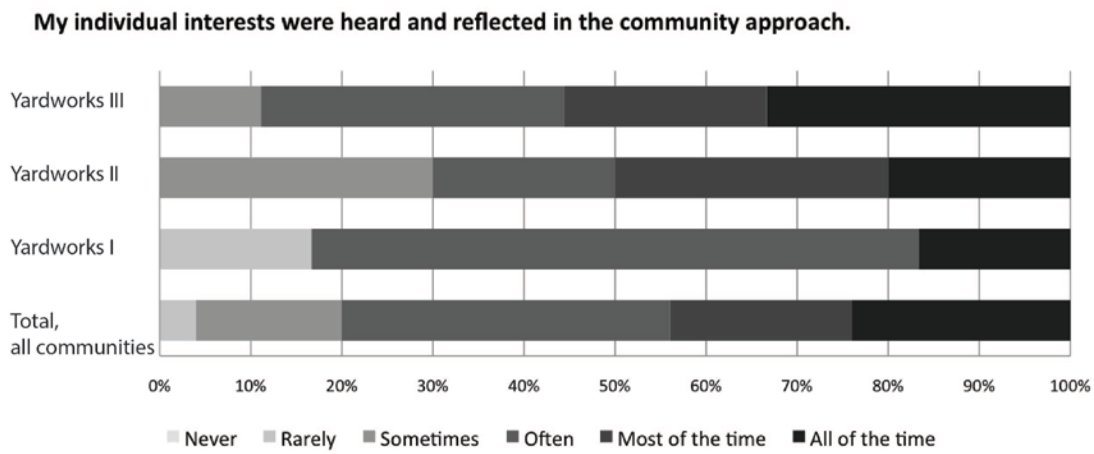

Figure 7. Post-project survey results indicating extent of landowner interests incorporated into the community approach (2015). Image by the author.

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

YardWorks I Community

Vision

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 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

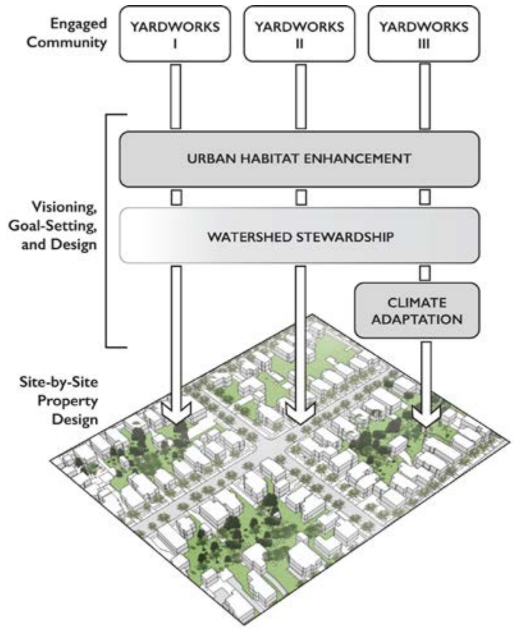

Figure 8. Elemental goals and motivations shared of each community for the project (2015). Graphic adapted by the author from graphic by and used with permission of Jesse Nicholson, MLA ’13.

4.5 Design strategy development

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.

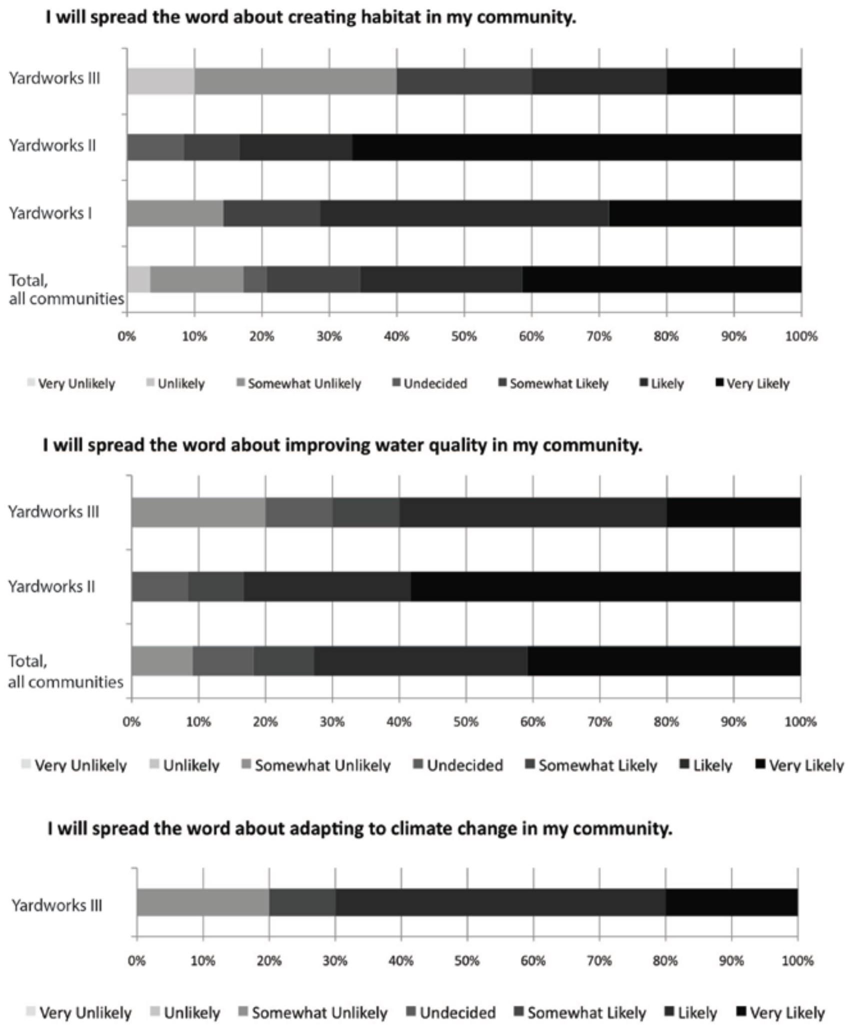

Figure 9. Likelihood that respondents will "spread the word" about goal-related aspects of the project with others (2015). Image by the author.

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).

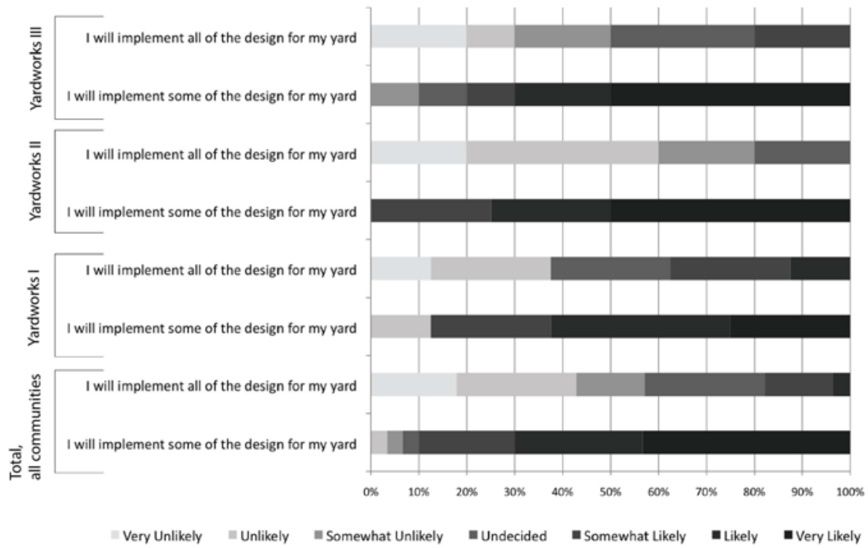

Figure 10. Likelihood that respondents will implement some or all of their design (2015). Image by the author.

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

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MAKING ROOM FOR RISK IN PLAY ENVIRONMENTS AND PLAYGROUND STANDARDS

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1 ABSTRACT

Over the past few decades, concerns about safety and liability have led to the elimination of features considered to be "risky" from many play environments. In response to this trend, some researchers are using a mix of a priori reasoning and empirical studies to make the case that risk is an integral part of challenging play, and that certain types of risky play are associated with health benefits and learning. New research and criticism of existing standards and research has encouraged the adoption of new regulatory language in the United Kingdom that acknowledges the value of risk in children's play environments. This paper introduces the current debate over rethinking American play environments and playground standards to allow for beneficial risks. The authors presented on this topic at the Council of Educators in Landscape Architecture conference in March 2016 in an effort to engage academics and researchers in the field of landscape architecture. The paper reviews how concerns about safety and liability have and are influencing play environments in the United States. It critically examines the way that the U.S. Consumer Product Safety Commission collects data on injuries related to play environments and suggests a more holistic approach to collecting and reporting data is needed to inform regulatory and design decisions. Finally, it discusses how landscape architecture academics may contribute to policy debates about risk in play environments, through research and participatory design studios. Some opportunities for future research are discussed.

1.1 Keywords

risky play, playground standards, National Electronic Injury Surveillance System, playscapes

2 INTRODUCTION

Colorful pole and platform playground structures surrounded by safety surfacing became standard on American playgrounds during the 1990s and 2000s. Such equipment offered a greater degree of wheelchair accessibility. It was modular, so it could be adjusted based on the site, the budget, and the clients' wishes. It was also designed to have fewer risks and hazards. However, critics have argued that the removal of risks has been associated with a decline in creative, challenging, and exciting play.

In an online article for *The Washington Post*, the occupational therapist Angela Hanscom (2015) called for "Rethinking the 'ultra-safe' playgrounds" in America today, and bringing back "'thrill-provoking" equipment. She recalled time spent on merry-go-rounds, teeter-totters, and taller swings, slides, and climbing structures, and argued that "we are limiting children's exposure to sensory input that actually helps children become sturdy on their feet and prepares them for learning" (Hanscom, 2015).

Similar sentiments can be found in a recent cover story in *The Atlantic.* "In the past generation, the rising preoccupation with children's safety has transformed childhood, stripping it of independence, risk-taking, and discovery," wrote the journalist Hanna Rosin. "What's been gained is unclear...What's been lost is creativity, passion and courage" (Rosin, 2014).

Lenore Skenazy, the founder of the Free-Range Kids movement, has also written extensively on the need for risk-taking on playgrounds. "A playground that gets kids moving and grooving and growing and thinking requires a frisson of adventure," wrote Skenazy for Salon in 2010. "Risk is a part of life. Minimizing it makes sense. Trying to eliminate it means eliminating play, because when kids play, there is always the possibility they could get hurt" (Skenazy, 2010).

These are just a few examples of the growing chorus of professionals, journalists, and children's advocates calling for a new way of thinking about beneficial risks within play environments. Some are looking back nostalgically at historic photos showing the more challenging play equipment of years past, "before the inspectors took over" (Hardman, 2012). Some are citing research that suggests allowing children to take risks on playgrounds is relatively safe and may have benefits for children's physical and mental health (Brussoni et al., 2015; Brussoni et al., 2014). In the United Kingdom and Canada, advocates have pushed for the government to reconsider the way it manages risk on playgrounds so that children's safety is considered more holistically and the benefits associated with risk taking are acknowledged (D.J. Ball, 2012; Brussoni et al., 2014). And they've had some success (D. J. Ball, 2012).

Meanwhile, in the U.S., some designers and playground owners are taking risks of their own on challenging and creative play environments that would have been less likely a decade ago. In Ithaca, NY's, Anarchy Zone, kids are encouraged to cover themselves with mud. The Artists at Play landscape that opened last summer near Seattle's Space Needle has a 35-foot-tall climbing net with tube slides nearly as tall (Bigelow, 2015). And on nearby Mercer Island, the local parks department has opened a new seasonal adventure playground where kids can build their own treehouses with hammers and saws.

Such examples may give one the impression that beneficial risks are becoming accepted, even in the U.S. Yet, in the very same state where kids are being given saws, the Richland School District recently announced plans to remove all swings from their playgrounds. District representative Steve Aagard told a reporter: "It's just really a safety issue… Swings have been determined to be the most unsafe of all the playground equipment" (Associated Press and KEPR-TV Staff, 2014).

This paper seeks to provide an introduction to landscape architects and landscape academics about the current discussion on beneficial risks in play environments. To participate in this debate, it is helpful to understand how playground professionals and researchers are defining risks and hazards. As the authors will explain, risky is not a synonym for dangerous. Certain hazards can be removed from play environments without diminishing their play value. However, using a mix of a priori reasoning and empirical studies, researchers are making the case that risk is an integral part of challenging and creative play, and that certain types of risky play are associated with health benefits and learning. This paper reviews historical and recent trends to show how safety and liability concerns influence play environments in the United States. It critically examines the way that the U.S. Consumer Product Safety Commission collects data on injuries and suggests that a holistic approach to collecting and reporting data is needed.

Advocates have successfully made the case for more holistic risk management on children's play environments in the United Kingdom—which had experienced a trend of risk removal during recent decades. The authors argue for similar regulatory language at the national level in the U.S. that recognizes the complex and sometimes beneficial nature of risk-taking in children's play. The authors see many opportunities for landscape architecture academics to contribute to this effort through studios and research. Some opportunities and needs for future research are identified.

3 RISKY IS NOT A SYNONYM FOR DANGEROUS

The terms risk and hazard have been defined in numerous ways that can confuse discussions of risky play and its benefits. In common speech, the words risk and hazard often have strongly negative connotations. The first definition of risk provided by Merriam-Webster (2015) is "the possibility that something bad or unpleasant will happen." Merriam-Webster (2015) defines hazard as "a source of danger," and suggests it can be used interchangeably with "risk."

However, in risk management, the two terms have different and distinct meanings. Hazards are "*potential* sources of harm" (Ball, Gill, and Spiegal, 2012, p. 27). Risk may be defined simply as the *probability* someone could be harmed by any potential source of harm. Most every feature in the environment has the potential to facilitate injury. As David Ball, Tim Gill and Bernard Spiegal (2012) have written: "People may trip over steps, slip on floors, walk into doors, or fall from climbing frames" (p. 27). Risk also may be defined as a more subjective measure that combines the probability of an adverse outcome and the seriousness of the harm that may result (Ball, Gill, and Spiegal, 2012).

Among professionals and academics writing on playgrounds, the terms risk and hazard are often used in another very specific way, differentiating between risks and hazards based on whether the child can perceive the chance for injury. In an online article for *Playground Professionals*, Ken Kutska (2013), the Executive Director of the International Playground Safety Institute, wrote that his "current definition of risk" was "a foreseen occurrence that combines the probability of occurrence of harm and the severity of that harm as perceived by the INTENDED USER." Similarly, in a paper published last spring, Mariana Brussoni and 14 other researchers (2015) use the term "risk" to describe "a situation whereby a child can recognize and evaluate a challenge and decide on a course of action" (p. 6425). They use the term "hazard" to describe potential sources of harm "that children cannot assess for themselves and that have no clear benefit" (Brussoni, et al. 2015, p. 6425).

How playground professionals differentiate between risks and hazards aligns with the way liability for injuries is often decided in U.S. courts. The recently released *National Guidelines for Nature Play and Learning Places*, includes a chapter on risk management written by the lawyer Allen Cooper, who explains that managers have "a duty to remove dangers that are not *open and obvious* to the intended user and that present a risk of injury above what is acceptable to society" (Moore, 2014, p. 118).

