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Green Readiness, Response, and Recovery: A Collaborative Synthesis



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Green Readiness, Response, and Recovery: A Collaborative Synthesis

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Abstract

A collection of case studies, interviews, and personal reflections inspired by a national workshop, *Green Readiness, Response, and Recovery: A Collaborative Synthesis* includes lessons learned from a diverse group of practitioners and researchers about the ways in which environmental stewardship has served as a catalyst for revitalizing communities. Its focus is on practical solutions from various sectors on how to best prepare for, respond to, and recover from disturbances. The book contains a wide range of examples, including social and environmental disturbances and disasters, urban and rural geographies, and various modes of action, from small nongovernmental organizations (NGOs) to government agencies. This volume is a shared endeavor by the USDA Forest Service and the TKF Foundation as they work to understand, cultivate, and celebrate the persistence of community, nature, and the human spirit.

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United States Department of Agriculture

Green Readiness, Response, and Recovery: A Collaborative Synthesis

Edited By:

Lindsay K. Campbell

Erika Svendsen

Nancy Falxa Sonti

Sarah J. Hines

David Maddox



Cornell University

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Introduo

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Foreword: The Value of Stewardship in Times of Recovery

Tony L. Ferguson

Director, Forest Service

Northern Research Station and Forest Products Lab

Madison, Wisconsin

Ferguson, Tony L. 2019. Foreword: The value of stewardship in times of recovery. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 8-9. <https://doi.org/10.2737/NRS-GTR-P-185-fw1>.

The USDA Forest Service was created in 1905 with a mission that continues to resonate and inspire our work today: “To sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.” Our emphasis on both land and people is summarized in our motto, “Caring for the land and serving people,” in recognition of our civic service, the fundamental importance of nature to human health and well-being, and our desire to awaken and strengthen all people’s connection to the land. “Caring for the land” represents our commitment to land conservation, restoration, and stewardship.

Over the last decade, Forest Service research and practitioner experience have demonstrated the power and potential of stewardship activity to help people rebuild and heal after disturbance—after hurricanes, floods, tornadoes, wildfire, and other natural emergencies, as well as human-caused disasters, such as terrorism and other violence. It is no surprise that stewardship can speed the recovery of natural infrastructure, but the act of coming together and creating collective, positive change and beauty in outdoor spaces can also help individuals and communities recover emotionally, psychologically, and/or spiritually. Stewardship action can even help communities become stronger and more resilient than they were before the trauma.

Our core stewardship and resilience research takes place at our New York City Urban Field Station, where our scientists have studied social and environmental response to tragic disasters like Superstorm Sandy in 2012 and the 9/11 terrorist attacks of 2001. The scholarship and personal narratives in this synthesis draw from these disturbances and many more, together illustrating how stewardship activity can help engage and empower people in the aftermath and contribute to the healing process. The importance of cultivating resilient communities and ecosystems becomes apparent as we tackle the complexities of climate change and natural disasters, and the tragedies of violence—none of which are bounded by an urban or a rural landscape. Enabling and employing stewardship networks and practices can put us on a better path of resilience, across all lands and all communities.

Foreword: Invaluable Resources

Tom Stoner

TKF Foundation, Annapolis, Maryland

Stoner, Tom. 2019. Foreword: Invaluable resources. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 10-12. <https://doi.org/10.2737/NRS-GTR-P-185-fw2>.

Over the past 150 years, a blink of an eye in terms of human history, our experiences in relation to nature have changed radically in much of the world. Dramatic migration to cities—coupled with urban planning and design that emphasized gray over green infrastructure, inequality, and perhaps an overvaluing of technology—has led many people to be divorced from nature, with little access to nature’s social and ecological benefits. At the same time, stress levels are rising. Though medicine has made incredible advances in recent decades, life spans that had for many years been lengthening are now contracting in some communities (Squires 2017). Our communities continue to face old and new challenges: some human-made, some natural, and often a mix of both—as with Hurricane Sandy in 2012 in the New York metropolitan area.

In the United States, we are quick to acknowledge the destructive power of nature. But our confidence in gray infrastructure and technology can also lead us to under-recognize nature’s capacity to both address ecological challenges and heal and promote well-being. Greater investment in green and blue infrastructure—and the social mechanisms that can create and nurture them—has the potential to combat a host of personal, ecological, and societal challenges. But we must act to increase this investment.

I think that what is often forgotten is the fact that we are a part of nature. Our need to connect with it is innate. When it’s lost, we suffer. This is why, we at the TKF Foundation have worked for more than two decades to give people the opportunity to connect with nature; to restore this essential, sacred bond. A simple concept, yet wholly profound when exercised.

In addition to our involvement with the Landscapes of Resilience gardens, we have supported the creation of more than 130 meaningful greenspaces that comprise the Nature Sacred Network, places where individuals can pause in an organic setting; one designed to encourage moments of mindful reflection and feelings of peace and well-being. Most of these spaces reside in communities hard hit by poverty, despair, stress, and other persistent challenges, including prisons, hospitals, and underserved city neighborhoods—places where hope is needed most.

These projects vary in size and complexity, but what unites them in success is a unique formula we’ve honed over the years in partnership with people and places. It is an approach that is deeply rooted in the communities each project serves—tailored to reflect and celebrate the community’s unique culture and values. From this source springs an authentic kind of pride: a restored sense of community and promise. Invaluable.

As we look to the future, it is our hope that we as a “community of communities” reimagine our cities and societies through a social-ecological lens. Small, nearby places of green infused into urban landscapes offer more than

beauty. They serve to reorient us in powerful ways—offering a moment of solace; asking us to pause, reflect, and refocus. In today’s frenetic world, that moment can change everything.

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Squires, D. 2017. The shortening American lifespan. New York, NY: Commonwealth Fund. <https://www.commonwealthfund.org/blog/2017/shortening-american-lifespan>.

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Background

Sarah J. Hines,¹ Lindsay K. Campbell,² Nancy Falxa Sonti,³ Erika Svendsen,² and David Maddox⁴

1. USDA Forest Service, Baltimore, Maryland

2. USDA Forest Service, New York, New York

3. USDA Forest Service, Baltimore, Maryland

4. The Nature of Cities, New York, New York

Hines, Sarah J.; Campbell, Lindsay K.; Sonti, Nancy Falxa; Svendsen, Erika; Maddox, David. 2019. Background. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 14-20. <https://doi.org/10.2737/NRS-GTR-P-185-paper1>.

Research and experience have demonstrated that environmental stewardship, including a wide variety of community greening efforts, can play a key role in helping communities recover from disasters and disturbance. These include both natural disturbances—for example, hurricanes, floods, tornadoes, and wildfire—and human-caused disasters, such as terrorism and other forms of violence. Moreover, we recognize that, now more than ever in the age of the Anthropocene, all disturbances are rooted in both natural and social causes.

The immediate aftermath of disturbance events requires a swift response and mitigation that focuses on health and safety. Various government programs are devoted to this work within the USDA Forest Service (e.g., incident command teams, urban forest strike teams, burned area emergency response) and in other federal, state, and local agencies. However, mid- to long-term recovery efforts typically have a different constellation of needs, including rebuilding both infrastructure and communities. As communities pull together to recover and rebuild, the mid- to long-term recovery stages offer many opportunities to adapt, learn, and cultivate community resilience.

Greening and community-based natural resource stewardship can play a large role in longer-term recovery; research and practice have demonstrated that these stewardship activities are key to *enabling recovery* and *building readiness and long-term resilience to future disturbances*. Stories related to enabling readiness, recovery, and resilience through stewardship are the focus of this book.

What is “Community Greening” and Community-Based Stewardship?

Stewardship is “the activity or job of protecting and being responsible for something.”⁵ When we refer to environmental or natural resource stewardship, we mean, very simply, people’s efforts to take care of the natural world around us. These efforts may include caring for private residential land (e.g., people’s yards), but the focus of this book tends to be on the formal and informal activities that take place on nonresidential lands and public, shared places. The individuals who engage in these activities may be part of large well-funded organizations, or they may be unpaid volunteers, or self-appointed caretakers.

Natural resource stewardship includes activities such as tree planting and/or pruning, community gardening, removal of litter or invasive species, creation of public green spaces, and other community greening efforts. It can also extend beyond the land, and include activities that help conserve or improve water or air, or address environmental issues (such as

5. Merriam Webster Online, <https://www.merriam-webster.com/dictionary/stewardship>. (accessed 11/16/2017).

pollution and forms of energy production) that have an impact on land, water, and air quality. Stewardship takes the form not only of hands-on work, but also of environmental education and community advocacy to shape and influence the governance and use of natural resources. A description of environmental stewardship used by Svendsen, Campbell, and colleagues (Connolly et al. 2013, Fisher et al. 2012, Svendsen and Campbell 2008) notes that these groups “work to conserve, manage, monitor, advocate for, and/or educate the public about their local environments.” It is important to acknowledge that stewardship groups are not only environmental in their focus. Many civic stewards focus on youth, seniors, arts, or civic engagement—and engage in stewardship practices in order to enhance community quality of life. Often, the act of stewarding involves members of the community meeting or getting to know one another more substantially.

The benefits of such community-based stewardship can be broad: facilitating medium and longer-term community disturbance recovery; strengthening social trust, enhancing civic participation, and fostering creative innovation; reducing vulnerability to future disturbances; and helping to address chronic vulnerabilities and socioeconomic inequalities in communities (McMillen et al. 2016, Tidball and Krasny 2014).

This book is designed to share ideas emerging from the research and practice of stewardship and resilience across the United States, including both Forest Service projects and projects close to the Forest Service mission. While many of the chapters come from the natural resources field, we expand our horizons to learn from voices in planning, design, and the arts—given that acts of participatory planning and community placemaking often include stewardship efforts. Our aim is to identify best practices, and explore new forms of collaboration. Each chapter is an exploration of a specific site, community-based project, or a national or international program to support such efforts. However, all chapters make an attempt to discuss lessons learned for other organizations and places. In this way, we hope to create a compendium of emerging best practices that are effective in strengthening the role of community stewardship in resilience and recovery.

Why is the Forest Service Interested in Natural Resource Stewardship Beyond National Forest Boundaries?

Since its establishment in the early 20th century, the Forest Service has been a conservation agency with a mission to engage in restoration and stewardship activities. However, when the Forest Service was established, 80 percent of U.S. residents lived in rural areas. Now, 83 percent of the U.S. population lives

in urban and urbanizing areas, where conservation and restoration are also greatly needed.

The mission statement of the Forest Service remains unchanged, but as demographic shifts occur, the Forest Service understands that “caring for the land and serving people” involves stewardship where people live. Also, the Forest Service is congressionally mandated to help steward all the nation’s forests—not only the National Forests, but also forests on state, local, and private lands, including our urban and community forests. Therefore, just as the Forest Service restored the ecologically degraded landscapes and watersheds of a century ago, so it also seeks to enable restoration and stewardship in urban areas through Research and Development and State and Private Forestry programs that provide scientific information, technical assistance, and financial support.

Finally, as disturbances such as hurricanes, floods, tornados, wild-fire, and acts of terrorism and other forms of human-caused violence seem increasingly common, communities are searching for ways to recover and rebuild in meaningful, durable ways. Engaging in natural resource stewardship activities becomes a way to make both the ecological and social fabric of a community stronger and more resilient.