4 SOME RISKS CAN BE BENEFICIAL

The way Brussoni et. al (2015) define risk highlights how risk aligns with challenge in play environments. This way of thinking is a starting point for many arguments that risk can be beneficial. It builds on J.J. Gibson's ecological paradigm and his concept of *affordance.* Affordances are "the fit between an animal's capabilities and the environmental supports and opportunities (both good and bad) that make possible a given activity" (Gibson and Pick, 2000, p. 15). Environments contain a range of "behavior settings" that provide different degrees of affordance for certain behaviors; the frequency that such affordances are activated is dependent on factors conceptualized as "antecedent conditions" (Figure 1, left column) and "filters" (Figure 1, middle column) (Gibson, 1977; Michelson, 1977).

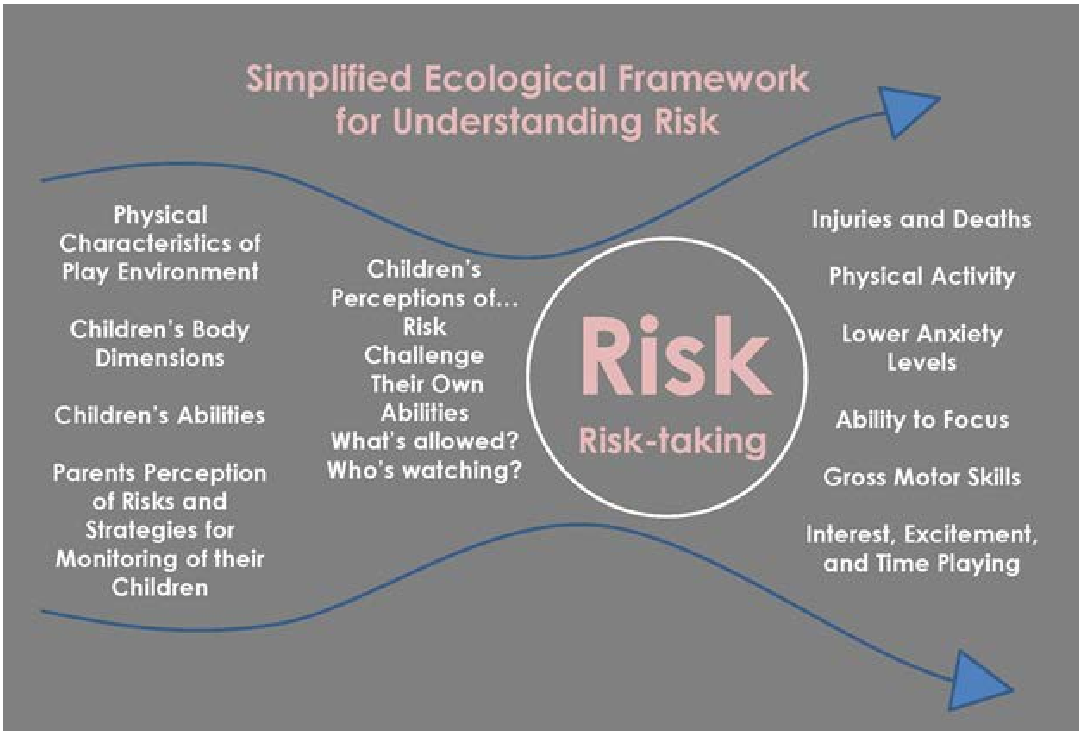

Figure 1. A simplified ecological framework for thinking about how various factors and a child's perception of them may inform whether the child takes a risk and the likelihood that risk-taking results in positive or negative outcomes (2016). Illustration by Daniel Jost.

Using the concept of affordance, one might see how the level of risk posed by any feature on a playground may depend on the child's developmental stage, physical characteristics, and/or skills the child has. Because risk is associated with body size and capability, risk is also associated with the opportunity for challenging play (Hart, 2002). For instance, a five-foot-high horizontal ladder (monkey bars) will not pose the same risk to a child that is three feet high as it would to a child that is five feet high. The moment a child becomes too tall to fall off the monkey bars, they will also lose the opportunity to swing from them with their legs extended.

An ecological theory of development also suggests risk-taking may be associated with learning gross motor skills that may actually reduce the potential of injury children face on the playground or elsewhere. Some studies have demonstrated how risk-taking is associated with learning physical skills. In a study conducted by Janice Butcher (1993), the relationships between playground skill and several variables, including parents' perception of children's risk taking, were examined. Data were collected from the parents of 64 children (24 girls and 40 boys), ages 7 to 9 years old. The study showed playground proficiency was not related to frequency of playground play or to direct parental support. But, notably, parental perceptions of a child's skill and attempts at risk-taking were significantly correlated with playground proficiency. A regression analysis of the measured variables showed that the only significant predictor of playground proficiency was a child's risk-taking attempts (Butcher, 1993). Hart (2002) has argued that in addition to obtaining physical skills, children learn to perceive risks and thus "learn to manage their own safety through appropriate risk-taking" (p. 145).

Risk-taking may also have benefits for children's mental health. The Norwegian scholars Ellen Sandseter and psychologist Leif Kennair (2011), have used the non-associative theory—a contemporary approach to understanding anxiety—to argue that risky play may have anti-phobic effects. They've warned "we may observe an increased neuroticism or psychopathology in society if children are hindered from partaking in age adequate risky play" (Sandseter & Kennair, 2011, p. 257). Sandseter and Kennair

(2011) defined risky play as "thrilling and exciting forms of play that involve a risk of physical injury" (p. 258). Later research in which Sandseter collaborated would add to this definition that "the risk can be real or perceived" (Brussoni et al., 2015, p. 6425). Sandseter (2007) has described six categories of risky play: *great heights, high speed, dangerous tools, dangerous elements, rough and tumble play,* and *disappear/get lost.*

Mariana Brussoini, a Canadian injury prevention specialist; Sandseter; and 13 other multi-disciplinary colleagues recently completed an extensive metadata literature review to understand what research exists on how Sandseter's categories of risky play are associated with different health and social outcomes. They found studies related to three of the categories—disappear/get lost, play at height, and rough and tumble play. They write that their "systematic review revealed overall positive effects of risky outdoor play on a variety of health indicators and behaviours, most commonly physical activity, but also social health and behaviours, injuries, and aggression" (Brusssoni et al., 2015, p. 6423). Five studies they identified showed that children who can disappear/get lost showed increases in habitual physical activity (Brusssoni et al., 2015). And a study by Floyd et al. that mapped children's behavior in 20 randomly selected parks in Durham, North Carolina showed lower levels of acute physical activity for children who were in the "presence" of a parent or another supervising adult (Floyd et al., 2011, p.258). There were no serious injuries or correlations associated with increased height and falls (Brussoni et al., 2015). Nor were there any signs of aggression reported from observed rough and tumble play (Brussoni et al., 2015).

This article's authors are cautious about using the term risky play as a variable affecting injury and beneficial health outcomes without discretely defining the different risks at play every time—especially when a study is not directly dealing with outcomes related to conquering fear or learning a skill. It seems unlikely the decreased supervision by parents is acting through the same pathway as it facilitates active play as conquering some risky feature would if it led to the anti-phobic effects. The way these elements are combined by Brussoni et al (2015) in their abstract might be better understood as speaking to the way risk is defined in policy rather than the pathways through which the environment affords specific outcomes. Still, their paper provides a strong introduction to the subject of the benefits that can be associated with certain types of risks and the current state of understanding of those benefits.

5 INJURIES, DEATHS, AND THE CPSC

The case for removing certain risks and hazards on playgrounds has frequently been made using data from the U.S. Consumer Product Safety Commission (CPSC). Since the early 1970s, the public agency has collected data from a sample of the nation's hospitals on what types of products are associated with injury, using a system called the National Emergency Injury Surveillance System (NEISS). That data is then used to make estimates on the number of injuries that have been associated with different types of products nationally. It is one of the most extensive data sets available on injuries that occur on playgrounds. And it tells us a great deal about how such injuries are occurring. However, using the data to assess the risks afforded by certain types of playground equipment can be highly problematic.

According to a 2001 CPSC report that is still widely cited, over 200,000 children are treated in hospital emergency rooms each year due to injuries associated with playground equipment (Tinsworth & McDonald, 2001). The CPSC estimated that 205,853 playground equipment related injuries were treated in U.S. hospital emergency rooms between November 1998 and October 1999. Just over three quarters of those injuries (75.8%) occurred on equipment designed for public use—that includes 34% that occurred in schools and 24% that occurred in public parks (Tinsworth & McDonald, 2001). The majority of public playground injuries treated in emergency rooms were fractured bones (39%); 22% were lacerations; 20% were contusions or abrasions; 11% were strains or sprains; 3% were concussions; and 2% were internal injuries (Tinsworth & McDonald, 2001). 97% of people seeking care for injuries on playgrounds were treated and released. Only 3% (around 6,200) required hospitalization (Tinsworth & McDonald, 2001).

The main cause of injury, which accounted for “all of the hospitalized injuries,” was falls. 79% of playground injuries on public playground equipment involved falls and 68% of those were falls to the surface below the playground (Tinsworth & McDonald, 2001). Similar data from earlier years was used to make the case for safety surfaces within the area surrounding play equipment (Frost & Klein, 1979), now referred to as the use zone (U.S. CPSC, 2010; ASTM, 2011). These figures suggest that understanding why current surfacing regulations are not preventing injuries and finding an economically feasible solution to the problem could potentially lead playground injuries to be reduced by 2/3, and could lead to the elimination of almost all playground injuries requiring hospitalization.

Unlike the hazard pattern data, the NEISS data on what playground equipment is associated with injuries—especially when it is used alone—is not specific enough to draw any conclusions about what might have led to the accident and where design intervention could be useful. The data categorizes playground equipment into a few broad groups, and shows how many injuries were associated with each category of playground equipment. But it is difficult to establish what sort of “swing” or “slide” led to an injury. For instance, hard metal animal swings, which are not recommended by the CPSC due to their potential for injuries caused by impacts, fall into the same category as a tire swings. This is problematic for those who would want to use the data to explore whether safety features are effective and for those who would like to make the case for revisions to equipment detailing that preserve play value--since the equipment continues to be lumped together with other equipment.

It is also impossible to establish the relationship between any specific play equipment and its surroundings using NEISS data alone. This is highly problematic given that the number one cause of injury is falls. If a child falls off a swing or slide onto the surface below, the swing or slide is associated with injury in the NEISS data. Yet, surfacing will affect whether the child sustains an injury from the fall. NEISS data is not collected in a way that acknowledges injury occurs as a result of a system of interacting variables. “Climbers,” a category that includes monkey bars, were associated with the most injuries in public parks: 53% of all injuries. However, 86% of injuries involving climbers implicated falls (Tinsworth and McDonald, 2001). The surfacing would clearly be playing a major role in this. Tinsworth and McDonald (2001) did collect some information on surfacing not typically found in the NEISS data using phone interviews, but they did not analyze equipment and surfaces together as systems.

Using NEISS data to assess risks is also problematic because the data sets include no information on the prevalence of the equipment or the amount of time children spend playing on it. Assume for a moment that all types of playground equipment had the same risk of injury. If this were the case, the most prevalent and most heavily used equipment would be associated with more injuries. It is possible that the NEISS data could be leading some decision makers to believe that certain types of equipment are more dangerous than others, when they are actually just more common or more beloved. Of course playgrounds with the fewest injuries are the ones that don’t get used at all.

A confusing graphic in the 2001 CPSC report may also be creating misunderstanding among local officials. Public playground managers in Richland and elsewhere have argued that swings are the most dangerous of all playground equipment. Yet, on public playgrounds, swings were associated with just 19% of all injuries compared with the 53% of injuries associated with “climbers” (Tinsworth and McDonald, 2001, p. 9). Unfortunately, the graph the CPSC report uses to show the percentage of all playground injuries associated with each type of equipment shows home and public playground injuries together. 60% of injuries on home playgrounds involved swings (Tinsworth & McDonald, 2001). So, a quick look at the graph (Figure 2) gives the impression that swings are the most dangerous of all playground equipment—they have the highest bar on the graph. This may be responsible for some local officials misunderstanding of the data. Notably, one reason the two are not comparable is that only 9% of the homes studied had a protective surface installed in the use zone. In contrast, 80% of public playgrounds had a protective falling surface at that time (Tinsworth and McDonald, 2001).

In addition to looking at injuries, Tinsworth and McDonald (2001) also analyzed 147 deaths that had occurred on American playgrounds between January 1990 and August 2000. Only 38 of those cases occurred on public playgrounds (Tinsworth and McDonald, 2001). Some researchers have used the small number of deaths reported by the CPSC study to try to quell concerns that playgrounds are particularly dangerous. One writer compares the 4 deaths per year known to occur on public playgrounds to other causes of death—the estimated 37 children killed per year waiting on school buses, the 20 sports-related deaths and 44 school homicides in the U.S. annually (Moore, 2006). However, the CPSC study was not a complete count of deaths on playgrounds in the U.S. during the period examined, nor was it a representative sample "[D]eaths due to falls are underreported in the Commission's data," according to Tinsworth and McDonald (2001, p. 21). They only collected death certificates related to falls for one or two states in all but one of the ten years studied. Efforts to obtain a more complete picture of playground deaths would be beneficial to those looking to manage the risks and hazards that lead to them, as no complete data on playground deaths appears to exist for the United States currently.

6 U.S. LEGAL ENVIRONMENT AND LIABILITY CONCERNS

Concerns about playground safety are closely linked with concerns about liability. Both have long informed playground design and management in the U.S. A book chapter by Arthur Leland from 1908 stressed playground equipment must be durable to avoid liability due to "accidents occurring from breakage" (Mero, 1908 p. 86). The attractive nuisance doctrine, which continues to be cited to this day, dates to a U.S. Supreme Court decision from 1873. It requires property owners to use "reasonable care" to protect children from dangerous constructions or agencies on their property that may attract them--even when the children are trespassing (United Zinc v. Britt, 1922).

Two major changes apparently affected liability on public playgrounds during the latter half of the 20th century. Greater latitude to sue local governments in some parts of the U.S. and the adoption of national design standards changed the legal environment, making it easier for citizens to pursue torts against manufacturers and certain municipalities for injuries on playgrounds (Mikus, 2014). Through the mid-1960s, American tort law usually protected municipalities from civil lawsuits under sovereign immunity—as long as the municipality could show it had used reasonable care. During the 1960s, the federal courts began removing sovereign immunity protections in certain circumstances, raising the likelihood that lawsuits would be allowed to proceed (Sisk, 2008).

Some states and municipalities have successfully taken action to limit liability claims related to recreation by adopting recreational use statutes. The recreational use statute in the state of Washington, RCW 4.24.210 reads, in part: "[A]ny public or private landowners or others in lawful possession and control of any lands … who allow members of the public to use them for the purposes of outdoor recreation … without charging a fee of any kind…shall not be liable for unintentional injuries to such users (Kozlowski, 2012, WA State Legislature). In a recent test of the statue, Swinehart v. City of Spokane (2008), the court found in favor of the city, based on the presence of the recreational use statute and the court's determination that the condition that led to the plaintiff's injury "was patent, or obvious" (Kozlowski, 2012). This may provide insight into why some experiments in risky play have occurred in Washington State.

The CPSC's creation in 1972 was another major turning point in the way playground liability was considered. It led to the first system for generating national data on the playground equipment associated with injuries, which informed the CPSC's *Handbook for Public Playground Safety* in 1981 (Barton, 2006). The first ASTM standards for playground surfaces would follow in 1991 and ASTM standards for playground equipment would follow in 1993 (CPSC, 2010). Both regulate children's play structures using limited age categories that lump ages 2 to 5 and 5 to 12 together (CPSC, 2010; ASTM, 2011). In effect, this means that all playground equipment must be designed to be safe for a 5-year-old.