Why do Communities Engage in Natural Resource Stewardship and What are the Benefits?

Stewardship is a form of empowerment. It is a means by which individuals and communities contribute to the beauty and health of their environment. It can also bestow a sense of purpose, providing an outlet for the natural human instinct to help, nurture, care, and love—both for the natural environment and for the people around us.

While stewardship activities help neighborhoods and infrastructure recover physically, the act of coming together, working side-by-side, and creating change helps individuals and communities recover emotionally, psychologically, and spiritually. In some cases, stewardship can help communities become stronger than they were before the trauma (McMillen et al. 2016, Tidball and Krasny 2014).

Especially in communities that have experienced hardship, economic divestment, or natural disasters, stewardship can be a way that residents connect, beautify, and restore the landscape. It is a way for people who may not feel they have a voice, to make a statement and have a tangible, visual impact and to stimulate public life. The benefits of stewardship in these areas extend beyond those who directly engage: many in the community experience a sense of pride and ownership, even if they were not involved in the

initial planning or execution. And neighborhood-level efforts can catalyze citywide changes. We also find that the benefits of engaging in stewardship activities extend into the future. Just as time spent together can build and strengthen a friendship, communities can be built and strengthened in much the same way. This creates both individuals and communities that are more resilient to future disturbances.

Key Messages from Chapters and Organization of the Book

The chapters of this book contain case studies, research, and national and international examples and programs. The chapters describe a variety of disturbance types, from fire, to storms, to terrorism. Some of the chapters are from practitioners directly involved in community-based recovery and resilience. Some of the authors are the leaders of national programs that support recovery and resilience activities in the Forest Service, other federal agencies, and nongovernmental organizations. Others are researchers who bring social science perspectives to processes of community recovery and re-greening. What unites the chapters is a focus on community stewardship and how it helps people both recover from disaster and create readiness for and resilience to the next disturbance.

The **Forewords** and this **Background** are designed to place this book in context. The Forest Service cares deeply about the power of community-based stewardship of natural resources, and the agency recognizes its role in helping navigate the complexities of stewarding all of our nation's forests and grasslands for the benefit of current and future generations. Similarly, the TKF Foundation, which has been a major supporter of this work and helped to make possible the *Cultivating Stewardship, Recovery, and Resilience Workshop* that served as the precursor and inspiration for this book, recognizes the value and healing power of connecting people with the landscape. As such, these two organizations make natural partners in the pursuit to illuminate better practices and encourage resiliency through stewardship.

The **Case Studies** section intends to capture the state of the science and practice around the design, stewardship, and community use of green space in response to different acute and chronic disturbances. These chapters focus primarily on the response and recovery of communities to various stressors, but also contain examples that speak to readiness. Throughout all cases, there is an emphasis on cultivating resilience.

The **Synergies** section includes programs, partnerships, and networks at multiple sites that are helping to prepare communities and foster stewardship responses. Finally, the **Epilogue** summarizes key points and take-home

lessons and emphasizes the importance of disseminating the lesson learned from these chapters to communities beyond those represented in this book.

Acknowledgments

We would like to thank all the participants of the *Cultivating Stewardship, Recovery, and Resilience Workshop*, which was held in June 2016 in New York City and provided the basis for the creation of this book (see appendix). These individuals came together, across boundaries and geographies, to represent cutting-edge perspectives of various agencies and organizations involved in stewardship. We acknowledge the critical role of our Forest Service State and Private Forestry and National Forest System collaborators in creating a forum that wove together perspectives from within the Forest Service that generated new and integrated insights. Specifically, the workshop and book would not have been possible without the support and involvement of Forest Service leaders and conveners such as Glenn Casamassa and Elizabeth Larry. Forest Service’s “Branching Out to Urban Audiences” provided funding support for the workshop; we thank our collaborators Phillip Rodbell, John Parry, and Teri Heyer on that proposal.

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This book’s strengths lie in its diversity of perspectives across sectors, agencies, and geographies, and it would not have been possible without the diverse contributions of the authors. Thanks to Susan Wright and her team at Northern Research Station Communication and Science Delivery for overseeing the copyediting and production of this book. Isaac Gertman of the Independent Group created the design of the publication.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Case Studies

Response, Recovery and Greening in the Red Zone: Lessons for Policy and Practice

Keith G. Tidball, Marianne E. Krasny,
and Elon D. Weinstein
Cornell University

Tidball, Keith G.; Krasny, Marianne E.; Weinstein, Elon D. 2019. Response, recovery and greening in the red zone: Lessons for policy and practice. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 24-43. <https://doi.org/10.2737/NRS-GTR-P-185-paper2>.

In “Greening in the Red Zone: Disaster, Resilience, and Community Greening,” Tidball and Krasny (2014a) make the case that creation of and access to green spaces promotes individual human health and community healing, especially in therapeutic contexts among those suffering traumatic events, asserting that making and being in green spaces confers resilience and recovery in social-ecological systems disrupted by violent conflict or disaster. To make this case, and to understand the broader implications of humans turning to nature in times of disaster or crisis, the authors proposed working definitions of greening and red zones, as well as a conceptual or explanatory framework. Such a framework describes the relationships between the act of greening and other components of the social-ecological system in which these actions are nested. The “Greening in the Red Zone” approach leverages the notion of resilience, which offers a strong foundation for understanding the role of greening following disaster and conflict at multiple, interrelated levels—individual, social, and ecosystem.

In brief, greening refers to the activities of humans, working alone or more commonly with others in their community, to restore local social-ecological systems through such activities as community gardening, community forestry, and improving habitat for wildlife and aquatic biodiversity (Tidball and Krasny 2014b). The term “red zone” refers to multiple settings (spatial and temporal) that may be characterized as intense, potentially or recently hostile or dangerous areas or times, including those in post-disaster situations caused by natural disasters such as hurricanes and earthquakes, as well as those associated with terrorist attacks and war (Tidball and Krasny 2014b). Social-ecological systems are complex, integrated systems in which humans are part of nature (Berkes and Folke 1998). Resilience, in broad terms, refers to the ability of humans, communities, and larger social-ecological systems to rebound and to reorganize in the face of outside stressors, including death of loved ones and full-blown war and conflict or disasters. During such times of crisis, breakdown, and reorganization, existing and potential sources of resilience often come to the fore; for this reason, discovering, building, and safeguarding those sources of resilience is critical to recovery from crisis (Walker et al. 2002). Greening, then, as a form of human agency and collective action applied to environmental stewardship, represents a critical source of resilience at individual, interpersonal, community, and even wider scales.

Examples

Although not often enough recognized in policy and research agendas, cases where humans who face disaster, conflict, or stress turn to greening as a source of resilience abound as evidenced by the chapters of “Greening in the Red Zone.”

Often viewed from the perspective of their negative environmental, social, and cultural repercussions, shocks or crises that result in serious disruptions to normal processes can help communities move beyond a state of denial and in so doing, “open up opportunities for reevaluating the current situation, trigger social mobilization, recombine sources of experience and knowledge for learning, and spark novelty and innovation.” Further, such changes may “lead to new kinds of adaptability or possibly to transformational change” (see also Olsson et al. 2007, quoted from Folke et al. 2010). Whereas a number of more formal processes exist for fostering such transformational change (e.g., scenario planning among watershed stakeholders, Peterson et al. 2003) here we are focused largely on transformational changes that emerge, or are “self-organized”, following shock or crisis. We find multiple examples of how a crisis—including natural disturbance, conflict, and slower decline, often acting in concert—spark reevaluation, social mobilization, the coming together of multiple experiences and knowledge, and innovation. One needn’t look far to find examples of self-organized greening that integrate components of transformation—whether in the creation of a community garden that brings together former enemies to create something of value and beauty on a site symbolic of devastating ethnic conflict in Soweto (Shava and Mentoor 2014), the construction of a series of 9/11 memorial green spaces in New York City (Svendsen and Campbell 2014), or the coming together of war veterans in a fishing stream in upstate New York (Krasny et al. 2014).

Even those greening responses that are initially self-organized with leadership from single community leaders or small groups of neighbors, often soon grow to involve multiple levels of governance reflecting a network of community organizations, government institutions, nongovernment organizations (NGOs), and sometimes business. Such connectivity enables those engaged in experimentation at small scales—the replanting of forests or reconstructing of wetlands—to learn across multiple experiments. The ability of actors from different levels of governance who are engaged in experimentation and learning to bridge from community to higher levels of social organization provides a means for what begins at a small scale to spark transformational change at increasingly wider scales (Folke et al. 2010). However, given barriers to transformational change embedded in existing policies and power structures (Pelling and Dill 2009), the challenge for proponents of greening’s transformative potential continues to lie in understanding the processes and sources of resilience and adaptive and transformative change at multiple levels. Although at times critiqued for its broad notions of social-ecological processes (Brand and Jax 2007), the growing body of resilience scholarship provides an important avenue for gaining such an understanding through sharing results of experiments, observations, and

reflections among an international network of scholars and practitioners concerned with social-ecological system change (Elmqvist 2014).

Despite the many examples above and related arguments by scholars writing about major disturbances and the environment (cf. Dabelko and Conca 2002, Machlis and Hanson 2008), in most cases policymakers dealing with conflict have expressed little interest in trees or other green infrastructure, except perhaps as a commodity (Jonnes 2011). In stark opposition to notions of how greening may provide space for adaptive governance, novelty and learning in post-crisis, and thus may open up opportunities for self-organized and collaborative transformations to emerge, municipalities and governments often respond with increased rigidity following a disturbance. We see this often when law enforcement agencies refuse to allow citizens to enter public parks and green spaces after a crisis, such as after Hurricane Sandy (beaches; Chan et al. 2015) and Hurricane Katrina (green spaces; Deflem and Sutphin 2009).

While reestablishing order post-disturbance is critical, greening can be a next step in opening up possibilities for transforming a system that has collapsed or been severely damaged. Engaging people in meaningful and collective action that draws on their knowledge and experience in growing things and their capacity as local leaders, and that provides opportunities to participate in local governance, to express biophilia and topophilia, and to transform often degraded ecosystems, may be an overlooked source of resilience in post-conflict and post-disaster settings.

What challenges do members of the policy-making community face in considering green infrastructure, and perhaps more importantly the *act of greening*, as components of recovery efforts following war, disaster, or other sudden and large-scale perturbances? We can identify at least five major barriers and related opportunities regarding how practitioners might change the policy landscape in response and recovery efforts.

Barriers and Opportunities in the Greening in the Red Zone Approach

Similar to how social-ecological systems can be resistant to change, the policy-making “system” itself may be subject to its own resistant feedbacks and traps (Tidball 2016, Tidball et al. 2014, Tidball et al. 2016). Thus, one might envision a particular policy-making community as either a subsystem or “basin” characterized by certain features within a larger landscape of multiple policy options or basins, or as a meta-system itself containing multiple options or basins. As is the case in social-ecological systems, barriers to moving from one policy option to another are not easy to overcome (Figure 1).

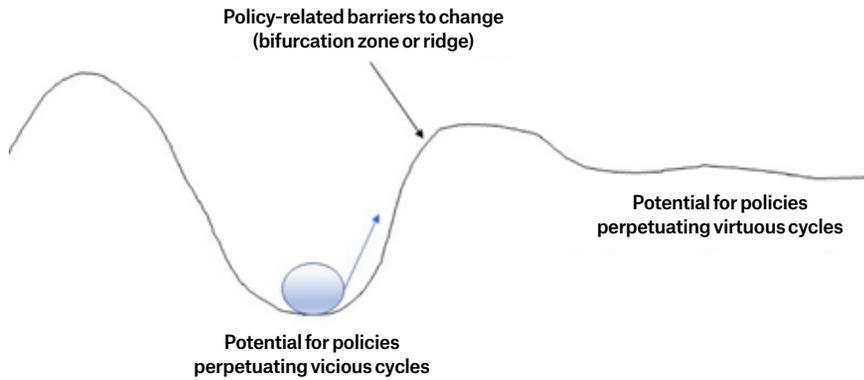


Figure 1: Policy barriers as ridges in a stability landscape, based on Tidball et al. 2014 and Tidball et al. 2018.

Image by Keith G. Tidball, used with permission.

Though ubiquitous, these stability landscapes, or ball-in-cup diagrams, are useful metaphors and heuristic devices for visualizing multiple system states (Tidball et al. 2017). Keeping this metaphor in mind, and following Pelling (2003), who has described feedback cycles as both “opportunities and barriers to building adaptive potential” in red zone contexts, we outline five barriers that limit rethinking of post-disaster policy options to incorporate greening, as well as how the insights garnered from the “Greening in the Red Zone” book might help address those barriers. These barriers—and related opportunities for rethinking policy options—fall into the following general categories:

1. Understanding Human-nature Relationships and the Importance of Place

Humans are of, and part of, nature (Krasny and Tidball 2015). This view is in contrast to notions of humans as being exempt from universal rules governing ecosystems—i.e., as a distinct group of beings who are outside of and have complete control over nature (see Tidball 2016 and Tidball and Stedman 2013 for further discussion on the problems of human exemptionalism and human exceptionalism). *Greening in the Red Zone* presents research-based evidence for the healing power of nature, and explicitly links psychological, sociological, and cultural understandings with biological, physiological, and genetic explanations for why humans might turn to nature in red zone times and places (Tidball and Krasny 2014a). Whereas humans engage with nature in a variety of ways during such taxing times the *act of greening* in whatever form, whether planting trees or producing food, recreating wildlife habitat or restoring wetlands, is a further means of experiencing the healing potential of interacting

with the rest of nature.

Moving from individuals to local communities, Stedman and Ingalls (2014) argue for the importance of attachment to places—or topophilia—in the well-being of red zone and other communities, and importantly, in the willingness of people to participate in greening and other civic renewal activities. Whereas civic renewal efforts centered on rebuilding the physical infrastructure play an important role in red zone communities (Kelling and Coles 1996, Vale and Campanella 2005), greening efforts go one step further by integrating the psychosocial aspects of humans’ relationship with nature with other components of civic engagement. Greening also may reinforce or restore a positive sense of place through such mechanisms as providing continuity with past customs and values related to growing vegetables, herbs, and trees (e.g., of rural people who have moved to cities; see Shava et al. 2010).

Yet, people’s relationship to nature and to place is largely absent from the policy conversation despite the paramount role it plays in the psychology of residents and the success or failure of virtually all efforts in troubled regions. The policy-making community has a tendency to focus on things and people, deemphasizing relationships, and often ignoring the value of place. The implications of these tendencies for policy and program design are profound. Although creating an identity through association with place, as captured in the notion of topophilia, need not explicitly include greenness, the added existential quality of greening brings with it an unusual power to positively affect the psychology of those involved, precisely because it reaches something fundamentally present in the human psyche. Further, greening reinforces and restores a sound sense of place. This occurs not only through reinforcing a fundamental human connection to nature but also through “remembering and reifying” past traditions related to use and stewardship of green space (Tidball et al. 2010). Thus, for individuals and for communities, including those that have been incrementally decaying over decades and sinking into the complete chaos of the red zone, continuity with the past is rebuilt, and a sensation of the unbroken created, through greening. The “brokenness” is undone and a sense of balance returns to a community.

2. Understanding Systems Thinking

The natural resources and international development policy-making communities have recognized past failures of single-objective policies that reflect so-called policy silos (Peirce 2009, Staley 2009) or stovepipe thinking (Johnson-Freese and Nichols 2011). Social-ecological systems (SES) perspectives, which emphasize the connections among people, their actions, and other components of the environment, offer a promising alternative

(Berkes and Folke 2002, Folke et al. 2002). In particular, this literature highlights two fundamental aspects of a social-ecological systems approach to healing troubled or disaster-wrought people and places.

First, the nature of post-disaster environments demands recognition that individual elements and processes within that environment have some relationship to each other, whether through feedbacks, networks, or some other mechanism. These systems are ecological not because they are green or natural—though they may be—but because they are characterized by layers upon layers of relationships that ultimately link the fate of all parts of the system, importantly, including the people within them (cf. Carlock and Fenton 2001, Jamshidi 2009, Kotov 1997, Luskasik 1998, Pei 2000, Sage and Cuppan 2001, Tidball et al. 2008).

Second, SES are dynamic. As we have seen above, the SES resilience framework presents several heuristics, including feedbacks, vicious and virtuous cycles, and basins of attraction, that help us to understand the nature of change and resistance to change in systems over time. An understanding that systems are dynamic, and that policies can be designed around expectations of change rather than of stability, is fundamental to SES resilience thinking but has not yet been well integrated into planning nor applied by the policy community in post-conflict and post-disaster response contexts.

3. Finding the Right Vocabulary

In contrast to the focus on dynamic systems among SES researchers, the lexicon often used by government agencies and first responders to crisis situations reflects a dominant view of these kinds of places as static. That lexicon, which is stamped into plans and evaluations, also overwhelmingly emphasizes conditions over characteristics. A condition, such as stability, describes how a place is doing at a given point in time, whereas a characteristic, such as resilience, expresses the nature of a person, place or SES over varying time and spatial scales (Cutter et al. 2008, Werner 1995). The problem with setting stability as a policy objective is that systems are highly dynamic, and their condition is impermanent. Relative to dynamic characteristics such as resilience, stability is easier to understand, simpler to design for, and therefore more likely to find its way into operational plans. This emphasis on stability rather than resilience, and the unrealistic treatment of stability as a permanent state, is symptomatic of a command and control mentality that imagines policy and programs directly steering a place and its people towards a final objective (Holling and Meffe 1996).

In contrast, the examples in *“Greening in the Red Zone”*, and in this volume, suggest the presence of nascent processes of transformation—of initial attempts to break out of vicious cycles and move into more positive basins of attraction. Such processes beg us to consider a different role for

the policy-making community—one of catalytic enablers for locally derived transformations that are already underway. Although examples from government agencies may be harder to come by given the prevalence of top-down approaches, they do exist. For example, Svendsen and Campbell (2014) describe how the USDA Forest Service developed a national registry and other means to support self-organized greening efforts that emerged in communities across the United States as part of the 9/11 healing process (Svendsen and Campbell 2005, 2006).

This example is notable in two respects. First, it was directed by Congress, the members of which may have more freedom than career government employees to engage in “out of the box” thinking. Second, the Living Memorials project was facilitated by a small, nontraditional and perhaps adaptive team of urban social scientists working within the Forest Service. This and several other “Greening in the Red Zone” cases suggest how, at times and places where nascent efforts exist that have the potential to cultivate virtuous cycles on a landscape characterized by vicious cycles of violence and degraded spaces, the policy-making community can step back from top-down approaches and instead develop means of enabling self-discovered modes of healing and rebuilding. Such a shift in approach will require an expansion of the policy lexicon to incorporate notions of changing characteristics, self-organization, and resilience.

4. Developing a Culture of Open-mindedness and Attention to Locally Derived Solutions

Despite the universality of human-nature connections, the role of nature in how people absorb shock and exhibit resilience in the face of dire conditions varies widely. All the cases presented in the “Greening in the Red Zone” book reflect the unique attributes of place. As such, they present opportunities for further learning about how greening efforts vary depending on place. Perhaps they also will stimulate seeking out other such cases, as well as attempts to understand their implications and potential for developing policies at the local, regional, and nation-state levels. In contrast, a culture that focuses exclusively on comparing cold statistics across different conflict or disasters settings without regard to context—such as numbers of deaths, number of injured, and number of rapes—may inhibit disaster and first response professionals from considering greening in crafting approaches to healing a traumatized community. Such thinking also may lead the policy-making community to deemphasize relationships among people, between people and nature, and importantly between people and local place.

Further, many members of the policy-making community may not have opportunities to observe or take part in community greening activities and

thus may not see greening as a local asset. One means to ground policy decisions in attention to place and to a role for greening is to draw on existing and facilitate new connections to local place and nature, as well as with community, among members of the policy-making community. In one such effort, the U.S. Secretary of Agriculture launched the People's Garden initiative, challenging all USDA facilities across the United States to implement a garden on-site or to become engaged with a local community garden. The response was overwhelming, perhaps reflecting a longing for engagement with nature and community. For example, within 45 minutes of sending an email calling for volunteers to help at the USDA headquarters garden in Washington, D.C., over 75 employees had responded, and within a year of launching the nationwide program, over 400 gardens had been established at USDA facilities.¹ Regardless of the agency for which they work, many government bureaucrats likely garden at home and are aware of the role gardening and other nature-based activities play in their everyday mental health and in recovery following personal hardship. Proponents of greening in red zones working in agencies and first response organizations might leverage these social-ecological memories and draw on such activities and awareness to create a culture of understanding of the importance of the role of local greening in recovery and resilience.

In pursuing policies that leverage existing self-organized, place-based practices and local assets, development professionals will be forced to devolve substantial design control to recipients of aid, even as they fund such efforts. The ability of members of the policy-making community to trust those who they intend to help requires a readiness to accept risk, patience, and a willingness to wait and see what green emerges from red and how they can best reinforce the positives of what emerges. This entails asking what sorts of nascent transformations in social-ecological systems are already underway, and whether it is desirable to see that change continue. Further, it requires asking if, and what sorts of, interventions are in fact needed to move the marble in the direction of a different basin. This thinking is challenging, given the political pressure on development professionals for rapid progress coupled with limited resources, and thus we recognize the challenges they face vis-à-vis our calls for recognition and facilitation of self-organized practices and assets.

The approaches we call for also place greater burden on potential recipients of aid, who are being called upon to act and to form more equal partnerships, rather than remain passive recipients of outside assistance. Such approaches require that local people recognize how much of their identity, health, and resilience is dependent on nurturing their active relationship with nature. These approaches may

1. L. Marquez, USDA, pers. comm.

also call on local people to engage in monitoring the results of their efforts, thus contributing knowledge as a kind of feedback that can be used in adapting resource management practices (Tidball and Krasny 2012). An important sign of resilience in a community and among individuals is the emergence or reemergence of healthy behaviors and relationships without prompting from outsiders, including actively engaging with nature. “To green” is a verb, not a noun, and it is the act of greening, not just the bearing of witness, that reinforces self-sufficiency, sense of community, and attachment to place.