In the years since, some states have passed laws requiring playgrounds to meet one or both of these standards (Moore and Cooper, 2014). And even in states where they are not written into the law, they may be used to define the *standard of care* that a playground owner or designer is held to in civil court cases (Frost and Sweeney, 1995; Moore and Cooper, 2014).

Even if a local community felt that they could tolerate the risk of injury for a giant-stride, a Tarzan-like rope swing, or a trampoline on a public playground, it would face a major hurdle to erecting this equipment. These are just a few of the equipment types categorically prohibited in children's playgrounds under either the ASTM standards, the CPSC guidelines, or both (CPSC, 2010; ASTM, 2011). Even if designers could come up with design solutions that addressed the hazards created by these pieces of equipment (and some have tried), playground owners would be reluctant to install them and playground manufacturers would be reluctant to sell them in the U.S., since the way they are discussed in the standards could potentially increase the liability the owners and manufacturers would face in the event of a single injury. That is likely why American playground owners have not copied Europe's efforts to install public trampolines that minimize the major causes of injury in home trampolines by placing their beds at ground level, surrounding them with safety surfacing, and minimizing their size to discourage multiple users at once (Jost and Rottle, 2014).

The CPSC also has the authority to issue national recalls on play equipment following injuries. The first such recall occurred in 1983 and involved a metal playset designed for toddlers by Pixieland that posed an entrapment hazard to small children that would have had no play value (U.S. CPSC, 1983). A second recall from 1985 also focused on a hazard, and also shows how CPSC intervention may lead to safer play equipment. After a girl was killed due to the failure of a weld on a tire swing by Miracle Recreation failing, the company was pressured by the CPSC to voluntarily repair all the other swings of that type (U.S. CPSC, 1985). However, the recall of the slalom glider in 2012 was not the result of an imperceptible hazard but rather a risk inherent in using the equipment that also enhanced its play value and level of challenge. The feature, which was like a slide but less passive, was recalled after it was associated with 15 injuries--all to children under the age of 8 (Kutska, 2012). Most were broken arms from a fall to the safety surface below. This led Kutska to raise questions about how standards categorize equipment, and how the CPSC considers the larger systems leading to injury and the level of injury seriousness when recalling play equipment (Kutska, 2012).

While liability was a powerful force for improving product safety in some cases, whether consumers have always ended up with safer playgrounds as a result of CPSC's regulation may be questioned. A recent incident in Cabell County, West Virginia illustrates how the CPSC guidelines, playground owners' concerns about liability, and the cost of new equipment may work together to lead to the removal of play features. The board of education had a lawsuit after a child was injured on a swing. The school district there was sued twice in one year over injuries that occurred on swings, leading to a $20,000 out-of-court settlement in one case. Wary of future settlements, it examined all its swing sets and found most did not have use zones compliant with the standards (Chambers, 2010). Faced with extensive costs to bring the equipment to meet standards, and fearing additional lawsuits, the district began removing swings from all its schools in the summer of 2010 with no plans to replace them (Chambers, 2010). Though, thanks to community outcry, there was some funding secured for updating some of these playgrounds the following year.

At least some decisions to remove risks are being made without any prodding from national standards. Neither ASTM nor CPSC prohibit swings teeter-totters, or merry-go-rounds (ASTM, 2011; CPSC 2010). The widespread decision to remove them has been made at the local level—sometimes with a poor understanding of the injury data. In 2005, the South Florida Sun-Sentinel reporter Chris Kahn wrote about plans to remove these items from Broward County, Florida's schools in an article that was picked up in many other newspapers. "They've got moving parts," said the school's Safety Director, Jerry Graziose (Kahn, 2005). "Moving parts on equipment is the No. 1 cause of injury on the playgrounds." Yet, the 2001 CPSC report stated that only 3% of all playground injuries involved impacts with moving equipment, 8% involved impacts with stationary equipment, and of course, falls were the leading cause of injury (Tinsworth and McDonald, 2001, p.29).

Another troublesome trend in recent decades has been the school districts that have chosen to remove recess from the school day entirely. For instance, Chicago did not have recess at most of its public schools between 1991 and 2011. While concerns about academic achievement clearly played a role in many school districts' decisions, another of the reasons for this trend that educators gave to the New York Times in 1998 was "a fear of lawsuits if children become injured" (Johnson, 1998).

The difference in the liability situations faced by different playground providers makes it hard to determine how often features were removed because of real liability concerns and how often they were removed out of fear. In Denver's Public Schools (DPS), there was only one lawsuit that resulted from the entity's negligence between 1994 and 2004 (Yost, 2005). Yet, despite the low number of injuries and lawsuits, DPS also removed teeter-totters and merry-go-rounds during the mid-2000s without replacing them with modern versions of the same equipment.

As the federal government has been increasing the potential for liability associated with providing playgrounds in recent decades, it has provided few incentives to provide beneficial risks or playgrounds at all. Notably, the CPSC was not charged with regulating play equipment to provide the best possible play experiences with the fewest injuries. It was created solely to reduce injuries (Mikus, 2014).

7 TOWARDS MORE HOLISTIC RISK MANAGEMENT IN THE UK

This is not all that different than the situation in the United Kingdom, where playgrounds were regulated by the Health and Safety Executive. Like the U.S., the U.K. had seen risky play diminish in recent decades. The situation was well documented by Tim Gill (2007) in his book *No Fear: Growing up in a Risk adverse society.* But in recent years, Gill and a variety of other professionals in the U.K, including many involved in the injury prevention realm, have been making the case for more holistic risk management on playgrounds with some success.

Some roots of the turnaround in the U.K. can be found in a report authored by Karen King and David Ball in 1989, titled *A holistic approach to accident and injury prevention on children's playgrounds.* This report raised questions about the effectiveness of safety surfacing on playgrounds as a strategy for protecting children from accidents (Ball, 2012). A major step toward change came in 2002, when Ball was contracted by the country's Health and Safety Executive to examine the statistics related to playground accidents and at the same time was hired by the Play Safety Forum to help develop a position statement on managing risk in play areas (Ball, 2012).

The Play Safety Forum's 2002 position paper on risk in play environments contrasted significantly with the approach common at the time. "[P]lay provision should aim to 'manage the balance between the need to offer risk and the need to keep children safe from harm,'" it said. "While the same principles of safety management can be applied both to workplaces generally and play provision, the balance between safety and benefits is likely to be different in the two environments. In play provision, exposure to some risk is actually a benefit: it satisfies a basic human need and gives children the chance to learn about the real consequences of risk-taking." (Play Safety Forum, 2002, p. 2).

Play England oversaw the creation of a more specific "implementation guide" for managing risk in 2008. And in 2012, a policy statement was released on the national level by the Health Safety Executive, an agency that like the CPSC had previously been charged only with keeping people safe. It clarified play providers' duty was to strike a balance between injury reduction and play "focusing on controlling the most serious risks and those that are not beneficial to the play activity or foreseeable by the user" (Health Safety Executive, 2012).

The policy changes in England have inspired people to work for similar changes in Canada and the United States. In 2013, a symposium on healthy risk promotion was held the day before the Canadian Injury Prevention and Safety Promotion Conference (Brussoni et al, 2014). In the U.S., Ball, Gill, and Spiegal's work served as an inspiration to Allen Cooper's chapter on risk management in the new national guidelines for Nature Play and Learning Places (Moore and Cooper, 2014). There is also discussion underway amongst some of the members of the ASTM committee and the CPSC to move away from the equipment-based playground standard and toward a standard that is performance based, which could potentially lead to removal of some of the categorical bans on equipment.

8 POLICY RECOMMENDATION

In the United States, the CPSC should consider following the HSE's lead and acknowledge in writing that there are often benefits associated with risk in children's play environments (Mikus, 2014). While CPSC does not have the charge of looking at health in a holistic way as the HSE does, a statement acknowledging that play equipment is different than other sorts of products it regulates and that in play some risk is beneficial would not be outside the CPSC's charge. According to its website, the U.S. Consumer Product Safety Commission is charged with "protecting the public from *unreasonable* risks of injury or death" (CPSC, 2016, emphasis ours). Risks that typically result in health benefits or learning and only rarely result in injury might be considered reasonable risks.

Including such a statement in the CPSC guidelines would likely change how liability is assigned in certain situations where benefits are clear and injury is rare. It could have the added benefit of quelling some unjustified worries about liability on the part of playground owners--particularly public owners in states without recreational use statutes and private owners. However, making changes at the national level alone would not be enough to ensure that beneficial risks are included in American play environments. As the authors have shown, decisions about risk are currently being made at many different levels. Systematic change would likely require a more extensive educational campaign for owners and designers and changes to state and local laws and standards.

9 THOUGHTS ON FUTURE ADVOCACY AND EDUCATION

Landscape architecture academics educating themselves about the debate on risk-taking in play environments could be in a good position to pass on their understanding to local stakeholders about this issue through community design projects (Brink & Yost, 2004). For example, in 1998, Lois Brink, a licensed landscape architect and a University of Colorado faculty member, began working with the Denver Public School District (DPS). At first, resistance to anything not manufactured or regulated by the CPSC was the norm. After much persuasion, Stephen Finley, Risk Management Supervisor for DPS, agreed to allow boulders to be "tested" on the Garden Place Elementary School (Yost, 2005). Surprisingly, there were no injuries nor accidents associated with these "risky" play elements (Yost, 2005); and today virtually all of the DPS "Learning Landscapes" have boulders (Brink, 2013).

Landscape architecture academics may also facilitate interactions at higher levels of government to clarify policies and push for change. For example, Robin Moore and Nilda Cosco, landscape architecture faculty members, and founders of the Natural Learning Initiative (NLI) at North Carolina State University, have brought together childcare providers and state regulators over a number of years to discuss concerns about what is allowed in North Carolina's outdoor play and learning environments. This has alleviated concerns and increased understanding among childcare regulators and providers about the potential benefits of outdoor environments, leading to new interpretations of regulations at the state level. A panel from NLI's 2010 conference titled: "Myth Busters: A Panel on the Interpretation of Childcare Regulations and the Outdoors" provides an example of positive effects of creating a discourse. See: https://mediasite.online.ncsu.edu/online/Play/dde8e5e16e2342c5ab9985e7da308ea71d.

An area of much discussion, addressed briefly during that panel, was whether childcare centers could grow tomatoes. Tomatoes were on a list of poisonous plants that excluded their use within the licensed outdoor areas of childcare centers. Although tomato leaves and stems do have low levels of toxicity, the amount that would need to be consumed for a detrimental effect would be unrealistically high, and the Carolina Poison Center had no recorded instances of ill effects caused by tomato leaves alone in its 13 years of data (NC Cooperative Extension, 2010; Natural Learning Initiative, n.d.). A child, who had eaten 5 or 6 leaves had "no ill effects" (NC Cooperative Extension, 2010). After researching the issue, the NC Division of Child Development and Early Education published a statement that growing tomatoes in licensed childcare facilities was allowed in areas that served children 3 years and older, since these children were beyond the stage where children explore their environments with their mouths (Natural Learning Initiative, n.d.).

10 SUGGESTIONS FOR NEW RESEARCH

Landscape architecture academics of various stripes--from environmental psychologists to historians--may also contribute new research that could help to inform new standards on risk in children's play environments. Based on a review of the literature more extensive than can be noted here due to space limitations, a few suggestions for future research might be offered.

10.1 Need for Better Record Keeping and Statistical Analysis

As Yost noted in 2005**, "**administrators, designers, users, and policy makers continue to follow recommendations based more on fear of litigation and raising insurance rates than on accurate statistical analysis" (p. 69). The authors reiterate her argument for better recordkeeping and reporting on playground injuries, so that challenging equipment is not removed based solely on fears and anecdotes.

10.2 Need for Less Abstract Categories in Research

Research on injuries must not use categories of play equipment that are too abstract to offer useful information on how the equipment is affording injury. Not all trampolines, for instance, are created equal (Jost and Rottle, 2014). Researchers need to be aware that when they ascribe injuries to equipment abstractly, rather than considering the root causes, this can lead to abstract language in standards that may limit opportunities for designers to come up with solutions to the actual causes of injury. New research might seek to track injuries on play features using more specific categories.

10.3 Need for More Ecological or Systems Thinking in Playground Research

Very little research has evaluated play features in concert with the surrounding surfaces and the child's perception of risk related to falling on those surfaces. An ecological or systems based perspective is needed when evaluating whether injuries were caused by play features or are just associated with them. Ecological models may consider the physical environment as well as other social, cultural, political, economic, historical, and mental factors related to children's interactions at different scales. Considering children's age is especially important in any research related to injuries in play environments.

10.4 Need for New Research on Equipment that is Categorically Banned

Researchers may consider a number of the abstract categories that the CPSC has forbidden on public playgrounds categorically without offering designers a chance to intervene with design solutions—the giant stride, the trampoline, multi-person swings (other than tire swings), and ropes that are not tied down at both ends. In each of these cases, previous researchers associated abstract categories of equipment with injuries, rather than considering the direct cause of injury and how it might be designed out. More research into how equipment designed to remove risks, such as in-ground public trampolines, performs in other countries or in other environments where they are allowed might be used to assess whether existing regulations are sensible.

Historical research looking at the history of equipment design and regulation could also be instructive. For example, Jost (unpublished) has found prominent early safety guidelines for detailing playgrounds by the designer Arthur Leland recommended that giant strides "must have very hard surfaces under them or in a few weeks great holes will be worn in the ground." (Mero, 1908, p. 82). At the same time, Leland was recommending soft sand in the areas beneath jungle gyms to provide a cushion for falls (Mero, 1908). If playground owners were following his advice, that might help to explain why the giant stride went from being considered one of the safest pieces of playground equipment at the beginning of the 20th century to the piece of equipment associated with the most injuries in a 1950s study--those who fell from it may have been more likely to fall onto a hard surface (Mero, 1908; Hase, 1958).

10.5 Need for Definition and Evaluation of Injury Seriousness

When trying to understand the injuries associated with certain types of equipment, some effort should be made to understand how serious they are, and if there were dangerous affordances that are specifically associated with serious injuries. While few would argue a skull fracture was less serious than a scratch, determining the seriousness of injuries does involve a degree of subjectivity. Work with stakeholders to come to agreement on what constitutes a serious injury on a playground would be useful. Is a serious injury defined by the treatment required (e.g. hospital visit, hospitalization) or is it defined by its persistent effects? Is a broken arm the sort of serious injury designers should strive to eliminate at all costs or is it something worth risking to sustain wider benefits?

10.6 More study of benefits associated with specific risky play features:

More research is needed to see if providing certain types of risky play correlates with reductions in obesity, ADHD, clumsiness, illegal drug use, aggression, tagging, depression, and anxiety. More environment-behavior research on the benefits of risky play and risk-taking related to children and youth's physical, mental, social, and emotional development and well-being are also needed.

10.7 Need for Transdisciplinary Partnerships and Cross-Jurisdictional Data Sets

Researchers from a diverse range of disciplines are needed to address the many factors and variables. Landscape architecture academics may have familiarity with materials, construction detailing, measuring park use, and visualizing/observing how the human body moves through space. Medical researchers, on the other hand, tend to have greater knowledge of the human anatomy and injury's effects. Many studies on playground injury have been conducted with only one of these groups, often medical professionals. Waltzman et al (1999)'s study in *Pediatrics* titled "Monkeybar Injuries: Complications of Play" is an example of a study conducted solely by medical professionals that might have benefited from having collaborators knowledgeable about landscape detailing and maintenance. It found "the surface below the [playground] equipment has no influence on the type or severity of the injury" (Waltzman et al, 1999, p. 1). However, the researchers simply divided up surfaces into categories based on material: sand, woodchips, dirt, and grass (Waltzman et al, 1999) without considering that different types or depths of materials may cushion falls differently. A team with a designer would be less likely to make this mistake.