5. Embracing New Forms of Governance

For most of the cases detailed in the *Greening in Red Zone* volume, leadership comes from the nongovernment sector. Nobel laureate Elinor Ostrom referred to “polycentric systems” of governance characterized by “multiple governing authorities at differing scales” (Ostrom 2010), and a similar concept, “overlap in governance”, is one of 11 attributes of resilient systems outlined by Walker and Salt (2006). These notions reflect governance arrangements in many of the red zone greening cases in this book, where local residents, grassroots community groups, NGOs, government agencies, and sometimes university researchers form partnerships that span from neighborhood-scale greening practices to national and trans-national nascent networks and policies.

For the policy-making community, this implies embracing new, more agile forms of governance in place of more rigid notions of *government*. An example of where this is already happening comes from the U.S. Environmental Protection Agency, which has adopted a multi-institution partnership model, including partners that engage communities in hands-on stewardship, in addressing control of nonpoint source pollution and other intransigent resource problems where more adversarial and command-control regulatory policies have proven ineffective (Sirianni 2009). Such polycentric governance approaches that incorporate human and nature interactions could be expanded to encompass planning for and responding to red zone situations, and are consistent with the notion that multiple efforts acting in partnership are needed to reduce the barriers between vicious and virtuous basins on a landscape.

Recommendations for Policymaking

The recommendations that follow are difficult, may take a long time to bring about, and demand courage from those involved. We recognize the challenges, but we firmly believe that avoiding some of the mistakes of the past will entail taking responsibility for fully confronting the existential quality of our personal and of humankind’s relationship with nature.

1. Treat environmental issues and environmentally-based solutions to policy problems with a priority that reflects their actual level of impact

The case has been made for the impact that green and greening has on lives both individually and collectively. Whether we are rich or poor, live an urban or rural existence, or are at war or peace, there is no disassociating ourselves from our relationship to nature or our dependence upon the services nature provides to us. We do not have the liberty to walk away from nature for the simple reason that we are an integral part of it. Innately we understand that our place in nature, our relationship to it, is existential. Our physical and psychological survival is ultimately dependent on the degree to which we recognize and embrace how we relate to the natural world that feeds us, slakes our thirst, cleanses our air, and calms our spirit. Things “green” and by extension the act of greening are an absolute national security imperative for every nation on earth, but particularly for those whose population density and behavior demand the most attention. Numerous other authors have made this point through discussions of food and energy security (Gleick 1990, Kobotzeff 2000), and of conflicts over natural resources (Machlis and Hanson 2008, Machlis et al. 2011). Still others have talked about a role for trans-boundary parks and conservation in peace-making (Dabelko and Conca 2002). In this volume, we add to these literatures a consideration of the importance of engagement in hands-on greening with the intent to build resilience in individuals, communities, and ecosystems impacted by conflict and disaster.

2. Emphasize characteristics rather than conditions, and systems thinking

Identify and address system characteristics, such as resilience and transformability, rather than focus more narrowly on achieving static conditions. Such an emphasis on dynamic processes is consistent with systems thinking. Previous work by Tidball and Weinstein (Tidball and Weinstein 2011, Weinstein and Tidball 2007) suggests how an environment-shaping strategy provides a path for applying such thinking in post-conflict and post-disaster development contexts.

3. Allow human experience to guide policymaking

In rare instances torture victims, disaster survivors, or former combatants confront policymakers directly. Such events are momentarily galvanizing if only because they are so dramatic and the audience so unprepared to manage and effectively internalize what they are witnessing, and they may be instrumental in sparking discussions about changes in policy. But what is the role of human experience in more rational policymaking? And what is it that is meant to be

secured if not peoples' abilities to enable positive experiences and to limit bad ones? We ignore the psychological and social impacts of our decisions at our peril. Only now, for example, is the U.S. military fully confronting the magnitude of psychological impacts of repeated deployments to combat zones, which reach far beyond military institutions deeply into our communities. Greening should be an important part of the multifaceted human experience that is considered in policymaking.

4. Relinquish control when needed

One of the defining characteristics of a dynamic system is that by definition, it is constantly changing, usually in unpredictable ways and at unpredicted magnitudes, and for unforeseen reasons. We live in complex systems, and thus imagining that we are in control may not reflect reality. And yet, policy and program design—not just in military domains but also environmental, economic, social, and virtually all other domains as well—is dominated by a command and control mentality. The analogies of holding a shallow pan of water or riding a bucking horse are apropos. The harder one holds on the more certain the water will spill or the rider will crash to the ground. Attempts at absolute control virtually ensures failure, whereas adaptation to an enabling and constraining role substantially improves our odds at making a meaningful difference, relies heavily on existing resilient qualities of the system, and by extension reduces the likelihood that we will contribute to comprehensive system failure.

Similarly, policy solutions based on the inherent assets of a place and its people are more likely to take hold and influence substantial change than those that are developed in a vacuum without input. Grassroots or bottom-up solutions may be neglected because they challenge “expert” opinion, reduce command and control, or may not conform to “regular” practice. The participatory approaches that are required of an asset-based strategy to policy and program design take time and a willingness to accept that the role of the professional is not only to educate, but also to listen, absorb, understand, and then translate that understanding into the actionable.

5. Resist pressure for immediate results

Allowing systems to transform takes time. Trust renews over generations, and collectively recognizing shared interests takes years. While people and political systems are highly impatient, long-standing strategies culled from the world of participatory project management make it possible to demonstrate continual progress by designing incremental but meaningful gains over the course of an otherwise slow process.

The policy-making community is therefore challenged not to make decisions between little and quickly on the one hand, and big and slow on the

other, but instead to seek a better understanding of the relationships between local communities' identities and institutions, and those of nations, and the contributions immediate short-term efforts can have in lowering or heightening barriers to the whole system shifting from one basin of attraction to another. In this respect, we suggest a perspective that emphasizes multiple vertical and horizontal interactions over hierarchies—that a particular level of action be treated not as a point lower or higher up in a hierarchy, but rather as a node in a network of relationships.

6. Work across sectors to incrementally incorporate environmental stewardship and management into existing programs

Addressing seemingly categorical issues, such as environment, security, education, or economic well-being, requires policymakers to work across multiple functional areas. This is made difficult through highly bifurcated implementing bureaucracies, i.e., agencies and departments charged with implementing programs that choose not to collaborate. However, innumerable opportunities exist to introduce greening into existing efforts, even if they are not yet fully connected to other programs or policies. Community-based land and resource management, for example, may be incorporated into school curricula and out-of-school environmental education programs (Krasny and Tidball 2009, Krasny and Roth 2010), and micro-lending and micro-economic development programs can favor or even explicitly encourage effective bottom-up resource management or community farming/greening efforts. Judicial and legal oriented reform projects can highlight environmental and land issues such as property rights and land use.

Community development and organizing efforts can use community greening as building blocks. Eventually enough greening-related programs will reside in multiple components of the development puzzle so that tying them together into a self-reinforcing web will not be such an impossible task after all. Greening, or the environment more broadly, may serve as a theme that roots each of the disparate sectors in holistic approaches to development post-disaster or conflict. A critical factor in incorporating greening into development strategies will be adding an individual with environmental and greening expertise onto inter-disciplinary teams in post-disaster and post-conflict settings.

Conclusion

We call upon policymakers to consider the role of participatory natural resource management—or of greening—in responses to red zones. We may look to the insights of the resilient Japanese, who have transformed their society in the 20th century to become a model of democracy and efficiency, and

who are now facing perhaps an even greater challenge in the 21st century to rebuild and transform in the aftermath of disaster of almost unimaginable scale. Yet policymakers in Japan from the very highest levels are listening to scholars and experts as well as farmers and fishermen who are encouraging a visionary approach to rebuilding after the great East Japan earthquake, tsunami, and nuclear catastrophe (Global Environmental Action 2011). Policymakers are seeking counsel from scholars of Satoyama and Satoumi (Morimoto et al. 2009, Shidei 2006, Takeuchi et al. 2003), who are encouraging a remembering and a reconnection of the Japanese culture's deep historical connection to nature. They are seeking new ways of thinking about themselves in relation to nature in the 21st century, they are reflecting societal concerns regarding safe and sustainable renewable energy alternatives, and they have invited conversation specifically about greening in the red zone. They have, simply, decided to embrace transformation, to think big about greening and sustainability.

Greening in the red zone, as a way of describing human-nature interaction after disaster and war, and as a policy approach, requires a kind of suspension of disbelief, and also a pragmatic understanding of the limitations of such an approach. Certainly greening and its attendant multiple benefits are not a magic wand to be waived over tragic circumstances to green-wash away the grim realities of disaster and war. Yet, the preponderance of empirical evidence and anecdotal corroboration as presented in this book and elsewhere regarding the value of greening in the red zone merits attention by the post-disaster and post-conflict planning and response communities. If planting trees, or caring for habitat, or gardening can restore both human morale and ecosystem service provision, and these things can happen in emergent and participatory ways with relatively minimal investment and transaction costs, and can catalyze and reinforce positive feedbacks and virtuous cycles in such tenuous and fragile periods, why wouldn't one add this arrow to the quiver of disaster planners and response practitioners?

This is what we hope to accomplish with this volume—to shed light upon the virtues of greening in the red zone, and to encourage adaptation and adoption of this approach as soon as is practicable. In light of inevitable climate change and future shocks, adding new approaches to the menu of options is the order of the day. But as important as quivers of new arrows are, the most important element is the knowledge and willingness to use them. We are boldly suggesting that the post-disaster and post-conflict response communities be bold, to think big like Roosevelt in his day, to accept the challenge of transformation following the lead of Japan today, to affirm fundamental inclinations like urgent biophilia and restorative topophilia, and to reap the multiple benefits of virtuous cycles and social-ecological services provided, via greening in the red zone.

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A Green Recovery in Cunningham Park: Drury University Responds to the Joplin Tornado

Traci Sooter, Keith Hedges, and Nancy Chikaraishi
Drury University
Springfield, Missouri

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We are all potentially connected to an unwanted disaster situation since no region is immune from some adverse risk. Most Americans live in areas that are exposed to hazards whether naturally occurring or through involvement with humankind. Natural hazards may be in the form of wild fires, heat waves, volcanoes, tornadoes, earthquakes, or hurricanes, while human intervention awakens hazards such as oil rig accidents, the physical neglect of buildings and infrastructure, or acts of terrorism. A disaster occurs when a hazard has a high degree of harm to human life, its shelter, or to ecosystems such as human lives lost, reconstruction costs of buildings and infrastructure, or the corresponding loss of fauna and flora (Hedges 2011). However, a disaster may seem distant until it happens in your backyard. One such disaster is the 2011 Joplin (Missouri) tornado. The tornado was particularly destructive: the community was plunged into darkness with over 10,000 buildings damaged or destroyed, and the loss of 161 lives.

The focus of this case study is on the Joplin community's recovery and response at ground zero of the tornado, Cunningham Park. The Volunteer Tribute Garden and the Butterfly Garden and Overlook are two major design-build projects that helped coalesce a community in turmoil. The narrative of the greening projects, their lessons learned, and recommendations are provided, beginning with the scale of the disaster event and some of the initial helping hands.



Figure 1: St. John's Regional Medical Center near Cunningham Park.

Photo courtesy of the City of Joplin, MO.