Transdisciplinary partnerships may also lead to cross-jurisdictional data sets on playground injury that combine detailed information on both injuries and the playgrounds that afforded them. Working with incident reports from schools, parks or childcare centers can be limiting because these reports do not always provide much detail on the type or severity of injury. For instance, Branson et al.'s 2012 study in *Pediatrics and Child Health*, based on school incident reports, built of of a fairly strong understanding of the physical environment (and how seasonal differences might affect it). But its information on injury is weak. It combines together minor head injuries with concussions; and fractures with dislocations and pulled muscles (Branson et al, 2012). This is likely because the injury is not fully diagnosed at the time the student leaves for a hospital. Injury severity, as discussed in the study, is based on whether or not an ambulance was called (Branson et al, 2012), which is a largely subjective measure.

Meanwhile, Waltzman et al's 1999 study, which exclusively used data collected at a hospital, had strong information on injuries and treatment required. But it lacked detailed information on the equipment-surface systems and the prevalence of these equipment-surface systems that might have been used to identify what had truly caused these injuries and how often certain systems led to injury. There would seem to be a possibility for school systems, park systems, and hospitals from the same region to work together to create new data collection systems that would address these issues. Data on other factors, such as usage, may be collected on an as needed basis through behavior mapping when there is concern about certain pieces of equipment.

11 CONCLUSION

This paper provides landscape architecture academics a brief introduction to the current debate over beneficial risks in children's play environments. We've noted that by definition, risk is associated with the potential for injury; however it is also associated with many benefits including physical and mental health benefits and improvements to gross motor skills. So, any agency that regulates it and any study that seeks to inform such regulations will need to take into this into account. Even if federal regulators acknowledge that risk may be beneficial as we suggest, much more research will need to be done on specific play features, the associated risks, and the potential benefits. The authors see many opportunities for landscape architecture academics to contribute. Through partnerships with professionals more knowledgeable about injury, regulators, and community members, it will be possible to conduct more detailed research, and facilitate discussions about what risks are acceptable that incorporate research.

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EXAMPLES OF ADAPTED ETHNOGRAPHIC APPROACHES FOR PARTICIPATORY DESIGN

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1 ABSTRACT

In landscape architecture practice, participatory design approaches emphasize community workshops and charrettes. But marginalized voices are often suppressed during group meetings, if those at the margins are invited at all. To expand inclusion in the design process, we propose adapting classic ethnographic methods such as one-on-one interviews and direct observation. The benefit of adapted ethnography is that it gives us first-person accounts of a place and of people's needs. Adapted ethnographic methods allow designers to observe how people really use and feel about places, and are well-suited to one-on-one interactions with stakeholders. Although ethnographic methods can be usefully adapted to landscape architecture processes, this adaptation differs from true ethnography. Developing an ethnographic narrative is a deep and long term endeavor, often occupying the majority of an ethnographer's career. To adapt ethnographic methods for use during a relatively short period of time, a spatial designer must limit the inquiry to a specific "lens" or particular question related to the community design at hand. Recently, we used an adapted ethnographic approach in the design process for a temporary park and associated streetscape in a Midwestern city with slightly less than a half million residents. We sought to understand downtown resident's lived experiences downtown, their perceptions of downtown place identity, and what they most valued in a temporary park.

1.1 Keywords

Participatory design, adapted ethnography, community engagement, temporary landscape, public space

2. RESEARCH RATIONALE, OBJECTIVES AND CONTEXT

2.1 Toward Insightful and Inclusive Participatory Design

Three authors of this paper are designers who routinely partner with urban communities to develop everyday landscapes, such as streetscapes. A fourth author is an ethnographer who studies public space in several cultures around world. The designers' goal is to help our community partners build landscapes that are imageable, poetic, and durable, while students learn inclusive participatory design practices. We seek to amplify place meaning—the type of pluralistic meaning described by Edward Relph (1999) through the qualities of "generosity and imperfection" (p. 26). "Whose meaning?" becomes an important question, though not easily answered. The ethnographer has served as a valuable advisor as we adapt, apply and interpret results of ethnographic methods.

Since the twentieth-century, landscape architects have been leaders in developing and critiquing participatory practices for design (Hester, 1989, 2006, 2012; Jaurez and Brown, 2008; Melcher, 2013). But as educator and designer Randolph T. Hester, Jr. has noted (2001), "There is an alarming overemphasis in participation today on consensus without vision" (p. 35). Then and more recently, Hester voiced criticism of processes that minimize differences and mask the needs of marginalized groups (2001, 2008). In order to be exemplary, Hester has said democratic and participatory landscape design practice must include four domains (2008): "1. Representing people. 2. Co-authoring design. 3. Provoking the familiar and the strange. 4. Nurturing stewardship. 5. Empowering people to represent themselves" (p. 97). Adapting ethnographic approaches to participatory design offers opportunities to achieve these domains.

2.2 Objectives

The purpose of this paper is to provide explicit examples of community participation in site planning and design that use methods adapted from ethnography. The authors' argue that worldviews and methods commonly used in the discipline of ethnography are valuable to landscape architects who wish to guide more inclusive participatory design. Two applied, methodological examples are included in the paper: adapted ethnographic methods used for participatory design of a temporary park and for streetscape redesign with bicycling infrastructure. Both methodological examples focus upon increasing participation by groups not originally included in the client/sponsor's vision for a participatory process. The definition of a marginalized community group is different for each example and is operationalized in the discussion of context, and at the start of each example.

Because the focus of this paper is to argue the benefits of adapted ethnographic methods for landscape architects, the focus within the examples is upon each study's methods. Within each example, methods and results are presented, the latter emphasizing how the outcome was more insightful or inclusive of community members and their needs. Discussion is combined in a single section that allows for comparison of both studies' methods and results.

2.3 Toward More Insight

William H. Whyte identified a frustrating and problematic issue when interviewing informants about spatial preference and needs. He discovered the spaces people claim to like best during questioning was frequently similar to descriptions of spaces informants avoided (Whyte 1980). This is not to say that researchers cannot trust informant's answers, but rather that we need to learn about people's daily lives and routines in a more thorough way than simply asking for a preference. The following is a hypothetical example: if interview patterns revealed a high preference for community gardening, yet no one in the neighborhood has time or interest in weekly maintenance responsibilities, who would tend the garden? Although a community garden could seem appealing for site programming, it may not match what the informants reveal as most applicable to their lives. In Design for Ecological Democracy, Hester encourages the use of participatory design, but acknowledges it is sometimes ineffective in determining user's values and everyday behavioral patterns (Hester 2006).

2.4 Toward More Inclusion

In our experience, during participatory processes co-organized with a client or community partner, landscape architects typically defer to the partner to invite community members to meetings and workshops, or to decide how participants will be recruited. Our partners usually represent some codification of power in the community, whether as an individual leader, organized community group, or incorporated non-profit organization. Others in landscape architecture have documented the power dynamics of client-consultant-public relationships within participatory practice and the inherent conflicts in this dynamic (Juarez and Brown 2008). Ethically, we must tread a fine line: respect our partner's authority while also gently questioning the partner's notion of "who belongs" in the decision-making and design process.

Marginalized groups can be described as "…those with the least power in society who historically have been disproportionately adversely affected by planning policies or left out of development activities" (Juarez and Brown 2008, 190). Landscape architecture literature has documented historic and on-going marginalization of racial minorities in open space planning (Lawson 2007). However, many identity characteristics may lead to marginalization. These include race, ethnicity, socio-economic status, age, disability, and gender, as well as other factors. What is meant by "marginalized" is defined at the start of each participatory example in this paper.

Ethnographic research is different than participatory design because it focuses more deeply on people's values, behavioral patterns, and culture. Landscape architecture, as a discipline, has borrowed and adapted many research approaches and methods from social sciences and humanities in order to study place, understand community, and design in response to human needs (Deming and Swaffield, 2011). The mixed methods approaches of ethnography are broadly recognized as applicable to landscape architectural inquiry (Deming and Swaffield, 2011), but still under-utilized in practice.

Ethnography is "writing about the culture of groups of people" (LeCompte and J. Schensul, 1999b, p. 21). In this sense, culture is the ritualistic patterns of individuals in a community determined by the attitudes, behaviors, beliefs, social arrangements, and norms expressed or observed. Ethnography assumes the researcher as the primary tool of investigation and documentation. Applied ethnography focuses on problems the researcher and stakeholders identify as important in the natural setting where research is being conducted. Therefore, ethnographic research is locally specific. It typically involves primary interaction with participants, uses multiple data sources, uses culture as a filter for interpretation, and offers researchers an accurate reflection of participant's perspectives and behaviors (LeCompte and J. Schensul, 1999b).

2.5 Context

Recently, we used an adapted ethnographic approach in the design process for a temporary park on private, downtown property in a Midwestern city of less than half million residents. Our primary partner was a not-for-profit development corporation working in cooperation with a private property owner. Through careful content analysis of a series of resident interviews, one student advanced the residents' desires, which initially seemed at odds with the property owner's desires (Glastetter, 2015), and the park was recently constructed.

Another student expanded the scope of the project to adjacent public streetscapes. She used digital tools in methods combining participant-observation and interviewing; first video-recording her own experiences and then the experiences of bicyclists on the city's downtown streets near the park site (DeOrsey 2015). The resulting streetscape recommendations are a value-added, rather than a requested or expected, deliverable to the community partner. Those interested in downtown development now have many, first person accounts leading to an interpretation of how cycling on the main thoroughfare could be improved from existing conditions.

In both examples, the students and faculty respectfully questioned who should be included in participatory processes. In the temporary park site design example, downtown residents were not originally included in park planning, as the park was at first imagined to serve professionals working downtown. In the cycling infrastructure example, cyclists were not originally included in discussion of the temporary park's audience and the city's bicycle plan does not address infrastructure along the main street where the temporary park was planned.

The chief value of adapting ethnographer's methods to landscape architecture practice is that ethnography's intent of providing a place-based understanding of culture or sub-culture reminds us to broaden the groups whose input is sampled (and provides a structure for doing so) and to rigorously analyze that input before interpreting its meaning for design. This paper offers a working definition of adapted ethnography for landscape architecture and presents the methods and used in two graduate student-led, participatory projects.

3. WORKING DEFINITION OF ADAPTED ETHNOGRAPHY

3.1 Drawing from Ethnographic Worldviews

In adapting ethnographic research, we employ an interpretivist worldview, acknowledging that cultural beliefs and meaning about a place or landscape are “socially constructed, situated…to a specific context, not fixed, negotiated, multiply-voiced, [and] participatory” (LeCompte and J. Schensul, 1999b, p. 50). Although we cannot claim to be ethnographers, we appreciate ethnographer’s questioning of the “…positivist orientation of the so called objective neutral investigator” and tendency toward “…accepting and analyzing our own human subjectivity in [the study] process (Whitehead, 2005, p. 7).

Depending upon context and situation, we may also employ a critical theory worldview. Critical theory in the field of ethnography calls for a focus upon community diversity and how power shapes inequalities (LeCompte and J. Schensul, 1999, p. 46). Hester’s call for “empowering people to represent themselves” (2008, p. 97) seems to call for an activist orientation. Both an interpretivist or critical theory worldview may lead to action, but according to ethnographers Margaret LeCompte and Jean Schensul (1999b), the critical theory worldview demands that the researcher aim “ to bring about change in equitable distributions of power, cultural assets, and other resources” (p. 45).

3.2. Adapted Ethnographic Approaches

Observational and interview approaches are “classic techniques” of ethnography (Whitehead, 2005, 9). Observational approaches, whether of human behavior or site conditions and artifacts, are not new to landscape architects. We commonly use observational mapping techniques pioneered by sociologists such as William H. Whyte (2001) and site analysis techniques codified by Kevin Lynch and Gary Hack (1984) and expanded by many others. However, rigorous interview approaches that explore meaning at individual and collective levels are less common in participatory design. More common practices include community workshops and charrettes emphasizing consensus, where individual, dissenting voices may not be recorded, if they speak up at all.

When interview techniques are used in participatory design, they usually include only shallow analysis of results. The recursive content analysis techniques of ethnography reveal contradictions, ambiguities, and allow for holistic reflection upon both verbal and non-verbal cues—ultimately painting a more complete picture of how the interviewee feels about the place and design program in question.

Ethnographers and other researchers engaged in narrative research (the recording and analysis of stories) will often use interview methods on the premise that, “the individual person is an important source of knowledge” (Kim, 2016, p.157). Anonymous, individual interviews (as opposed to focus groups or collective charrette processes) allow participants the protection to speak freely without fear of losing status within the group. Considering that a portion of any human group may consider themselves to be introverts, it is meaningful that individual interviews also foster participation from people who are less likely to contribute their ideas, thoughts, and stories in a group context. Specific methods we have used for interviewing and content analysis are discussed in the following section, containing two examples of adapted ethnography.

Examples discussed in this paper use sample sizes of five to six participants. Using adapted ethnography may superficially appear to be in conflict with sociological participatory approaches such as large-scale surveys. However, according to Jeong-Hee Kim (2016), an education researcher and expert in narrative research, decisions of approach and methods is not a numbers game, but a question of “appropriateness of data” (p.161). A narrative, interview based approach is needed if the goal is in-depth understanding of individuals’ lived experiences (Kim, 2016; Whitehead, 2005). Kim (2016) recommends that sample size should be a result of time and resources available, and the point at which redundancy of themes arises in the data sample may help determine a minimum sample size.

Unlike many other disciplines using survey methods, ethnographers have a history of using qualitative, narrative approaches as a critical step to generate formative theory before later developing focused tools for large scale, quantitative studies (S. Schensul et al., 1999). Landscape architects can learn from this process of first generating formative theory, grounded in careful (and local) narrative study and analysis, before developing structured, quantitative surveys. Both projects featured here include a combination of approaches and methods; neither include large-scale surveys.

Adapting ethnographic research methods to landscape architecture calls for a caveat: in projects lasting a year or less, we cannot produce a true ethnography. Developing such a narrative is a deep and long term endeavor, often occupying the majority of an ethnographer’s career. Thus to adapt ethnographic methods for use during a relatively short period of time, the researcher must limit the inquiry to a specific "lens" or particular question (LeCompte and J. Schensul, 1999b, p. 4). For our purposes, the community design dilemma is the lens through which we use adapted ethnography to bring marginalized voices into the discourse. Therefore, our working definition of adapted ethnography for landscape architecture practice is the use of ethnographic methods within a time-limited project scope circumscribed by the planning and design needs of the community partner and stakeholders. Further, while true ethnography may have a goal of understanding people and place for their own sake, adapted ethnography for landscape architecture is an applied endeavor intended to yield the most insightful and inclusive participatory design process for a particular dilemma.

4 BACKGROUND ON THE POP-UP PARK

The urban site that would become the Pop-Up Park in downtown Wichita, Kansas was an eyesore: a fifteen foot pit left after a downtown building was demolished and the developer's plans stalled during the economic downturn of 2008. Wichitans referred to the site, located prominently on downtown's main street as "the Hole." A group of five landscape architecture graduate students and their faculty advisor teamed with the Wichita Downtown Development Corporation (WDDC) and the private property owner to create a temporary park on the derelict site.

The purpose of this temporary landscape is to attract people to an under-utilized part of downtown and provide needed amenities to downtown residents and workers. The initial program from the WDDC and property owner was thoughtful: a flexible use space that could be used as a food truck park and event space. As the students developed a typology of temporary landscapes, they termed the Pop-Up Park an "interim" landscape (Fox, 2015). The site owner eventually plans to develop an office building on site. When this occurs, the WDDC plans to relocate the Pop-Up Park amenities to another downtown site (Holt, 2015).

Though the property is privately owned, the park was funded through a Knight Foundation Fund grant with the purpose of creating an amenity for public use. The not-for-profit WDDC served as project manager for the park's development. City agencies such as parks and recreation are involved in maintaining the park. The park's temporary and public-private nature made engagement with downtown residents and evaluation of downtown conditions vital. Dialogue with area residents allows the park to serve current needs while transparently disclosing that the park will be relocated to another temporary site when the site owner chooses to redevelop the property.

5 EXAMPLE ONE: CONTRIBUTING TO A SITE PLAN AND DESIGN-BUILD FEATURES FOR THE POP-UP PARK

As part of the temporary landscape's planning process, the graduate students and faculty advisor helped the WDDC plan and facilitate a stakeholder charrette. Student and faculty input guided the charrette process and broadened the type of stakeholders invited to participate. In a city where less than one half of a percent of the population lives in the downtown core, these residents are often left out of planning processes, leading us to consider them a marginalized group. Building from an initial convenience sample of contacts provided by the faculty advisor, graduate student Abigail Glastetter developed a snowball sample of six residents who live and work downtown to interview in order to determine how the park might satisfy their needs. Glastetter conducted anonymous, in-depth interviews with these downtown residents, visually representing their needs, wishes, and perceptions of downtown through imaginative photo-montage. She and her peers eventually helped develop schematic plans and design details from the charrette and interview results, and contributed to several features of the park through a design-build process.

5.1 Site Inventory, Observation and Analysis

Site inventory was key to identifying adjacent building functions, infrastructure, and contextual and social relationships (fig.1). Site inventory and analysis occurred over a period of several days so observations covered a range of times and days of the week. Passive observation allowed documentation of situations or systems at work without disruption of their natural flow. It was crucial to take notes and pictures of the existing site and its setting, events, sequences of transit movement, and human activity around the site.

Figure 1. "The Hole" location on Douglas Avenue. Reproduced by permission of Wichita Downtown Development Corporation.

Observing the existing site and its immediate context over several hours on different days led to an understanding of existing site uses, patterns, social behaviors, events, and contextual influence. Site observations identified types of activity on the street near the site and times of most use. These initial site observations were a form of recursive analysis: cyclical interaction between data and hypothesis, eventually revealing a pattern. Documenting site patterns, events, social behavior, and uses helped Glastetter build a list of potential types of stakeholders.

5.2 Stakeholder Design Charrette

In mid-January 2015, during most of a Friday afternoon, a design charrette was conducted at the WDDC storefront in downtown Wichita to discuss opportunities for a Pop-Up Park design on Douglas Avenue. The WDDC invited city agency, private foundation, and business owner stakeholders to the charrette. The university team also invited three area residents to attend. Participants first walked to the nearby site, then returned to the storefront for charrette.

Facilitators used a list of verbal prompts during small group discussion at the charrette. The prompts were intended to encourage reflection upon the value and impact the temporary park could have on the entire downtown district. These prompts were also used to remind group members the installation will only be at the Douglas Avenue location for a maximum of five years; therefore, they needed to consider how site programming and furnishing can remain adaptable and durable for relocation. Examples of these prompts are listed below:

Do you interact with downtown Wichita routinely?
What portions of downtown do you frequent most?
What brings you to downtown Wichita most often? How do you get there?
How far do you typically walk when exploring downtown?
Is there any one amenity or quality of downtown you feel is lacking?
Did you feel safe in/around the site?
Can you think of ways the site could be used now, which could also easily be translated to another site in the future?

Next, charrette groups developed schematic site plans and details. Groups were asked to propose materials, furnishings, conceptual artwork, and program elements in their site plans. Each small group contained a mix of design and construction professionals, students, and downtown stakeholders. Each group managed its own process, with students actively listening and testing ideas by drawing with team members. Once completed, each small group presented their schematic design concept to the entire room for feedback. All three groups were given fifteen minutes to explain and take comments or questions from the audience.

5.3 Adapted Ethnographic Method: In-Depth Interviews

Because just a few downtown residents were present at the design charrette, Glastetter next conducted a series of one-on-one, in-depth interviews with nearby residents. In-depth interviewing allows "exploration of any and all facets of a topic in detail" (LeCompte and J. Schensul, 1999b, 121).

Potential participants were identified through a snowball sample based upon an initial convenience sample provided by the faculty advisor. Participants were then selected based on their residential proximity to the site, demographic diversity, and lifestyle diversity. The sample of six residents included two individuals with low socio-economic status, a single parent, and one individual living with disability.

The six participants were interviewed to gain a deeper understanding of the needs and wishes related to landscape characteristics and amenities for people who live and work in the sub-district around the derelict site. This small sample size is a reflection of the time limitations of a graduate master's project, as thorough textual analysis of interviews is time-consuming. However, at the sample size of six residents, Glastetter did find redundancy of themes, an indication of adequate sample size (Kim 2016).

Following standard human subjects research protocols, Glastetter informed interviewees of the research intent and purpose prior to beginning questioning, obtaining each person's consent to be part of the study. All participants were asked to choose a pseudonym to encourage openness in their narrative. Bio-sketches of each participant reveal lifestyle diversity of the sample. Although demographic diversity was a factor in sample selection, bio-sketches published in project documentation do not associate demographic characteristics with a particular individual, so as to avoid deductive disclosure of identity.

The interviews were flexible and semi-structured with a clearly defined goal to determine participant's values and behavioral patterns in relation to living and working downtown. Participants were encouraged to lead the interviews and direct conversation. This form of interviewing offered participants the discretion to decide how to respond to prompts, not bounded by suggestive alternatives or constrained by response length.

Interviews were intended to discover how the Douglas Avenue Pop-Up Park could be integrated into local stakeholder's routines and daily needs. Glastetter analyzed informant's narratives to identify patterns and themes, rather than specific answers. This approach means that she used a broad to narrow exploration technique during questioning. Therefore, informants were questioned about their relationship to downtown as a whole. It was critical to understand how and when informants would, or could, use the reinvented space. This was important to note before asking informants specific questions about site design.

A flexible question framework was used during the interviews as an outline tool to help elicit stakeholders' daily routine and priorities. The main categories of this framework and an example question from each category is included below (full list of questions not shown for sake of brevity):

Spatial Preferences: Do you have fond memories that you feel could be credited to a specific place?
Routine Interaction with Downtown: What does a daily commute look like to you?
Identity and Place Attachment: Do you think Wichita has an identity…what about downtown?
Walkability: Are active modes of transit a possibility for you (safety, distance)?
Natural Space: What is the furthest distance you would travel to reach a green space?
Routine Interaction with the proposed Pop-Up Park site: During what hours and days do you routinely interact or have potential for interaction with the site?

Although no specific time length was specified, all interviews lasted between one and two hours. This was plenty of time to allow the participants to lead the interviews into the direction of their choosing and to focus upon portions they felt most relevant. All interviews were audio recorded and simultaneously noted by hand. Glastetter took notes during the interviews to document changes or variations in tone, physical posture, and noteworthy response lapses. These notes were useful in determining portions of the interview during which participants seemed to show the most non-verbal emotion and emphasis.

5.4 Adapted Ethnographic Method: Interview Coding and Analysis

Data from interviews were organized and analyzed using a system of coding. "Codes are names or symbols used to stand for a group of similar items, ideas, or phenomena that the researcher has noticed in his or her data set" (LeCompte and J. Schensul, 1999a, p. 55). Coding helped categorize ideas, themes, units, patterns, and structures within the transcript. At the most basic level, coding is a way of organizing data in the form of a framework that researchers can understand and interpret. Interview coding took shape as a thorough noting process. Once the interviews were complete, Glastetter methodically listened to the audio recordings several times to document what prompts were used and the participant's answers. Glastetter spent a minimum of six hours the first time listening to an interview. She listened to each interview a minimum of two times. Each time a different color text was used to add notes. These notes were then combined with the hand-written notes taken during the interview. With all notes combined, Glastetter could begin to draw conclusions about themes and patterns based on the participant's verbal and non-verbal responses. Themes are ideas or thoughts participants continuously discussed.

Glastetter used both a deductive and inductive process of analysis to code interview data. Deductive analysis was used during the division of data into piles with similar concepts; as well as when she assigned a number of codes and highlighted text according to their congruity. Themes were identified by the number of times an idea was discussed and the emphasis placed on the topic. Themes were determined when a topic was narrated repeatedly with emphasis. For example, if an idea was discussed with little prompt during interviews and was habitually mentioned with obvious interest, the idea was labeled a theme. Inductive analysis occurred through comparison of recurrence and emphasis between individual's themes to determine hierarchy. Recurring themes were prioritized as findings.

5.5 Findings and Design Implications

Recurring (redundant) themes from the interviews were: identity crisis of downtown, outdoor preference for vegetation, lack of residential amenities downtown, a perceived negativity in the community toward cycling and public transit, a distinct downtown lifestyle, Wichita identified as a place for families, and lack of nighttime activities in the area of the proposed Pop-Up Park site. Glastetter created photo-montage perspectives reflective of themes in individual participant's interviews (fig. 2). The photo-montages illustrate idealized ways the participant's responses could be interpreted at the site scale. Glastetter used the montages as a visionary, rather than pragmatic exercise. Participant's quotes are used as labels for the design programming ideas. Quotes were taken directly from the interview's audio recording.

Figure 2. Photo-montage visualizing the idealized park of participant "Pablo". Image by authors.

Using the recurring interview themes, Glastetter reevaluated the WDDC's initial Pop-Up Park plan resulting from the community charrette and proposed a revised site plan. By bringing downtown residents into the discourse (it initially included only property developers, city agencies, and young professionals), Glastetter revealed differences between what nine-to-five employees would like the site to be and what those who live downtown desire for the site. For example, although public transit and cycling were not addressed during the charrette, three interviewees focused upon these issues. Through careful content analysis of a series of resident interviews, Glastetter advanced the recurring residents' desires (green space, inspirational art and furnishings, creative night lighting) in harmony with the property developer's desires (low maintenance, clearly removable and temporary) and the needs of downtown employees (food trucks, a place to eat lunch).

Although not all elements of the revised site plan were implemented, concepts from the interviews that occur in the now built, temporary park are the need for green vegetation in the space, the need for unique and site furnishings, the need for nighttime uses, and the need to give the park an iconic identity that resonates with Wichitans (fig.3). Another student in the master's report group built upon a recurring theme in the interview's by following up on the residents' desire for iconic art (Mercado 2015; fig.3). Other students proposed how the site could interface with future pedestrian and cycling improvements downtown, and proposed future locations for the Pop-up Park (DeOrsey 2015, Holt 2015). Serendipitously, but not as a result of the design process, an improved bus stop has been added by the City, adjacent to the site.

Figure 3. Installation of student designed and fabricated art and site furnishings in the Pop-Up Park. Reproduced by permission of Chip Winslow.

5.6 Limitations

Time limited Glastetter's sample size for interviews. With additional time, she would have continued to expand the snowball sample of interviews to more diverse participants and lifestyles. A longer project timeline would have allowed for more iterative feedback on montages and site plans. Ideally, with more time, she would have continued the feedback loop: asking participants to provide feedback upon the imaginative photo-montages, further refining a schematic site plan based upon their feedback, and later obtaining post-occupancy feedback.

Site construction was dependent upon availability of fill dirt from another project. The Pop-Up Park implementation was postponed several weeks due to the slow progress on development excavation providing fill. The construction delay inhibited Glastetter from studying the park post-occupancy, which would have offered further information as to whether the park's design does or does not meet the needs of nearby residents.

6 EXAMPLE TWO: CYCLIST PERCEPTIONS OF DOWNTOWN STREETS ADJACENT TO THE POP-UP PARK

The urban design of Wichita, Kansas, like many other mid-sized, American cities, currently prioritizes the car over the pedestrian or cyclist. At present, pedestrians and cyclists combined make up less than two percent of the transit mode share in the city (City of Wichita 2013). Although it may sound strange to consider cyclists a marginalized group, in this Midwestern, auto-dominated city, cyclists are routinely left out of downtown redevelopment project planning. As the interview process confirmed, cyclists feel extremely marginalized downtown and are even subject to harassment by motorists.

Although cyclists are seldom consulted on individual redevelopment projects, the City of Wichita recently completed a Bicycle Master Plan with broad input from citizens across the city. But unfortunately, the current plans for Douglas Avenue, the major downtown thoroughfare which fronts the Pop-Up park, includes only signage, rather than infrastructure, in the form of shared lane symbols (City of Wichita 2013). Douglas Avenue is a missed opportunity and needs a re-envisioned strategy based upon input from a marginalized group: those who bicycle Douglas Avenue on a regular basis.

Recognizing that an implicit need in the WDDC's goal of enlivening the area around the Pop-Up Park is enhanced walkability and bike connectivity to the park, graduate student Danielle DeOrsey chose to study cyclists' experiences. She hypothesized that better understanding the lived biking experience of Downtown Wichita would help her to develop design recommendations that address current streetscape issues as they occur in daily life. Her exploratory study documents the experiences of a small group of people who bicycle in or through downtown Wichita on a regular basis, with a focus upon experiences near the Pop-Up Park site.

6.1 Adapted Ethnographic Method: Documentation of participants' bike rides

DeOrsey recruited a participant sample of five cyclists based upon a combination of convenience contacts that snowballed to recruitment through a Wichita bicycle advocacy group. To be selected for the study, participants had to be regular cyclists downtown with a willingness to record their cycling experiences during the cold weather months of February and March, due to the project timeline. Although she is not a regular cyclist in downtown Wichita, DeOrsey recorded her own riding experience to help her better understand the conditions her participants experience. Thus DeOrsey's study included a first person (her own) account of cycling in the downtown, as well as five participants accounts.

For the safety of the five participants, DeOrsey asked that they follow their typical, familiar ride routes. Also for safety, participants were not asked to respond to any scripted questions or issues, but rather to simply vocalize their own stream-of-consciousness already occurring during the ride. In this first step of the research, participants recorded their experience visually and verbally by using GoPro cameras during a typical bike ride. DeOrsey followed accepted human subject research protocols of informed consent and protection of participants' identity. Each participant was asked to choose a pseudonym.

6.2 Adapted Ethnographic Method: follow-up interviews while viewing the ride video

Next, each participant reviewed their video in real time with DeOrsey, clarifying their comments and the overall experience. Partly for convenience (no further travel to Wichita was required by the researcher) and partly for documentation, DeOrsey used video-conferencing software to "share screen" a video of the participants ride, while audio and video-recording the participants on-going reflections during the interview (fig.4).