The Disaster Event

At 5:17 p.m. on Sunday, May 22, 2011, tornado sirens sounded. A veil of rain disguised the multiple vortex, EF5 tornado coming down on Joplin, Missouri (Sooter 2018). As the storm made its way across the city, it ripped a path of

destruction nearly a mile wide. The slow-moving storm became more destructive as it stalled for several minutes gaining wind speeds of more than 200 miles per hour on top of St. John's Hospital and Cunningham Park (Figure 1). When the storm finally passed, the five-story, concrete hospital was rendered unstable and the park, once filled with 100-year-old trees, was unrecognizable. The storm and the deadly debris cloud that began on the western edge of Joplin was slow to dissipate and continued on to the town of Duquesne and into Jasper and Newton Counties, a total of 22.1 miles over 38 horrific minutes. The impact was devastating. It became the deadliest tornado in the United States since 1953, and the more than 7,500 homes and 3,000 commercial buildings lost created over 3 million cubic yards of waste and caused over \$2 billion in damage (Onstot 2013).

Helping Hands

What happened immediately after the storm was best described by then-City Manager Mark Rohr as "the miracle of the human spirit" (Rohr 2012). The tornado had passed, but rain continued to pour upon the people of Joplin as they pulled themselves out of the rubble and began helping their neighbors. Community members from outside of the storm zone raced in to help. People from neighboring towns and cities also came to lend a hand. Local, state, and federal government agencies and first responders raced to the scene. From across town to across the world, the volunteers kept coming (Sooter 2018). As of April 13, 2013, the count for registered volunteers from reporting agencies and organizations was at 176,869 individuals who completed 1,146,083 hours of volunteer service (Onstot 2013).

Students, faculty, and staff from Drury University, a small school rooted in the liberal arts tradition 70 miles from Joplin, were among the volunteers (Sooter 2018). With a sense of urgency, Drury organized groups to help. Athletic teams collected and distributed vans full of food and supplies. Faculty and staff, in small groups and independently, assisted with search and rescue, served meals, collected and distributed clothing and supplies, and provided counseling. One staff member even suited up in his clowning gear to cheer up children in shelters. While this staff member was entertaining the children, he also noticed that the women in the shelters did not have purses or any of the things they would normally carry in them, and children did not have books. He soon organized a campus purse and book drive seeking donations from faculty and staff. The campus community contributed 200 filled purses and 1,100 books to the women and children in the shelters.

From moments after the storm lifted in May 2011 through spring 2014, Drury University faculty, staff, and students contributed more than 12,000

hours of volunteer service in aid of Joplin (Sooter 2018). A majority was brought to bear on the re-greening of Cunningham Park.

Responding with the Re-Greening of Cunningham Park

Cunningham Park, Joplin's first city park, has been recognized as the location where the tornado first reached its maximum intensity and has been referred to as ground zero. The park has a deep history since the beginning of the 19th century. Then-Mayor Thomas W. Cunningham donated 7 acres of Blendville, MO, land in 1899 that was annexed and became known as Cunningham Park (Simpson 2011). The Women's Park Association secured a tax levy to develop the park and they are responsible for its early success. By the Great Depression, the park was vibrant featuring a fountain, flowerbeds, bandstand, shelter, playground, refreshment stand, swimming pool, and bathhouse. Next to the park was the notable Carl Owen house. The house was built in 1911 and majestically overlooked the park from a higher elevation with its 19 iconic "airplane" dormer windows. The home sat at the northeast corner on Porter Avenue. All that changed when the tornado lifted the iconic feature of Cunningham Park off its foundation then dropped it on Porter Avenue. The park, the Owen's home location, and the land where two neighboring homes once stood, became a focal point for re-greening with two centerpiece projects by Drury University.



Figure 2: The SmartMob! heads to Joplin.

Photo by Mark Miller, used with permission.

The Volunteer Tribute Garden

In July 2011, the Drury Design-Build Program (part of Drury's Hammons School of Architecture) partnered with the ABC television show "Extreme Makeover: Home Edition" to help create a second wave of awareness and volunteerism for Joplin. The Joplin community asked Drury Design-Build Program to design and construct a tribute in Cunningham Park to thank the 170,000 volunteers that assisted Joplin after the devastating storm. The result was The Volunteer Tribute, with a monument bearing the sentiment "Miracle of the Human Spirit." The architecture students designed and built (along with the aid of other volunteers and professionals) a garden space honoring the volunteers who came to the aid of Joplin. Students developed the conceptual design, construction documentation, and execution of construction as part of their third-year studio project.

The design featured four rings of stone walls, four bronzed tools, and four stainless steel pedestals represent the processes of the search and rescue, debris removal, demolition, and the rebirth of Joplin. At the center of the ring, a mosaic butterfly symbolizes the reported stories of butterflies protecting children during the storm (Real-McKeighan 2011). The Tribute was implemented under the show's broadcast network television constraints (Verschoor 2012). The show negotiated to rebuild a neighborhood of seven houses in 7 days and to restore Cunningham Park. The show's contribution was built in 168 hours, with continuous, round-the-clock work.

The construction introduced "SmartMob!", a flash mob with a purpose: to engage the greater Drury University campus in the project (Figure 2). The SmartMob! premise is high impact, low time commitment projects. Students from across campus were informed via social media that a service project would happen on a particular date. Enthusiasm for the project was built over a 2-week timeframe as additional details were covertly released. It was only when the 120 students, faculty, and staff arrived at the construction site at Cunningham Park, did they learn that they would lay the sod for the Volunteer Tribute. This first-ever SmartMob! installed 26,000 square-feet of sod in less than 45 minutes. They were so energized by the experience, they continued to lay sod throughout the 6-acre park. A SmartMob! was initiated again for the construction of the stone walls at the Butterfly Garden and Overlook. Volunteers were serenaded by 20 music therapy students who provided a "rejuvenation station."

The Butterfly Garden and Overlook

A national grant from the TKF Foundation through their Nature Sacred Awards Program permitted the students to design and build a healing garden in Cunningham Park. TKF provided funding for six research projects designed to scientifically prove the inherent value and need for nearby, open access



Figure 3: Butterfly Garden and Overlook.

Photo by Evan Melgren, used with permission.

to urban nature. The purpose was to demonstrate how nature in the city can provide sacred, spiritual, and healing experiences for individuals and communities. In 2013, the Butterfly Garden and Overlook was one of the six funded projects offering students an opportunity to create a place within nature where Joplin residents could heal from the loss of a loved one, home, job, and sense of security or community as a result of the tornado (Figure 3).

The design of the Butterfly Garden and Overlook weaves together the conceptual ideas derived from Worden's four tasks of mourning (Worden 1991). Worden recognizes the process as accepting loss, processing the pain of grief, adjusting to the new environment, and creating an enduring connection with what was lost. The process is coupled sequentially with a portal, path, destination, and sense of surround, common elements among all TKF funded projects. The portal, symbolizing accepting loss, is the front door to the Carl Owen house, one of three houses destroyed by the tornado that were replaced with full-scale frames. The path is a labyrinth throughout the garden, which allows the users to process grief. The destinations are four sacred, private spaces with a bench and a journal as a means of adjusting to the new environment and healing. The surround is the circular butterfly garden and complimentary house frames to provide a connection to what was lost. The garden features a butterfly pavilion, symbolic water features, and educational storyboards of heroism and children's accounts of butterfly people. The Volunteer Tribute and Butterfly Garden and Overlook are two projects that re-greened Cunningham Park and facilitated recovery.

In Their Own Words: A Community Recovering

The oral histories and journal entries at the TKF bench are two foundations that demonstrate how the community recovered. Drury University collected, transcribed, and archived several dozen survivor stories. The stories provide the emotional depths at the time of the disaster. The post-disaster journal entries are from individuals willing to share their thoughts in the sacred place.

Oral Histories

Selected histories express the meaning of the park's loss, the symbolism of trees, and the guidance for healing. One survivor spoke about the park.

I miss the park, the gazebos, the trees, and miss watching people in the park getting married, playing with kids. I used to go outside on my lawn chair and just listen to music and enjoy the scenery. I still do that. I take my car with a lawn chair, put some music on and just sit where my house used to be. I will basically look at where the hospital used to be and I don't know what to think. I go over to my lot and I still mow the yard and make it look really nice.

The Woman's Park Association helped develop the park and its 200-plus trees. One survivor noted the significance of trees in their lives.

That tree in my backyard is a symbol for me of Joplin. It is a survivor, it healed, and now it is growing again. One minute you are sitting there, storm warnings happened, and then my life changed in an instance. I am lucky to be alive. Joplin will come back but it will take a while. Joplin will be bigger and better but it will not be the old Joplin.

One survivor mentions the need for grieving guidance and requests a book.

I know that everyone needs to grieve how they need to grieve. You can't put any time on grief. You can't. Whatever it is, your process should be your process. That's one of the things they kept telling me. I'm like, 'Give me a book, give me something so that I know what I'm supposed to do.' And they're like, 'There is no book.' And I said, 'What do you mean there's no book?' They said, 'There is no normal on grief. Everybody's different.' It took me a long time to get that through my thick head, that there was no playbook that I could read. There's a how-to book on everything else. I'm like, 'There's no Grief for Dummies book?' and they're like, 'No. There's ones to help you along the way, but there's no playbook to tell you what is normal because there is no normal. What you knew is not what you know anymore.'

The design team has responded by bringing Worden's four tasks of mourning to life. The notion is that the re-greening will facilitate healing.



Figure 4: A father reading the healing journal to his child.

Photo by Evan Melgren, used with permission.

Journal Entries at the TKF Bench

At the Butterfly Garden and Overlook, the four sacred destinations have benches with journals. The grant provider furnishes a bench, which is built by inmates. The bench “is place of respite that invites one to pause and reflect. More than just a place to sit, the presence of a Bench in an Open Space Sacred Place is an invitation to pause on one’s journey—to sit, to rest, to breathe, to be present, to experience all the gifts that an Open Space Sacred Place has to offer” (TKF 2017).

The journal is a specially created waterproof, blank book and pen combination located beneath the bench (Figure 4). The journal invites visitors to articulate their experience. Visitors share words or images of the experience of being in a sacred place. More than a simple diary, record, or log of daily events, a journal is a collection of inspiring thoughts and reflections that attest to our need for opportunities to connect with each other and be in nature (Stoner and Rapp 2008). Over 25,000 journal entries have been submitted at various sacred spaces in the United States and have been coded by researchers. One specific to the project was, “What a beautiful Memorial. I remember May 22 like it was yesterday. I remember the heartache felt. This park brought a sense of peace and healing.”

Becoming a Sacred Place

The dual identities of Cunningham Park as the city's first park and as Joplin's ground zero uniquely positions the park as a sacred place primed for rebirth. The community exhibits place attachment and conducts remembrance activities at the park and the park has become a national destination.