While the initial bike ride documented an unstructured experience (no prompts were given to participants), the follow-up interviews were semi-structured by a series of verbal prompts, as well as the shared viewing of the participant's video document. DeOrsey used the following prompts in the interviews: *What would you change about the biking experience in Downtown Wichita? What would have made your ride a better experience? What made you feel safe/unsafe? What do you enjoy the most about your route? What are your least favorite parts of your route?*

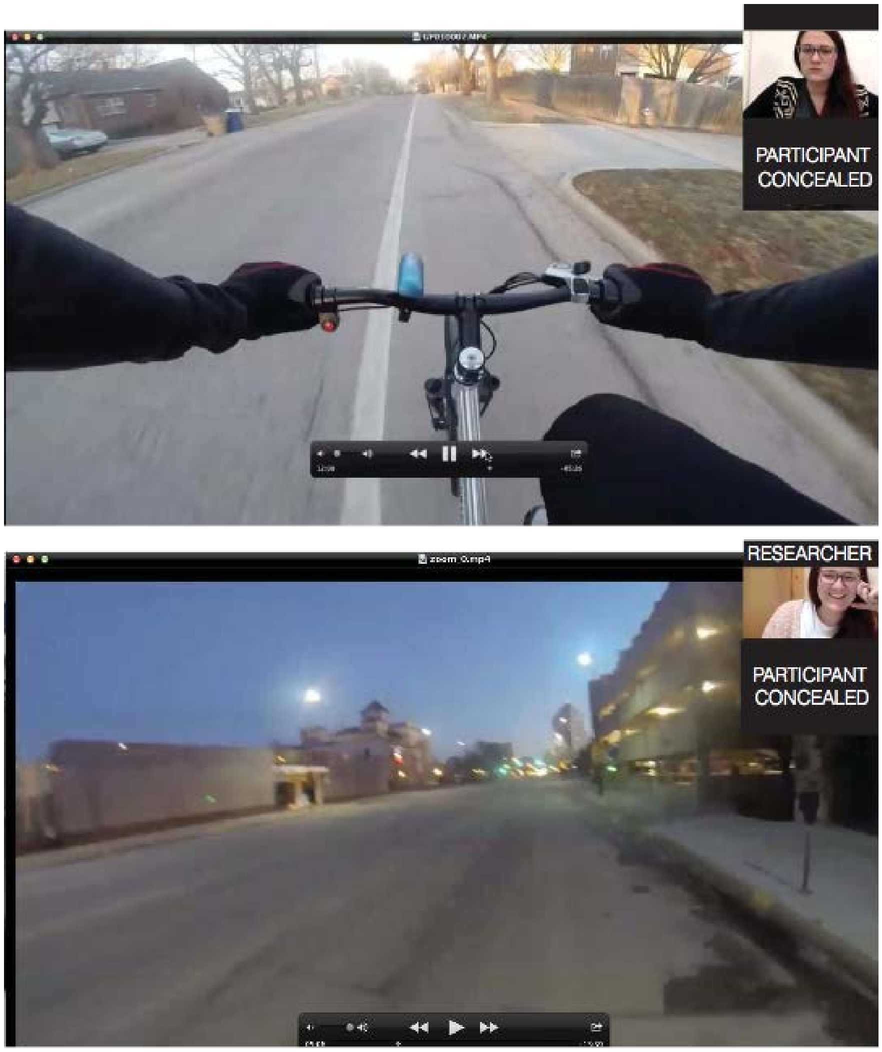

Figure 4. Examples of follow-up interviews while viewing ride footage with video-conferencing software. Image by authors.

6.3 Adapted Ethnographic Method: Content Coding and Analysis

Thematic coding techniques were used for content analysis of the video and sound data. Data collected from experiential bike rides and follow-up interviews was transcribed and coded based upon themes that appeared. Themes were identified based on the number of times the concept was mentioned and the emphasis placed on certain comments during the bike ride studies and follow-up interview reflections.

6.4 Adapted Ethnographic Method: spatial mapping of data points and classification of bicyclist comments

The initial coding analysis was then spatially mapped to determine where comments were elicited during participants' rides. Data points were geo-referenced. Next, these mapped data points were classified by value and theme. Experiential data from participants was divided into three value categories of negative, neutral, and positive comments. The categorization of comments was based on each individual's language pattern, assigned a value interpretation. Areas with the highest density of negative experience data points dictated potential focus areas where the streetscape should be improved for cyclists. An in-depth look at what was being said occurred for the densest areas of negative comments.

Negative comment clusters were initially identified based upon their overall density of comments. Once identified, the points were then cross-referenced with the actual comments from the participants.

The mapped data was also coded by subject matter. This process was used to determine focus areas with the most useful comments and issues presented by the participants.

DeOrsey also used a comic book-like montage graphic process to visually correlate the verbal comments made by the participants to their actual physical experience recorded via GoPro. The comic strips (fig.5) use a series of image frames that were extracted directly from each participant's bike ride data to develop a montage in order to understand this data. This process helped to highlight the most important physical aspects of each participant's route in a sequential format and was paired with direct quotes from both the bike rides and follow-up interviews. Comments made during the participant's bike ride are illustrated with a quote bubble and comments made during the follow-up interviews are illustrated with text boxes.

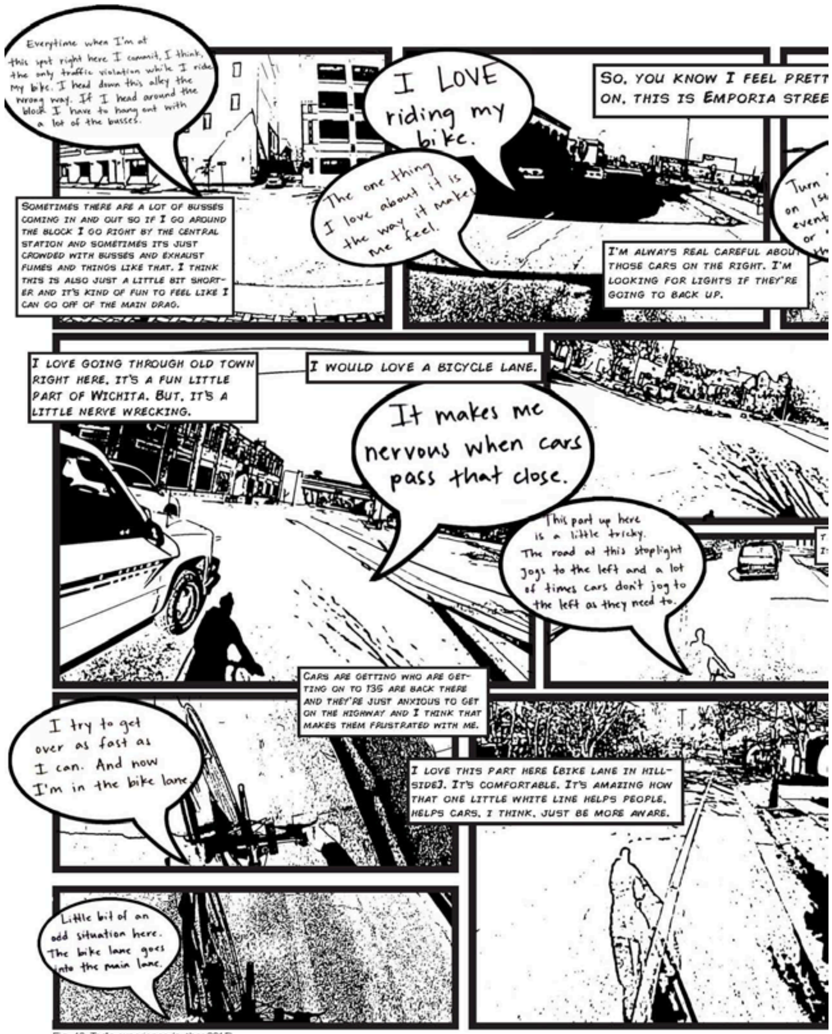

Figure 5. Excerpt from a comic-inspired visual interpretation of individual participant's ride and interview themes. Image by authors.

6.5 Findings and Design Implications

Five major negative comment themes emerged during the initial coding process: problems with the urban environment, biking experience/ infrastructure, road/traffic, safety, and motorist behavior. These themes emerged during initial analysis of the video-recordings and analysis of follow up interview results. Mapping of comments revealed negative comment clusters were focused around intersections, showing the need for further design development of intersection layout and overall strategies to increase safety in those critical areas. DeOrsey developed recommendations based upon the comments within these themes. Final design strategies for two selected areas near the Pop-Up Park were grounded in analysis of participant experiences and streetscape design best practices.

Bicyclists of Wichita are faced with many stressful situations during their daily routes. DeOrsey learned that while each participant was unique, they wanted the same things: safety, a pleasurable ride, and to be respected by motorists. Not all bicyclists' needs can be answered through design; some require a cultural change of attitudes toward bicycling. Although this finding is not specific to the streetscape design near the Pop-Up Park, it is nonetheless valuable information for the WDDC as they continue to influence and promote downtown redevelopment.

6.6 Limitations

Time and seasonality were major limitations for the cyclist study. The timing of the studies fell during a fairly cold winter, which reduced the potential participants who were biking on a regular basis and who were willing to participate. With more time, DeOrsey would have asked more cyclists to record their experiences by expanding the snowball sample. She also would have sought a more diverse sample of cyclists. All of the participants are bike commuters or rely on biking as primary mode of transportation. The five participants are a part of very small sub-culture in downtown Wichita—those that are most comfortable cycling in Wichita. DeOrsey's study did not include recreational cyclists, children, or older adults.

With a longer project timeline, DeOrsey would have engaged in a group process including the City of Wichita bicycle coordinator, the WDDC, and the study participants to evaluate the streetscape design proposals and to generate interest in considering further enhancement of Douglas Avenue for cyclists.

Lack of participant familiarity with the GoPro technology was a minor problem. While DeOrsey supplied each participant with a full battery and an explanation on how to use the camera, user error caused a loss of two potential participants' data.

7 DISCUSSION

Group meetings for community projects, like workshops and charrettes, can yield important results, especially in allowing people to learn "who [their] neighbors are" (Hester 1989, 74). Some even assert "…group sharing may be essential in an empowering process" since in group settings people learn to negotiate the design process (Juarez and Brown 2008, 193). However, marginalized voices are often suppressed during group meetings, if those at the margins are invited at all. One-on-one interactions, especially when the participant knows their identity will be protected, can lead to candid responses, without compromising the participant's status within the group. As demonstrated in both example studies, adapted ethnographic methods allow designers to observe how people really use and feel about places, and are well-suited for one-on-one interactions with stakeholders.

Both examples presented here included a combination of group and individual processes, beginning with a group charrette for the Pop-Up Park site and then focusing on specific, marginalized populations: in one case a diverse sample of nearby downtown residents, and in the other case, people who use bicycling as their primary mode of transportation. Moving toward individual interviews allowed the researchers to prioritize input that might have been disregarded in a group setting.

When contrasted to group processes commonly used in participatory design, the interview process and rigorous content analysis of adapted ethnography may be criticized as too time-consuming. Landscape architects and other participatory design consultants may not wish to invest the time needed to conduct such thorough analysis of stakeholder input. We contend there is little point in collecting community input without rigorous analysis, as shallow analysis leaves the professional vulnerable to her own misperceptions and biases regarding what actually occurred, was said, or is desired. If landscape architects and their clients desire transformative participatory processes, it is necessary to invest time in analyzing community input and dialogue. Rigorous content analysis of input provided by those in the Pop-Up Park design study revealed the significance of nighttime activities and green vegetation to those living (not just working) downtown. Spatially mapping the content analysis of cyclist experiences in the streetscape design study revealed specific intersections near the Pop-Up Park that need redesign in order to safely include cyclists in the roadway.

The time constraints of student work are similar to constraints on participatory design projects in practice; thus understanding the value and limitations of a small sample is key. The value of open-ended, in-depth interviews lies in the possibility of interpreting a deep narrative about people and place. The limitation of using a small sample size to meet time constraint is that the resulting interpretation has only local relevance for design application. However, local relevance is most needed in site specific design decisions.

Adopting the ethnographer's worldview encourages the landscape architect to follow the ethnographer's frank advice for decision-making when power conflicts arise: rather than assuming that the dominant voice (e.g. client) is always right, "…attempt to promote a dialogue by means of the research project or during review of research results; strategize ways to do the most good—or the least harm—for all…" (LeCompte and Schensul, 1999, p. 48). Ethnographic worldviews require that the landscape architect return again and again to the question 'Whose meaning?' is codified through site design.

7.1 Limitations of the Adapted Ethnography Examples and Directions for Future Research

The benefit of adapted ethnography is that it gives us first-person accounts of a place and of people's needs. However, short term use of ethnographic approaches also has limitations. In order to respect the disciplinary differences between landscape architecture and ethnography, we must return to an operationalized definition of adapted ethnography: in the two examples presented, we have focused upon a physical settings and a certain scope of needs (seeing culture through the 'lens' of site design), rather than investigating the entire cultural system of a place.

In both example studies, time limitations precluded recursive feedback from participants on research interpretation and design proposals in progress. Especially because both student researchers used imaginative means of visualizing the interpreted data, participant review of interview interpretation and its translation to design would have been a valuable addition to both studies. Further use of and reflection upon adapted ethnography in participatory design is needed in order to develop strategies for optimizing the amount of time spent in gathering and interpreting data, portraying findings for iterative feedback, and applying findings to design.

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USING SoTL IN UNIVERSITY FACULTY PERFORMANCE EVALUATIONS

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1 ABSTRACT

Colleges of Agriculture have become increasingly diverse assemblages of both traditional academic units and less traditional professional programs. As a result, differences in academic training, skills set development, and classroom assignments among faculty in these colleges, have made faculty performance evaluations increasingly difficult. This fact, along with greater expectations relating to external funding and peer-review publications, is creating unbalance in scholarly academic pursuits.

This paper examines the findings of a consultancy project designed to learn how universities currently define teaching as “scholarship”. The purpose was two-fold: 1) to bring greater balance in, and inclusiveness to, the standards and criteria used to evaluate teaching, research, and outreach work in faculty performance reviews; and 2) to re-establish the significance of teaching to its central role as a “scholarly activity” in university affairs. To this end, interviews with eleven associate or assistant deans at ten Land Grant Universities, Colleges of Agriculture revealed a broad array of strategies used to improve teaching as a scholarly endeavor. This paper reviews the current teaching evaluation methods in place or being considered at these schools; existing or new standards and criteria being used to define the scholarship of teaching and learning through concepts like SoTL and emerging theories in educational psychology; and teaching enhancement strategies in use or proposed by college administrators to improve individual faculty teaching performance. The paper concludes with suggestions for units of design within academia that would facilitate this rebalancing effort and thereby, improve the outcomes of performance reviews for faculty of design.

1.1 Keywords

Teaching, scholarship, higher education, faculty performance evaluations, design arts

2 INTRODUCTION

Michigan State University was founded in 1855 as the state's land-grant university with the mission to advance knowledge and transform lives through education, research, and community outreach (Board of Trustees 2008). As such, the university charges every faculty member to undertake "scholarly" work that advances the lives of Michiganders (and at a greater scale, global citizens) through the "creation of knowledge". Scholarship, in this sense, is directly tied to the mission statement. How individual faculty members interpret, operationalize, and prioritize their work responsibilities, however, is dependent on two factors: 1) their contractual obligations (in percentages of teaching, research, and outreach); and 2) the effectiveness with which they achieve scholarship in their work. These two factors often serve as the baseline for determining faculty performance for considerations of merit, promotion and tenure.

The current evaluation of faculty performance, therefore, should include consideration of all three major work responsibilities of faculty (i.e., teaching, research, and outreach). Over the years, however, the notion of "scholarship" has become increasingly tied to research activities and increasingly removed from work surrounding teaching and outreach. This is due, in part, to the widespread practice of peer review and the presentation of research ideas among the community of scholars that comprise academe. Teaching and outreach, on the other hand, has increasingly assumed more technical and/or generic roles, independent of the academic community and its peer review processes. Such a separation has reduced the roles of these two activities to something that faculty perform as an obligation of employment (Shulman 1995). This artificial dichotomy of faculty work has led to significant problems in faculty performance review, a process that ultimately affects annual, competitive merit increases (unit level); decisions affecting reappointment, tenure, and promotion (college level); and award/ recognitions (university level).