The oral histories and journal entries express a sense of place attachment by recognizing Cunningham Park as a home and a connection with the survivors' faith. Being Joplin's first city park, the place has been the home to many functions. In essence, it is a "third place," where individuals, not related by birth, share a kinship by gathering in groups and establishing feelings of a sense of place (Oldenburg 1999). The frames, of the Owen and neighboring houses and the healing garden is Joplin's "third place." The sacred home for the bench and journal is a place that "is remarkably similar to a good home in the psychological comfort and support that it extends" (Oldenburg 1999). Norberg-Schulz (1988) states, "that 'landscape' cannot be isolated from human life and from what is divine," implying the life and divinity are coupled. Faith plays an important role in place attachment: "While the characteristics of place itself can inspire and cultivate devotion, spirituality, community, and tranquility, a person's connection to place is not solely reliant on the qualities of place and can also be learned through the process of religious socialization . . . and the role of ritual, artifacts, storytelling, and the experience of place in the learning of place attachment" (Mazumdar & Mazumdar 2004).

Joplin has recurring remembrance activities at the park. On the 6-month anniversary, a ceremony was held by the city of Joplin in which they planted one tree in honor of the victims and unveiled a small memorial that held the 161 names of those lost. The Walk of Unity occurred on the tornado's 1-year anniversary with over 10,000 people recreating the tornado's destructive path in reverse, which concluded at Cunningham Park (Figures 5 and 6). The path has two poignant reminders where the reverse direction represents the healing process for individuals and families, while the gathering at ground zero in Cunningham Park provides community strength. Boston Globe correspondent Juliette Kayyem wrote about the Walk of Unity: "Joplin isn't just a story of hope winning over pessimism. What makes Joplin a truly American story is that its transformation is a triumph of local ingenuity, starting with the most democratic of events: a public meeting" (Kayyem 2012). Kayyem's insightful comment highlights an example of community and healing at a place re-greened. Each year since then, a ceremony of remembrance called "Joplin proud" takes place in the park.

As the first green space restored in the heart of the tornado's path, Cunningham Park has become more than healing gardens and now is a national destination for the masses. Although the design of the park was



Figure 5: The Volunteer Tribute Garden at Cunningham Park on the 1-year anniversary.

Photo by Jared Hoffpauir, used with permission.



Figure 6: Volunteer Tribute's central gathering space, mosaics, and plaque to thank the volunteers.

Photo by Evan Melgren, used with permission.

meant for the local Joplin community, according to the Director of Parks and Recreation, Chris Cotten, the park sees up to 1,200 visitors on any given summer day. The parking was redesigned to permit bus parking for tourist visitors. The community considered three elements built in the first 6 months in the park to be “memorials”: The Victim’s Memorial, The Volunteer Tribute, and the Children’s Reflecting Pond. All three drew tourists. Later, the addition of the Butterfly Garden and Overlook with its multifaceted layers of symbolism, iconic frames of the houses that once stood on the property, and the story boards further strengthen the community place attachment and sacredness of Cunningham Park. Furthermore, the community continues support to maintain the park through its heavy traffic demands.

Lessons Learned

The lessons learned have a theme of continuing community support, a strengthened stewardship.

- After disaster, people from across the world will show up to help, some will stay for months, some will stay indefinitely. These groups tend to be very dedicated and reliable.
- The success of the four stages of disaster recovery (search and rescue, debris removal, demolition, and rebuilding) can be attributed to the leadership, organization, and dedication of the municipality.
- The success of the rebirth of the community was due to the can-do attitude of the citizens who picked themselves up out of the rubble and their constant articulation of gratitude for the volunteers.
- Re-greening soon after disaster gave community members relief from the grayness created from the debris removal scraping the landscape.
- Archiving stories of heroism, symbolic spiritualism, and storm facts and making them available to community and visitors became important in healing the community. Most visitors to Cunningham Park spend time reading the storyboards in the Volunteer Tribute and Butterfly Garden and Overlook.
- Place attachment was prevalent after the storm. Many community members mentioned “missing” the iconic Owen “airplane window

house.” Creating the outline of the home gave community members an enduring connection to the past to allow them to move forward, but not forget (Worden 1991).

- Shards of debris became representative of people’s lives. Reconfiguring the debris in a meaningful way (butterfly mosaic and in storyboard pedestals) gave peace to some, was embraced by many, and became an important element in emphasizing the impact of the storm on lives.
- The theme “miracle of the human spirit” became a sense of pride for the community and supported the endurance needed to complete the four stages of recovery. Wristbands bearing the phrase were handed out and a sculpture of the wristband located in the Volunteer Tribute became a photo spot for the community as families posed in the 6-foot circle.

Recommendations

- Listen, be inclusive, and collaborative. All volunteers matter and can have overwhelming impact on design and execution of a project.
- Survivors need to tell their stories. Listen, remember, share, and respond through design. Butterfly stories were important to survivors and were memorialized on signs, murals, and were welcomed in the two Drury projects.
- Re-green soon after disaster. Greening gives community members relief from the grayness created as the landscape is scraped during debris removal stage of recovery.
- Archive stories of heroism, symbolic spiritualism, and storm facts and make them available to community and visitors. This becomes important in healing to the community
- Create an enduring connection to what was lost, as outlined in William Worden’s fourth and final step of the grieving process (Worden 1991). This could be a landmark, a symbol, or in the case of Joplin, the outlines of three homes in Cunningham Park which represent the 5,000 homes lost across the community, or shards of debris becoming a butterfly mosaic.

- **Articulate a rallying theme to unite and uplift the community. In Joplin, the “miracle of the human spirit” theme and the wrist bands given to volunteers bonded volunteers and the community. Chris Cotten, Director of Parks and Recreation in Joplin, made this observation:**

One day, shortly after we completed the Extreme Makeover of Cunningham Park, when we re-sodded the entire park in just a few hours, I turned the corner at 26th and Maiden Lane and noticed a family sitting in the grass picnicking. I saw that family in Cunningham Park doing something so normal before the storm and knew, everything would be alright.

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Codesigning a Workshop Garden

Victoria Marshall¹ and Renae Reynolds²

1. Landscape Architect, Singapore
2. Urbanist, New York, New York

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Rather than being abandoned, a waterfront garden was upgraded and expanded after Hurricane Sandy damaged much of the Rockaway Peninsula in Queens, New York City in 2012. While the garden transformation was undertaken by the landscape architecture practice Till Design,³ and coordinated by a larger team called Landscapes of Resilience,⁴ the role of the gardeners is equally important to bring forward. We are a landscape architect and educator (Marshall, principal of Till Design) and a project coordinator and urbanist (Reynolds) and we participated with gardeners during a recovery process following Hurricane Sandy. In this chapter we show that the upgrading and expansion of the garden can best be seen as emerging from the situated efforts of the gardeners.

The garden is located at Beach 41st Houses, which is a New York City Housing Authority (NYCHA) complex built in 1973 and it is now home to approximately 1,700 people. The Houses are part of Edgemere, a neighborhood on the Rockaway Peninsula. Notably, the Houses are located on the low lying Jamaica Bay side of the peninsula. They are not alongside the iconic boardwalk that characterizes the Atlantic Ocean, which was more urgently renovated with dunes as a recovery and resiliency measure after Hurricane Sandy. The garden is a private, community garden and is composed of a long row of personal garden plots arranged parallel to the shore. All of the plots were destroyed by Hurricane Sandy and the gardeners sought to rebuild them in the same location. The Landscapes of Resilience team (hereafter referred to as the Team) was funded by the TKF Foundation⁵ to assist in this rebuilding work and to expand the garden area so that more residents might use it. The designed features of the expanded garden include a reliable and accessible fresh water source for each plot, a shared lawn area, planting beds with flowering plants and trees, a swale, additional gardening plots, signage, benches, and a pergola.

The TKF Foundation supports the building of gardens as sacred spaces. The Team interpreted the notion of the sacred as emergent, through action and interaction. Entitled the Workshop Garden, the design concept for the upgraded and expanded garden came from an observation that the gardeners solve problems and generate ideas through “workshopping,” which is something broadly defined to include humans and nature. Till Design aimed to build more comfortable spaces for such interaction to occur thus, fostering the possibility that a sense of sacredness might arise. Settings were designed for events and meetings as well as chit-chat for productive dissent and consensus. The Workshop Garden was, therefore, conceived as something that is never finished. It is a productive and dynamic space that is constantly codesigned by people as well as nonhumans. By

3. <http://tilldesign.com>

4. https://www.nrs.fs.fed.us/nyc/focus/resilience_health_well_being/landscapes_resilience

5. <http://naturesacred.org>

codesign we refer to design action that is both diffuse and shared and can be found outside of human agency.

When we began the project in 2012, we elicited the knowledge and experience of the gardeners and grounds staff of the Houses. Rather than focusing on consensus building alone, our approach was intentionally open and flexible to expression, contention, and negotiation. What we found, over time, was that the recovery and rebuilding process was generally supported by collaboration. Importantly, we also found that collaboration was sometimes undermined by everyday tensions. We have chosen to bring these everyday tensions forward because they illustrate how the gardeners shaped this project.

In an image essay format, we lay bare the ways that everyday disturbances occur amidst larger disturbances, such as the Hurricane, and how these more benign or routine tensions presented challenges to recovery. We have chosen to pair text and image vignettes evenly as this allows us to best communicate the variety of granular tensions we encountered, and shaped. We believe that this format demonstrates how our work was impactful and genuinely fostered social and social-ecological resilience within a recovery process. Ultimately, we aim to give recognition to the persistence and resilience of the gardeners as they continue work together to strengthen social ties and develop collective mechanisms for recovery amidst a demanding coastal setting in New York City.

During an earlier project conducted by coauthor Reynolds,⁶ a small intergenerational group of women was convened to reflect on the history and present state of their Rockaway neighborhoods. They were senior women who had chosen to move to the Rockaways between 1970 and 1978 as well as young women in their sophomore and junior years of high school. The older generation shared personal stories about moving to the peninsula. One woman moved from the U.S. South in search of economic opportunity. Another sought safety for her daughters after witnessing harassing encounters between them and men in her Harlem neighborhood; this woman remarked on the different lifestyle Rockaway offered. Yet another spoke about a chance excursion to Rockaway with her fisherman husband. When they came across the newly built Ocean Village, now renamed Arverne View (a housing estate that was developed after many beachside hotels and bungalows were demolished), they decided to live there so they could go fishing together. Accordingly, they were a part of a wave of African Americans moving to areas that were previously settled by Irish and German-Jewish immigrants.

In addition, the older generation described Playland, a much-loved amusement park that was located in the Rockaway Beach and Seaside neighborhoods

6. "Towards a Collective Future: Collectively curating alternative narratives of the past" was Reynold's 2015 MA thesis submitted to the Theories of Urban Practice program at Parsons School of Design. Marshall was Reynolds' thesis supervisor.



Figure 1: Joy.

All photos from worldsfairphotos.com, used with permission.

of the peninsula (Figures 1A, 1B, 1C, 1D). The park was closed in 1987 due to disinvestment and increased insurance premiums. Prior to the closing, the park had been bifurcated by Robert Moses' development of Shorefront Parkway. The older women described Playland as a place of community. The social life of the Rockaways in the 1950s–1970s was fraught with racial tension and spatial conflict (Kaplan and Kaplan 2003). Playland however, allowed for *joy*, comingling, and connection. Long after it was dismantled, memories of the amusement park shaped a sense of loss that resonated among the younger generation. They described feeling jealous for never having known that version of Rockaway. Thus, we assert that the demolition of Playland and other such disturbances have been profoundly disorienting, and are as resonant within the collective memory of the Rockaways as the 2012 Hurricane disturbance.

Hurricane Sandy made landfall in the Rockaways on October 29, 2012, and the Beach 41st Houses' residents experienced approximately 4 feet of



Figure 2: Refusal.

Photos A and B by Victoria Marshall; photos C and D by Elizabeth Gilchrist; all used with permission.

flooding across the grounds and in the first-floor building lobbies. The residents lost power for 2 weeks and had to rely on back-up generators. Some residents reported sporadic power outages for a month. In a response to the storm, NYCHA closed the Houses' community garden because officials feared that the soil was contaminated due to the inflow of water from Jamaica Bay. One year after the closure, NYCHA tests proved the soil was safe, and the garden was reopened. In the meantime, most gardeners abided by the closure rule. Their unattended plots became overgrown and filled with windblown trash (Figures 2C and 2D). However, in the midst of the sense of uncertainty about the future of the community garden, two gardeners refused to stop gardening. This is because those gardeners grow vegetables and they form an important part of their diet and household budget (Figures 2A and 2B).

The Houses' community garden was founded in the early 1990s by residents and it is composed of 32 plots. Each plot is enclosed by a chain link fence and secured by a padlocked gate. In addition, each plot is numbered and



Figure 3: Desirable.

All photos by Victoria Marshall, used with permission.

registered to a specific gardener. Residents reapply every year for permission to manage their plot and in general, one or two plots become available for new owners each year. The garden is a setting that allows for a pleasant experience of the mostly still waters of Jamaica Bay. In addition, the Houses' shoreline is enlivened by the presence of dogs and their owners, fishermen, and a group of residents who relax in a shelter made of found materials (Figures 3A and 3B).

In response to the prevalence of chain link fences around and within the Houses, an initial design idea for the expansion of the garden was to remove part of the fence and open an access point from the garden to the bay. In addition, a "workshopping" setting was proposed under an adjacent mature tree that cast a deep, welcoming shade. This idea was rejected by the gardeners. The response ranged from a view that a gate would be a nuisance and for some, it was undesirable. There was a perceived fear that strangers might come through the gate and steal plants and or tools from the gardens. Although there emerged an agreement that the gate was possible, there was



Figure 4: Inside.

All photos by Elizabeth Gilchrist, used with permission.

consensus that it needed to remain locked. Consequently, coauthor Marshall decided to change this design concept. She removed the gate to the bay and relocated the “workshopping” setting into its present location in a new pergola. This is one of many redesigns that were made to uphold a collective vision for the expanded garden (Figures 3C and 3D).

Gardening restarted, officially, in the summer of 2014 and the Team hired a community organizer to support the gardeners in their efforts to clear their overgrown plots (Figures 4A, 4B, and 4C). The everyday presence of community organizer, Elizabeth Gilchrist, brought to our attention many tensions. In particular, there was contention about the appropriate use of the lawn, which was to become part of the expanded garden area. Dog owners were using it as a space to exercise their dogs however, dog waste was consistently left behind (Figure 4D). There was a fear of encountering an unleashed, large breed dog such as, a pitbull. For example, gardeners had experienced their smaller pets feeling threatened when out for a walk, and sometimes the



Figure 5: Pond.

All photos by Victoria Marshall, used with permission.

gardeners themselves feared being attacked. For these reasons many gardeners felt irritated by dog owners' behavior, would not walk on the grass, and discouraged their children from playing there.

The gardeners convened to develop a solution to this problem and there was a design outcome. In the spring of 2015 the Team coordinated a series of weekend signage workshops. Signs were created by the gardeners to express the meaning and personal sentiment they held for their garden plots. In addition, the signs were designed to counter the vernacular style set by NYCHA. Rather than the use of 'NO!', the new signs engaged messages that supported positive decision making about the appropriate use of the lawn.

Within the expanded garden area water pools when it rains. In addition, when high tide and storm events coincide, further waterlogging occurs. It mostly collects in two large areas; the first area is characterized by an emerging saltmarsh-like environment. A member of the NYCHA grounds staff stopped mowing this area in 2014 because it was consistently so wet that



Figure 6: Listen.

All photos by Victoria Marshall, used with permission.

her mower would get stuck. The second area was more critical for Till Design to address because the waterlogging regularly made that lawn area muddy and unusable. The design solution was to build a pergola on elevated ground (a covered shelter with a picnic table for events and meetings) and construct a swale to direct and absorb surface water flow (Figures 5A, 5B, 5C, and 5D).

The swale concept initially generated much chit-chat among gardeners and grounds staff alike; “We don’t want a pond!?”, “Who will maintain it?—not us!” Ultimately contention about this proposed change allowed us to engage in a meaningful conversation about sea level rise. Rather than building a wall or a levee, a swale is a design element that ameliorates everyday waterlogging as it absorbs surface water and allows it to infiltrate slowly after a storm passes or the tide subsides. The bay is encroaching on the grounds at the same time as the gardeners are elevating their plots and embedding their gardening practices deeper into the shoreline. Our approach for engaging this situation



Figure 7: Privacy.

All photos by Lindsay K. Campbell, USDA Forest Service, used with permission.

was to find a material solution that will help the gardeners live better with the everyday flux of water rather than, trying to keep it out.

As the expanded garden design project moved forward, our codesign process became an increasingly embedded experience (Figures 6A, 6B, 6C, and 6D). We operated from the standpoint that the gardeners should have an opportunity to make close connections with us. In order to support the development of trust and mutual understanding about our intentions, we continually met with the gardeners to build a garden that was reflective of their values, experiences, and sense of meaning. Coauthor Reynolds and the contractor Craig Desmond became people to whom the gardeners could ask questions and convey creative ideas or feedback on a particular design element. This became an essential role after Gilcrist departed the project to begin her studies.

An example of this occurred when Desmond demarcated the boundaries of a new planting bed with spray paint. The gardeners had seen the

approved design in the form of drawings many times but, as lines were painted on the grass, everything became more real. One gardener sounded the alarm vociferously because the garden beds were perceived as “too big” and overlapped with an area where children sometimes play. After listening, coauthor Marshall revised the planting bed layout.

While this might be understood as an example of the limits of representation and a reflection on the limited ability of the gardeners to read a plan, which is an abstraction of a place they are familiar with. We share this moment of tension in order to reflect upon the garden codesign process more generally. The chit-chat with Reynolds and Desmond, which continued until there was a consensus about the appropriate extent of the expanded garden, was an important moment that brought the gardeners closer together.

In the spring of 2013, in the midst of an impending storm, the residents and the NYCHA Green Team planted chrysanthemums and ornamental cabbages under an ominous grey sky (Figures 7A, 7B, 7C, and 7D). The planting workshop was as an initiative supported by NYCHA. We saw it as an opportunity for the gardeners to be together outside of their individual plots and to create something jointly. During this workshop a theft occurred. Gilcrist exclaimed that someone had been in an avid gardener’s garden and stolen her vegetables. The gardener, in a moment of anger and frustration, then began to pull her plants out at the root, ripping them from the soil and discarding them all. She was defiantly letting us know that she’d rather quit gardening than have her produce stolen.

The Houses are part of a neighborhood where many people are resource poor. It is not a stretch to imagine that a hungry resident would help themselves to food. Nevertheless, the gardener felt a distinct sense of trespass—a feeling shared by all of the gardeners. The private quality of garden plots is evident in their layout, selection of materials, and arrangement of plants. For example, more valuable plants are located away from the shared path and some are covered in protective string. Valuable items such as gardening tools are stored in gardeners’ apartments and they are transported using hand carts. The theft of the gardener’s private vegetables reinforced assumptions about what exactly is shared or not in this community garden. Her fellow garden members rallied around her and with their consolation, she recovered from the disappointment of the moment.

The Houses’ gardeners were an informal garden collective at the start of the Workshop Garden project (Figures 8A, 8B, 8C, and 8D). After they felt supported in their efforts to organize, they coalesced into an official NYCHA Resident Green Committee (RGC) in the winter of 2016. As an RGC the gardeners entered under an institutional umbrella, which allowed them to apply for small grants for self-led beautification and community engagement



Figure 8: Collaborate.

All photos by Victoria Marshall, used with permission.

workshops. At this time, a group of local organizations and individuals came together to support greening in the surrounding neighborhood and raise the profile of the already existing resilience activities of the residents.

Three greening sites—Edgemere Farm, Seagirt Community Garden, and The Rockaway Youth Task Force Garden—joined forces with coauthor Reynolds and the Beach 41st RGC secretary. The group became known as the East Rockaway Growing Coalition (ERGC). The name intentionally emphasizes the east end of the peninsula, as the locus of their network, in order to differentiate their work from those groups on the west end. This is because the east end has received the least attention, historically, and does not figure in the summer beachfront showcase, which signifies the west end. The ERGC participated in the many community meetings throughout 2012–2016 that were about the redevelopment of the peninsula after Hurricane Sandy. The group acted to fortify the community and request access to the promised new resources. In this way, the workshop approach expanded its focus of concern

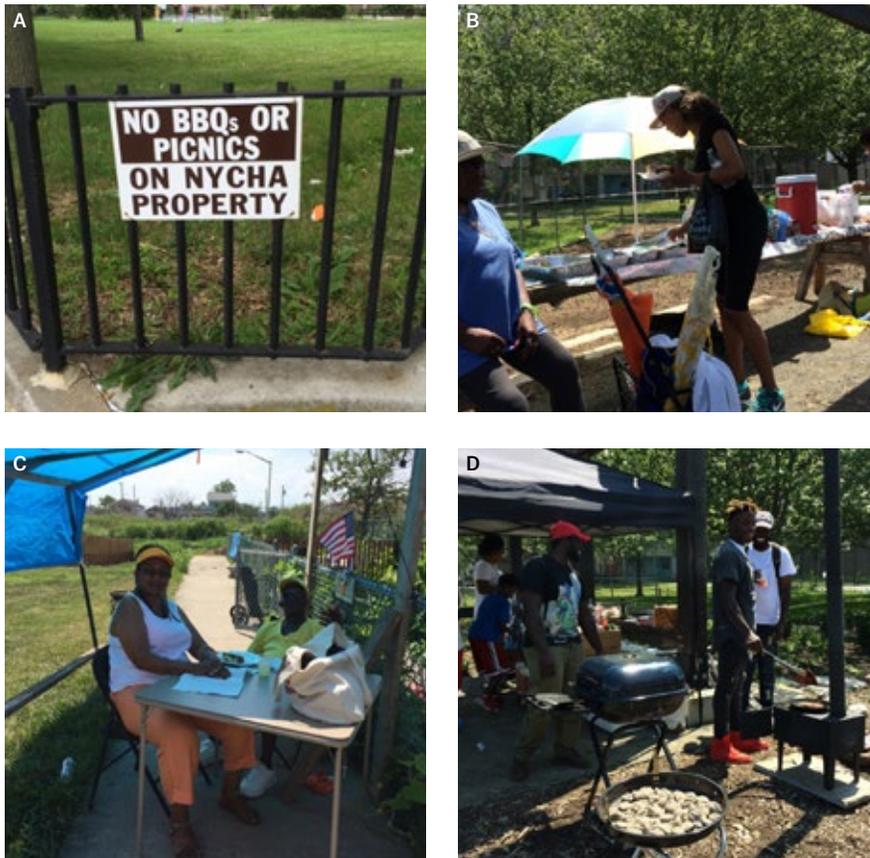


Figure 9: Picnic.