In the early 1990's, scholars of pedagogy like Boyer (1990) began to challenge inequities in university practices that separated academic responsibilities into "scholarly" and "non-scholarly" pursuits. Increasingly, new discourse within universities has considered teaching (and to a lesser extent, outreach) as one facet of a broadly conceived idea of "scholarship" (Weiser 1996). The caveat is that both teaching and extension-outreach should be subject to a set of rigorous professional standards that are similar in function to research standards—i.e., peer-reviewed articles, grantsmanship, and patents. If these standards can be defined and operationalized within a university for both teaching and outreach, then both should weigh in equally with research in decisions about faculty hiring, tenure, and compensation".

With this information in mind, this project was conceived with the intent to answer several questions relating to university practices surrounding teaching performance evaluation in Land Grant Colleges of Agriculture in the US (Table 1).

Table 1. Questions used to frame the research project.

What do we want to find out?

a. Do they currently have teaching performance standards/criteria for faculty across their college?
    1. How are the standards/criteria set? (Example: by units, by colleges, by the university?)
    2. How is faculty teaching evaluated by these standards/criteria—i.e., the process of evaluation? (example: peer reviewers, unit head annual merit reviews, faculty committee in a unit, college committees)
b. Current satisfaction with teaching performance evaluation (in terms of standards/criteria, process, outcomes, etc.)
    1. Likelihood of change; likely timeframe for change (if appropriate)
    2. Possible strategies for improvement
c. Characteristics of this college that are unique from other land grant colleges?

Why is this information important and how will it be used?

a. Current evaluation of faculty performance includes teaching performance as one of three major work responsibilities of faculty (the other two include research and service)
    1. Used in annual, competitive merit reviews within units
    2. Used in decisions affecting reappointment, tenure, and promotion within colleges
    3. Used in university and other professional award recognitions
b. Social justice demands that transparent and equitable guidelines for faculty in their roles within a multi-disciplinary institution.

c. Nature of a university is to strive to advance sound and reliable measures and means for improving the environmental ambience within which its faculty work.
   1. Improved effectiveness in task performance by faculty
   2. Incubators for improved means and measures that have usefulness to other sectors supported by university research (e.g. teaching performance in secondary and primary school environments; work performance in the private sector; etc.)

Who should we interview and how should we obtain the data?

a. It is proposed that a select number of Colleges of Agriculture and/or Natural Resources within U.S. Land Grant universities serve as the focus of the study.
b. Minimum of ten schools
   1. Similar and dissimilar enrollments
   2. Professional programs and academic programs in same college
   3. Regional considerations (bold are 1st tier recommended)
      a. Big 10 schools: **Wisconsin**, Minnesota, **Purdue**, **Ohio State**, Penn State, **Illinois**
      b. Other Mid-western states: **Iowa State, Kansas State, Colorado State**
      c. West Coast/Southwest: **Oregon State**, **University of Arizona**, **New Mexico State**, Cal Poly San Luis Obispo
      d. South: **Texas A&M**, University of Georgia, **Clemson, U of Florida**
      e. East Coast: **U Mass-Amherst**, Syracuse, U Conn
c. Interview Process
   1. Initial Contact (Telephone) covering: purpose, appropriate contact person, status of current teaching performance standards, criteria & evaluation process, appointment scheduling (telephone or personal interview), existing university documents/policy for college RPT process
   2. Review of Documents/Policy; summary of findings (to be shared prior to interview)
   3. On-site or Skype Interview (Taped? Release form?)
      a. Current understanding of College review process on Teaching Performance
      b. Accuracy of University Policy summary of findings;
      c. Corrections, omissions, & additions to the summary
      d. Anticipated changes in university and college policy and Evaluation practices
         1. Regarding teaching performance standards/criteria
         2. Regarding evaluation process
         3. Post interview summary and review by interviewee, followed by a compilation of all findings on a school by school basis

What will we do with the findings?

a. Products that will be generated
   1. White paper summarizing the findings presented to the CANR Dean, CAC and RPT for review and comment & to the administration after vetting.
   2. Professional, peer-reviewed paper
b. Open a dialogue within the college and the greater university community
   1. Concerning the measures and methods currently used by other universities to evaluate teaching performance
   2. Encouraging the operationalization of those methods most appropriate to the MSU mission of supporting outstanding learning experiences for its students and ultimately in the creation of an informed electorate for Michigan.

These questions helped to frame a study that basically examined three issues: 1) the nature and use of teaching performance standards and criteria; 2) current review processes for evaluating teaching effectiveness; and 3) current satisfaction with review outcomes. In short, it addressed whether teaching currently is considered a "scholarly pursuit" on par with research among faculties in Land Grant universities across the country. To this end, it was intended that the study findings serve as an underpinning in discussions surrounding the "scholarship of teaching" in the College of Agriculture and Natural Resources at Michigan State University and to expand the dialogue on this subject among other Land Grant Universities within NACTA (North American Colleges of Teachers in Agriculture).

3 THE STUDY AND METHODOLOGY

3.1 Materials and Procedure

The research project was submitted for review in summer, 2014, and received IRB approval in early fall, 2015.Two survey instruments were developed for the study. The first instrument was designed to gather baseline information on U.S. Land Grant Universities and their Colleges of Agriculture. The second instrument identified seven sets of questions used in the interview of college deans in the land grant universities selected for the study (Westphal 2015).

For the baseline information, data from the Internet, allowed the research team to identify potential schools around the country for possible participation in the study. The baseline survey was designed to provide a standard set of data on individual universities. Two criteria determined whether a university was selected and profiled. First, all institutions involved in this study had to be Land Grant universities in their respective state. Second, only Colleges with the name “Agriculture” in their title were identified as potential study sites. The baseline survey profiled the size of the university, its location, current enrollment, number of colleges, land grant status in the state, and general information on the “agricultural” college on campus (name, address, telephone number, and characteristics of the college, organization of the Dean’s office and contact information, and college by-laws).

3.2 Participants

Initially, baseline data on a stratified sample of twenty universities was taken that represented Land Grant schools from six regions in the U.S.: Midwest/Great Lakes, West, Southwest, South, Southeast, and Northeast. Considerations of time and travel expenses eventually narrowed the study population to ten schools in the Midwest/Great Lakes, West, and Southwest (Table 2). These included: University of Wisconsin, Purdue University, Ohio State University, University of Illinois, Iowa State University, Kansas State University, Colorado State University, Oregon State University, University of Arizona, and New Mexico State University.

Once schools were identified, additional information specific to university-wide policies and practices addressing standards of faculty performance, student evaluation practices, and promotion, tenure, reappointment and merit were gathered for each institution being considered for selection in the study. In addition to campus-wide policies and practices, specific information on the agricultural colleges (e.g., administrative hierarchy and organization, bylaws, award/recognition practices, teaching excellence centers, etc.) was gathered using websites at these same universities. This was done for two purposes: 1) to facilitate locating the administrators primarily charged with faculty evaluation within each of respective colleges of agriculture; and 2) to prepare the interviewer for the interview process that would follow.

3.3 Procedure

The interview process consisted of three steps: scheduling, on-campus interview, follow-up. Approximately one month to six weeks before an anticipated visit, the office manager listed in the baseline data for the Dean’s Office was contacted by telephone. The ensuing discussion described the purpose of the study and solicited assistance in locating the dean most likely to be responsible for faculty performance evaluation in the college. From the initial telephone call, usually contact with a staff assistant for the appropriate dean followed; review of the dean’s calendar took place and a one-hour interview was scheduled. Information on the location of the dean’s office on campus, a campus map, and exchange of contact information with the staff person was completed as well.

Questions from the interview survey were reviewed prior to visit & used to guide the on-site interview process. In preparation for the interviews, baseline data on the select Land Grant University and its College of Agriculture also were reviewed the night before an on-campus interview, along with notes taken during the initial telephone conversation when the interview was scheduled. University and college statistics (when available); faculty handbook information; college bylaws; university- and college-wide student evaluation practices/policies; and college administration hierarchy (including assigned roles and responsibilities of faculty titled at some level of dean when available) were reviewed.

Notes were taken during the interview process by the researcher. However, no audio recording of the interviews took place. Eleven college administrators at the level of assistant to associate dean participated in the interviews (one school sent two deans to participate in the interview). Materials provided by the interviewee during the interview session (or emailed following the interview) were filed with the school profiles. Other materials gathered prior to the interview and used to inform the interviewer also were added to each school's profile.

Table 2. Profile of the selected Land Grant universities for the research project using Internet data

School	Region	Total Enrollment	College Name	#Units	On-campus Teaching Center
Colorado State	West	25,100	College of Agricultural Sciences	5	Y
Iowa State	Midwest	34,700	College of Agriculture & Life Sciences	15	Y
Kansas State	Midwest	24,700	College of Agriculture	9	Y
New Mexico State	Southwest	18,100	College of Agricultural, Consumer, & Environment Sciences	8	Y
Ohio State University	Midwest	57,500	College of Food, Agriculture, & Environmental Sciences	11	Y
Oregon State University	West	26,200	College of Agriculture Sciences	8	Y
Purdue University	Midwest	39,000	College of Agriculture	10	Y
University of Arizona	Southwest	42,000	College of Agriculture & Life Sciences	13	Y
University of Illinois	Midwest	38,900	College of Agricultural, Consumer, & Environment Sciences	7	Y
University of Wisconsin	Midwest	38,800	College of Agriculture & Life Sciences	18	Y

Pool of 20 Land Grant universities originally profiled for the study included: **Wisconsin, Purdue,** Minnesota, **Kansas State, Oregon State, New Mexico State**, Texas A&M, University of Florida-Gainesville, U Mass-Amherst, Syracuse, Cal Poly San Luis Obispo, **Ohio State, Iowa State, Colorado State,** Univ. of Connecticut**, Univ. of Arizona,** Univ. of Georgia**,** Clemson**,** Penn State**, Univ. of Illinois.** Those in bold type were selected for further study and had their administrators interviewed.

4 DATA AND ANALYSIS

4.1 School Profiles

Ten Land Grant Universities were represented in the study. In terms of regional representation, the schools were primarily in the Midwest, West and Southwest; this was due to limited travel and time resources. Therefore, some limitations in the study findings may exist in terms of generalizing the data to teaching and performance evaluation across in the U.S.

The universities included: Colorado State University, Iowa State University, Kansas State University, New Mexico State University, Ohio State University, Oregon State University, Purdue University, University of Arizona, University of Illinois, and University of Wisconsin. All of these schools had Colleges of Agriculture. Many of the Agricultural Colleges in the study were not composed of the "traditional" disciplines that marked Land Grant Universities of Agriculture and Engineering in the late 1800's and most of the 20th century. Today, only two maintained a composition that would have been easily recognized as Colleges of Agriculture—Kansas State and Purdue. The other eight colleges were combinations of the traditional disciplines found in earlier Colleges of Agriculture, Natural Resources, Home Economics, and/or Natural Science; this phenomenon reflected the internal pressures that many universities are experiencing from reduced state funding or the diminished relevancy of certain subject areas, disciplines, or societal needs. Within the study group, the colleges were composed of 5 to 17 academic units, often encompassing professional schools or accredited programs within their ranks. Agricultural Extension programs and Experiment Stations were viable entities within all ten colleges, although their research and extension emphasis varied widely. All the universities had Centers for Teaching Excellence, but some of the Centers were housed in the Ag Colleges while others were University-wide in their support base.

The associate and assistant deans in this study represented universities that ranged in size from on-campus student enrollments of 57,500 (Ohio State) to 18,100 (New Mexico State); the average student enrollment in 2014 for all ten schools (graduate and undergraduate) was 34,500. Total student enrollment represented in the study was 345, 000.

4.2 Personal Interviews

Eleven faculty administrators at the level of associate or assistant dean were interviewed on their respective campuses during the study; no full deans participated directly in the study. All of the interviewees were in Colleges of Agriculture at Land Grant Universities in the United States and all had at least one professional program among the academic units in their college. Many interviewees held joint appointments as Directors or had Endowed Chairs, and as a group, they held administrative positions within their respective colleges an average of 12.1 years. Only one administrator was employed in his/her current role for less than one year. All interview sessions lasted at least one hour, and most extended to an hour and a half. All deans were interested in receiving the results of the study; one dean was willing to help expand the study to more Colleges of Agriculture through NACTA. Summaries of each interview were made, based on notes of the interviewer; no audio recordings were taken.

The faculty administrators were interviewed to gain insight on the teaching evaluation processes in place in the Colleges, and the teaching evaluation standards and criteria used to evaluate teaching effectiveness and student learning. However, as a benefit of physically visiting the campuses, and personally interviewing these individuals, the researcher was able to broaden the study to include teaching enhancement strategies used by the colleges. Tables 6-8 summarize the data gathered that related to the scholarship of teaching during the interview sessions.

4.3 Teaching Evaluation Methods

A wide-range of teaching evaluation methods (Table 3) exists among the Colleges. To clarify the differences between some evaluative processes, a lexicon of terminology was developed by the author (Appendix A). Only one tool—the summative (i.e., end of semester) Student Evaluation Review (SER) as opposed to the formative (i.e., throughout the semester) —was universally in place among the ten universities. However, summative SERs varied widely across the universities in both name and content. Some universities require that all colleges use the same battery of questions, while other universities identify a group of 2-5 baseline questions relating to course content and teaching performance, followed by additional questions that are tailored to the subject matter, course setting, teaching style, and/or

Table 3. Teaching evaluation methods actively in place, based on interview data.

	Schools									
	Colo. St.	Iowa St.	Kansas St.	N Mex St.	Ohio St.	Oregon St.	Purdue	Arizona	Illinois	Wisconsin
Teaching Evaluation Methods										
Student Evaluations										
Direct 1:1 feedback	x				x	x				
Summative (SER) surveys	s	t	t	s	s	s	s	s	s/t	s
Alumni Feedback (non-anecdotal)	x	x	x		x					
Peer Evaluations of Teaching (PETs)										
Team membership affiliation:										
Unit Senior Faculty	x	x	x	x	x	x	x	x	x	x
CollegeSr Faculty (n/d)										
Univ.mentor committee										x
External Sr Faculty (n/d)										
Classroom visits (frequency):										
One per year	x									
Two or more per year		x	x		x					
One before PT										
Two or more before PT									x	
Unit dependent				x		x				x
Review Team composition:								n/d		
One senior faculty in unit				x			x		x	
Two senior faculty in unit					x					
Three senior faculty in unit										
Department Head	x			x			x			
Unit dependent						x				
Teaching Portfolios	n/d	x	x		x			n/d		
Teaching philosophy statement	n/d	x	x		x			n/d	x	
Other In-class observations	x	x	x	x	x	x	x	x	x	x

Abbreviations:

s-standardized university SER

t-tailored SER

x-present or declared

n/d-no data or data not verified or clear student learning style of the college, unit, and/or subject matter. One would assume (incorrectly) that any specially-tailored questions were tested for validity and reliability by the on-site testing agency charged with the task of summarizing evaluations at the university before administering modified SERs. However, this did not appear to be a universal practice among all the schools in the study. The Center for Innovation in Teaching and Learning (CITL) at the University of Illinois, was the most conscientious in this regard. This was due to its decades' long commitment to proficiency testing, course development, and expanding teaching resources across campus (http://citl.illinois.edu/teaching-resources). Such validity and reliability testing was not practiced consistently among universities in the study.

Some Colleges of Agriculture encouraged formative SERs of student learning and faculty teaching at midpoints during the semester; these primarily were used to test new subject matter or teaching delivery mechanisms in an effort to improve overall teaching effectiveness. All Colleges in the study used "end of the semester", summative surveys of course content, student learning, and faculty teaching performance; these were used for comparative purposes in the evaluation of faculty teaching effectiveness to achieve learning outcomes within a unit. In nearly every interview, summative student evaluations alone were considered insufficient indicators of effective teaching by the deans interviewed; and many deans had either encouraged adoption of other teaching evaluation tools or were in the process of testing additional tools that would provide a more holistic view of a individual faculty member's performance and the student learning achieved in the classroom. In nearly every interview, the deans cited the literature on the pedagogy of learning.

Many colleges were grappling with either putting a peer evaluation of teaching (PET) tool into place or trying to improve the effectiveness of existing PET review systems. Great variability exists in PETs across this sample of universities in terms of guidelines for reviewers, number of reviewers, review practices (including number and scheduling of classroom evaluations), and review standards/criteria. Among the most nettlesome issues with PETs have been the faculty time commitments that an effective PET system demands, or the lack of tradition within a university to use PETs (http://www.celt.iastate.edu/teacjomg-resources/document -your-teaching/peer-evaluation/ last accessed on December 1, 2014). In this study, the most active institution in the study that was utilizing PETs and refining its procedures, and disseminating its findings, was Iowa State University and its Center for Excellence in Learning and Teaching (CELT). This Center was originally created to improve teaching in the College of Agriculture and Life Sciences, but it has extended its influence beyond college boundaries through workshops, power-point presentations, and other mechanisms to widely affect student learning through improved teaching performance across campus. To bring standardization to PETs, CELT recommends the inclusion of certain materials in the review process to improve inter-rater reliability of teams. These materials include a faculty Teaching Portfolio (Centra 2000), which should contain a teaching philosophy statement, syllabi, exams, assignments, student products and other indicators of student performance that can be independently reviewed by a PET. Some PET review teams seek out non-anecdotal alumni feedback and/or external reviewer input of teaching materials from professional groups/individuals affiliated with a particular discipline. Almost all promotion and tenure review processes of tenure track faculty will seek outside evaluations of a candidate's work; however, these external reviewers often are directed to the more easily evaluated standards/criteria that mark research scholarly activities. Seldom are external reviewers asked to review teaching portfolios associated with a candidate, even when a candidate's academic responsibilities to teaching are above 50% time; this practice could be easily changed with PET team input.

During the interviews with the deans, some difficulty with terminology entered the discussion. For example, many individuals interchanged "general peer review" of academic responsibilities (i.e., the standard external review of teaching, research, and service that commonly accompanies a promotion or tenure case) with "peer evaluation of teaching (PET)" reviews. A second area came from deans who considered individuals outside of a department as "external reviewers" even though the faculty member under question was either in the same college or another college on-campus. The changing lexicon that has accompanied changing theories of effective teaching and learning in universities also can create confusion when discussing faculty evaluation processes with colleagues who were trained during different eras. Therefore, it is important that everyone affected by, and involved in, faculty evaluation review processes across colleges are updated as to lexicon changes occur in higher education. This insures good communication among reviewers in an institution. Centers for Teaching and Learning Excellence will be among the timeliest sources of information on changes in terminology and theories of learning on-campus.

4.4 Teaching Evaluation Standards and Criteria

A broad set of teaching evaluation standards and criteria were employed (Table 4) among the ten schools. Standards that served as “Evidence of Student Learning” and/or effective teaching (beyond normal institutional quantitative profiles involving teaching loads, undergraduate/graduate advising levels, graduation rates, etc.) included: SER qualitative comments, SER quantitative summative scores, SER formative scores (when tied to summative scores), exceptional (i.e., state or national) student awards, exceptional (i.e., state or national) student recognitions, student preparedness (for subsequent coursework in curriculum or upon entering the workplace [based on employer standardized assessments]), student products (e.g., exam performance, papers, awards, artwork, performances), graduate student placement upon graduation, graduate student career attainment levels, university teacher ranking systems (see CILT, University of Illinois), candidate’s self-evaluation of teaching, and faculty teaching perspectives inventory (TPI).

Table 4. Teaching evaluation standards and criteria in place, based on interview data.

	School									
	Colo. St.	Iowa St.	Kansas St.	New Mex St.	Ohio St.	Oregon St.	Purdue	Arizona	Illinois	Wis.
Teaching Evaluation Standards & Criteria										
Evidence of Student Learning										
SERs Forms										
Qualitative Comments	x									
Quantitative Scores	x	x	x	x	x	x	x	x	x	x
Exceptional Student Awards				x	x					
Except. Student Recognition	x	x	x	x	x					
Student Preparedness										
Subsequent Coursework	x									
Entry level post-graduation	x	x		x	x				x	
Student Products										
Exam Performance		?	x							
Papers		?	x		x				x	
Nat’l, State, Local Awards	x	?	x	x	x				x	
Artwork		x								
Performances		x								
Teaching Ranking System										
Candidate's Self-Review		x	x		x				x	
Teaching Perspectives Inventory		x							x	

Abbreviations:

x-present or declared
?-likely, but needs further verification/clarification

Four deans specifically reported that units within their Colleges set their own teaching standards and criteria: Illinois, New Mexico State, Kansas, and Purdue. A fifth university, Wisconsin, stated that a faculty member’s university-wide mentoring committee which is established at matriculation, sets the guidelines for teaching performance. (This is due to the strong faculty governance system at this institution). An examination of the other five schools' faculty handbooks imply that most standards/criteria of performance are set at the unit level, since it is there that decisions affecting curriculum are made.

4.5 Teaching Enhancement Strategies

Finally, it was refreshing to witness the broad complement of "Teaching Enhancement Strategies" that are used to improve the effectiveness of faculty teaching (Table 5). These included: senior faculty

Table 5. Teaching enhancement strategies used to improve teaching effectiveness and student learning outcomes based on interview data.

	Schools									
	Colo. St.	Iowa St.	Kansas St.	N Mex St.	Ohio St.	Oregon St.	Purdue	Arizona	Illinois	Wisconsin
Teaching Enhancement Strategies										
Collegial Interactions										
Senior Faculty Mentorships	X		X							X
Teaching Partnerships			X							
Student Evaluation Review (SERs)										
Modified Summative SERs		X		X	X				X	
Matches College Learning Outcomes		X			X				X	
Matches Unit Learning Outcomes		X		X	X				X	
Matches faculty member's LOs		X		X	X				X	
Formative SERs		X							X	
Grants										
Small College Pedagogy Grants		?	X		X				X	
USDA Instructional Grants			X	X	X				X	
Workshops										
Teaching ImprovementWorkshops	X	X	X	X	X	X	X	X	X	X
Peer Reviewer Training Workshop	X	X		X						
Mandated 1st yr. Fac. Teaching Workshops					X				X	
Graduate TA Teaching Workshops			X		X				X	
Awards/Recognitions										
Alumni Faculty Recognition Banquet					X					
External Faculty Recognitions		X	X		X					
Internal Univ. & College Awards	X	X	X	X	X	X	X	X	X	X
Other										
Monthly Book Clubs	X				X				X	
Teaching Menus		X								
Teaching Academy				X	?				X	X
Required Teaching Portfolio		X			?				?	
Required Teaching Philosophy Statement		X			X				X	
Abbreviations:										
x-present or declared										

mentorships, teaching partnerships, formative SER's, small college pedagogy research grants, USDA instructional improvement grants, teaching improvement workshops, "Teaching Menus", and Book Clubs that reviewed the latest thoughts on university teaching. Peer Evaluation Team (PET) workshops were offered in several universities, and encouraged in a number of Colleges, for the purpose of enhancing the Scholarship of Learning and Teaching (SoTL) among faculties. In all cases, for faculty rated as "below average" on the standards used to measure teaching effectiveness (within a unit or College), these individuals were encouraged to pursue teaching improvement options available to them. These options were universally mentioned by the deans: 1) seeking out and securing **input from the Teaching Center** on-campus; 2) working with the deans to identify **mentors** from the ranks of senior faculty who are known for teaching excellence in the College or unit; and 3) participating is **teaching enhancement programs**. Close personal monitoring of improvements in teaching by the deans as a follow-up, reinforced the importance of teaching excellence to others in the college.

5 CONCLUSIONS

The Scholarship of Teaching and Learning (SoTL) is not a new concept, but its use is being redefined in higher education today. University administrators interested in restoring balance among the three competing interests for faculty time (i.e., teaching, research, and extension) in higher education today, are broadening the scope of SoTL to include more viable teaching standards and criteria, improved evaluation processes, and significant enhancement opportunities to promote teaching as an endeavor worthy of scholarly recognition among peers. These efforts are slowing gaining traction as pivotal points in discussions affecting faculty merit, promotion, and/or tenure. To prepare for this study, the author examined a variety of publications, including seminal works on the scholarship of teaching and evaluation, including Boyer (1990); Centra (2000); Cohen and McKeachie (2008); Johnson and Ryan (2000); Kremer (1990); Lattuca and Domagal-Goldman (2007); and Root (1987). Personnel at university "Centers of Teaching Excellence" when visiting the University of Illinois and Iowa State University campuses suggested other works, and citations for these works are provided in the Bibliography section to promote further insight into the scholarship of teaching.

From the consultancy experience and past assignments involving faculty performance evaluations, it is the author's contention that SoTL has high potential to be a viable concept within the merit and tenure system at most institutions. The key is how it will be operationalized within existing review systems by the administration. Central to any integration will be the issue of credibility, particularly as it applies to the standards and criteria used to judge the scholarship of teaching and learning. It is here that external professional groups and individuals (e.g., Council of Educators in Landscape Architecture (CELA), Fellows in ASLA or CELA, retired professor emeriti, etc.) can play a role. Clearly, they could facilitate some of groundwork that evaluation methods, like Peer Evaluation of Teaching (PET), would require. Identifying and validating standards and criteria used to measure the "effectiveness" of teaching is another area where external professional input from professional groups like the Landscape Architecture Accreditation Board [LAAB] might enhance the scholarship of teaching. Finally, having external design professionals helping in various aspects of the faculty review process, would insure that the unique teaching demands of design studios, become a contextual part of an evaluation process.

Our online examination of university-wide policies from a variety of sources (including faculty handbooks) revealed almost no information on specific standards or criteria used for evaluating faculty performance. Websites of Colleges of Agriculture fared slightly better, with about half of the 21 Colleges actually outlining "general expectations" for faculty in teaching, research, & outreach, respectively. Interviews of the associate or assistant deans were the most informative. Almost all discussions focused on strategies used to change internal work conditions that would "level the playing field" among researchers, extension personnel, and teachers. In some cases, this involved modifications in: 1) teaching assignments; 2) contact hours related to subject matter; 3) student evaluation reviews (SERs); and/or 4) the use of SoTL in course output. The practical aspects of incorporating SoTL into existing evaluation systems often followed. Pro arguments included perceptions of social justice, administrative aspirations, and needs to "re-balance" evaluation systems that overemphasize research outputs and SERs. Barriers included institutional inertia, faculty workloads, and lack of "on-site evaluative expertise".

Each interviewee showed remarkable consistency in supporting his/her faculty in terms of improving all aspects of faculty performance, but especially, in improving teaching performance. It was clear that each of them used discretionary tools to encourage innovation in the classroom—small grants, awards/recognitions, mentors, workshops and other vehicles to celebrate and share innovative teaching with high learning outcomes. This was perhaps the most inspirational part of the consultancy project. In a sense, it showed that the Land Grant philosophy continues to serve all segments of the public—including the ranks of academe (i.e., the faculty), who ultimately serve as the vehicle for "advancing knowledge" outward to the general public.

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7 APPENDIX

7.1 Lexicon of Terminology

In this study, several new concepts were introduced during the interviews. The following set of terms are provided so that the text and tables can be understood more clearly.

Alumni Feedback—formal data collection methods, tested for validity/reliability, and used to survey the learning/teaching impact of a faculty member on students; non-anecdotal.
Candidate's Self Review—refers to a faculty member's "Philosophy of Teaching" statement which is normally a part of a teaching portfolio, but not always.
Internal versus External Peer Reviewers—this refers to the composition of the peer review teams with internal suggesting all reviewers are from within a unit, and external reviewers come from outside the unit but within the college.
Performances--may include judging teams, national or state competitions, or other venues where an independent group of jurors evaluates student skills.
Peer Evaluation Workshops—programs designed to train peer reviewers in teaching scholarship and thereby, increase inter-rater reliability when peer review occurs in a unit.
Positive External Review—refers to the normal P&T process of seeking outside "authorities" in a discipline to comment on the "institutional contributions of a candidate to his/her profession/discipline.
Senior Faculty Mentorship—Senior faculty at the Associate or Full Professor rank within a unit selected to advise a junior faculty member within the same unit.
Single Reviewer versus Multi-reviewers—this refers to the number of peer reviewers on a team when evaluating teaching in the classroom.
Student Preparedness—refers to the status of a student to take on the next level of challenge based on his/her knowledge and skills acquisition in a course or curriculum.
Teaching Evaluation Methods—teaching review practices actually in use presently.
Teaching Menu—the product of an individual faculty member who details his/her teaching plan throughout the year, including evaluative comments about success and/or failure.
Teaching Partners—senior faculty at the Associate or Full Professor rank from one unit cross over unit boundaries to mentor or teach collaboratively with a members of the faculty from a different unit.
Total Enrollment—includes graduate and undergraduate students, 2014.

APPENDIX

Peer Review Process

The *Landscape Research Record* publishes top quality articles selected from manuscripts submitted to the Council of Educators in Landscape Architecture (CELA) annual conference each year. The Record serves the mission of the CELA, that is, to encourage, support and further education in the field of landscape architecture specifically related to teaching, research, scholarship, and public service. The Record contains recent research and scholarship in all aspects of landscape architecture, distributed in the following tracks:

- Communication and Visualization
- Design Education and Pedagogy
- Design Implementation
- History, Theory and Culture
- Landscape Performance
- Landscape Planning & Ecology
- People-Environment Relationships
- Research & Methods
- Service-Learning and Community Engagement
- Sustainability
- Urban Design
- Film

The steps and typical timeline of the peer review are described below.

Abstract Submittal: September

Peer-reviewed article publication on the Record starts from the abstract submittal to the CELA annual conference. The CELA executive office sends out Call for Abstracts around August each year.

Abstract Review: September-October

The Vice President for Research leads the track chairs in the abstract review. Double blind review is used. Each abstract is reviewed by at least two reviewers.

Paper Submittal: January 20-25

Authors of accepted abstracts receive the invitation to submit a full paper in November. The deadline is in January of the following year. The papers submitted at this time are not peer reviewed but only edited to satisfy the conference standard. Papers that do not follow the template of the conference are rejected.

The CELA Annual Conference: March-April

Paper Review: May-June

Papers that are submitted in time in January and stratify the conference standard become eligible to enter the peer review for the publication in the Record. The track chairs manage the review for their tracks and select high quality papers based on the score of abstract review, grammar, completion of study, contribution of new knowledge, format quality, etc. The track chairs then send out selected papers to at least two reviewers.

Review Result and Revision: July

Track chairs collect review results and make recommendations on the manuscripts. Papers that are accepted with revision requirement will be sent back to the authors in July.

Final Manuscript Submittal: August

Authors submit final manuscripts by August 31st. All papers are published by December 31st.

The Outstanding Paper Award: December-March

The CELA Executive Committee has authorized The Outstanding Paper Award for published papers in the Record. The Vice President for Research and track chairs collectively select the winning paper. CELA notifies the winner(s) of the award, which is presented at the following CELA Annual Conference.