All photos by Victoria Marshall, used with permission.

from the immediate garden space and into the surrounding neighborhood, toward a collaboration with other community gardeners, and beyond.

In the early summer of 2015, the Houses' residents were concerned about being outside because a shooting incident had occurred one recent afternoon. During this tense summer, we were joined by artist Carmen Bouyer for a series of weekend signage workshops. We later realized that our playful presence helped the gardeners to be outside more, and so we planned more events for the next year. Although gatherings are discouraged by NYCHA, in the summer of 2016 the Team hosted a potluck picnic in the pergola, even though the roof had yet to be installed (Figures 9A and 9B). There were also two picnics in the fall of 2016 after the roof had been completed.

During these events, people create spaces anew. For example, the contractor team at Natural Garden Landscapes rigged up two stoves and cooked for everyone (Figure 9D), while some gardeners hosted separate small gatherings in their garden plots. The garden secretary was inspired by these events



Figure 10: Care.

All photos by Carmen Bouyer, used with permission.

and in the fall of 2016 she hosted a workshop of her own initiative. Supported by a community block grant, she hosted art classes where participants were invited to tour the gardens with her and then paint something that inspired them. Looking forward, a gardener shared with us that she would like to host weekly church group meetings in the pergola. Another gardener was planning for her daughter’s birthday party in the garden. A third gardener set up a semi-permanent shade structure across the path so that his partner, who is not a gardener, can join him outside on the weekend (Figure 9C).

The planting beds that surround the pergola were built by volunteers in the summer of 2016. Relying on the collaborative networks established during our time of engagement, we elicited support from neighbors, including a tenant association and resident green committees in other nearby public housing complexes, the New York City Department of Parks and Recreation, NYCHA’s Green City Force, and local community organizations including the members of the East Rockaway Growing Coalition. One hundred people

participated in this event however, the question remains who will care for the Workshop Garden going forward? And how will the Workshop Garden continue to support resilience?

While the expanded garden codesign process and the project of constructing it brought more community connections and beauty to the Houses, it also created new tasks for an already understaffed NYCHA grounds crew (Figures 10A, 10B). Our goal therefore, has been to encourage the gardeners to continue to care for the spaces beyond their plots, in partnership with the grounds staff. We were inspired by the gardeners who had already ‘jumped the path’ and planted decorative plants in the lawn opposite their garden plot. In response, Till Design added five new gardening plots in the lawn so that more gardeners could join. The new plots include painted flags, which signal that the expanded garden area is a specially cared for place (Figures 10C, 10D). Lastly, funding from a small grant supported ongoing garden making and maintenance in the 2017 growing season.

Conclusion

While Hurricane Sandy was the initiator of our presence at the garden, we have emphasized the important historical context of the Rockaways, which has experienced both social and natural forms of disaster. New York City Urban Renewal in the 1960s and 1970s is an example of a devastating redevelopment project that removed entire neighborhoods on the Rockaway peninsula. It left a patchwork of vacant lots, historical beach bungalows, single-family homes, as well as, public and private housing estates. In spite of the challenges, Rockaway’s decentralized networks of activists and advocates play a critical role in supporting the resilience of the residents today.

The legacy of African American religious organizations of the mid 20th century, which fought to ensure the right to adequate housing for communities of color under great racial tension and discrimination, persists (Davies 1966). This is linked with today’s local nonprofit efforts to politically engage diverse communities of young people, and to support healthier environments through care. The east end of the peninsula is anything but inactive and accordingly, we worked to connect residents of the Houses with the current group of activists and advocates. As such, the Workshop Garden now functions as a type of public space. It affords the opportunity for encounters that range from a personal sense of the sacred to heated chit-chat. In addition, the garden has better spaces for structured dialogue aimed at specific directives like producing food as well as, community building and participation in debates about the next round of redevelopment on the peninsula.

Embedded engagement helped us to join with the gardeners and their gardens, and to learn with them how to practice amidst everyday disturbances, which stand on top of historical disturbances. Our codesign role in the Workshop Garden was completed in the fall of 2016 and we found that the gardener-led process allowed us to shape a garden that is actively supporting the transformation of the peninsula in an ongoing way. We also found that it is only because of the gardeners practices that this type of public space in a private community garden is possible, and sustainable. Finally, we found like the gardeners themselves, we have a deep attraction to the individual garden plots, which help to make the Workshop Garden and this shoreline so active.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Response and Future Readiness: Vegetation Mitigation After Destructive Wildfire

Hillary K. Fishler,¹ Miranda H. Mockrin,²
and Susan I. Stewart³

1. Oregon State University, Corvallis, Oregon

2. USDA Forest Service, Baltimore, Maryland

3. USDA Forest Service, retired

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Over the past several decades, wildfire has become an increasingly costly and destructive natural hazard as a result of a combination of ecological and social factors, including climate change, decades of wildfire suppression on the landscape, and residential expansion into fire-prone vegetation (Fischer et al. 2016, Flannigan et al. 2013, Moritz et al. 2014). From 1999 to 2016, an average 1,449 residences were destroyed annually by wildland fire and billions of dollars spent on fire suppression. In response to the challenges of wildfire management, the National Cohesive Wildland Fire Management Strategy advocates the creation of fire-adapted communities (FAC), communities that can coexist with wildfire because of their investments in education, vegetation thinning (i.e., reducing fuel), planning and management of the built environment, and appropriate suppression and emergency response (Fire Adapted Communities Coalition 2014) (Figure 1). The FAC program envisions a collaborative, iterative approach where residents, communities, and governments work to identify and implement needed wildfire risk reduction actions over time, as resources, threats, and opportunities change. Unlike other natural hazards, wildland vegetation management is a key part of preparing for and responding to wildfire, as vegetation is both a vulnerable resource and a source of risk.

Combined, vegetation management on the landscape, vegetation mitigation around the home, and other human interactions with natural systems (e.g., ignitions, suppression response) play essential roles in determining the frequency and severity of wildfire (Parise and Cannon 2012, Syphard et al. 2013, Fischer et al. 2016).

However, unlike other natural hazards, social scientists are only beginning to examine what happens *after* wildfire events (Mockrin et al. 2016, Paveglio and Edgeley 2017). A large and growing body of social science literature focuses on risk reduction and management *before* wildfires (McCaffrey 2015) but post-wildfire studies⁴ have mostly been case studies, focusing on individual locations and often one facet of community recovery or response (e.g., psychological distress, changes in building codes) (Carroll et al. 2005, Eisenman et al. 2015, Mockrin et al. 2015, Mockrin et al. 2016). It is unclear how vegetation mitigation might change after a fire—mitigation alone and in combination with other strategies that communities may pursue to reduce wildfire risk for future occurrences. Studies of hazard impacts and recovery often focus on large events, such as hurricanes, earthquakes, or flooding, which damage thousands of homes, or more, in densely populated urban areas (Highfield et al. 2014, Newman et al. 2014, Pais and Elliott 2008). In these larger metropolitan areas, green spaces may be dominated by urban parks, street trees, and smaller natural land holdings, surrounded by urban infrastructure. In contrast, wildfire is neither limited to urban settings nor, in most settings, a one-time event,

4. Here, we refer to social science studies of human community response and management after destructive wildfire—there are many studies of ecological recovery and response to fire.

Fire Adapted Communities

Communities in wildfire prone areas are working together to be fully prepared for wildfire. A fire adapted community (FAC) incorporates people, buildings, businesses, infrastructure, cultural resources, and natural areas to prepare for the effects of wildfire. There are many components to being a FAC, with a range of roles and actions that can reduce risk. The following components of a FAC are adapted from the “Guide to Fire Adapted Communities” (Fire Adapted Communities Coalition 2014).

Neighbor to Neighbor

Neighbors are linked by wildfire risk. If one home is inadequately prepared, the risk level to the entire neighborhood increases, and everyone’s safety is impacted. Neighbors can collaborate to use Firewise principals in their community.

Science and Research

A wildfire is still a threat, even if it’s miles away. Traveling embers can ignite roofs, vents, lawn chairs, decks, fences, mulch, pine needles, and other common items around your house and yard. Cleaning debris and maintaining landscaping reduces the likelihood of ignition.

Fuel Management

Land management and wildfire are closely related. Ranching, farming, timber and logging operations, species management, and development can impact wildfire risk. FAC resources include information on forest land management, healthy fire behavior on managed land, and farm/ranch fire guidance.

The CWPP Process

A local Community Wildfire Protection Plan (CWPP) is a collaborative plan created by the fire department, state and local forestry, land managers, community leaders, and the public. The planning process maps values at risk and requires actions to reduce risk, such as prescribed burning, fuel reduction, or other measures that prepare a community to better confront their wildfire threat.

Residents & Home

Residents can increase their home’s survival and family’s safety during a wildfire by making wise decisions about defensible space and situational awareness. Landscaping and home construction techniques and having an emergency preparedness plan can all help residents. Local fire departments work with residents on emergency evacuation through the Ready, Set, Go! Program.

Whole Community

A fire adapted community acknowledges and takes responsibility for its wildfire risk, and implements appropriate actions at all levels. Actions address resident safety, homes, neighborhoods, businesses and infrastructure, forests, parks, open spaces and other community assets. Whole communities are coming together to confront their common risk.

Codes & Standards

Consensus developed codes and standards can provide criteria for planning development in areas that might be threatened by wildfire. The National Fire Protection Association’s main wildland fire standard and the International Code Council’s wildland urban interface code are both designed to reduce wildfire risk.

and it tends to destroy smaller numbers of homes (Alexandre 2015), with local authorities leading response and recovery (Mockrin et al. 2016). With wildfire, the vegetation management actions taken in recovery can alter fire's frequency, path, and severity in the future, and determine ultimate well-being of human and ecological systems. Wildfire is therefore a unique hazard which can contribute to our understanding of green stewardship, readiness, and response.

Becoming and maintaining community fire-adaptedness means managing for fire in social, political, economic, and ecological aspects. Managing vegetation is key, including vegetation management at the landscape level and around individual home sites. At the landscape level, managers work to reduce the likelihood that vegetation will support a destructive wildland fire, using fuel treatments and other management strategies to promote fire-resilient landscapes (Stephens et al. 2012). At the individual home site, managing vegetation in the immediate vicinity of homes can also reduce the risk of wildfire damage, in addition to using fire-resistant materials when building homes (Cohen 2000). In many cases, communities may choose to pursue these household mitigation activities collectively at the neighborhood level, through the Firewise program. The Firewise program through the National Fire Protection Agency is a voluntary program that certifies neighborhoods and small communities that have taken key collective actions to reduce the risk of wildfire damaging or destroying homes (obtaining a risk assessment and making an action plan; see more at www.firewise.org/usa-recognition-program.aspx) (National Fire Protection Association 2016).

Our Study—Response and Recovery After Wildfire

We undertook a study of community change following destructive fire, using nine sites across the United States to examine whether wildfire experience led to adaptation on the part of local governments and communities. Our interviews broadly addressed community-level response and rebuilding after a wildfire, with an emphasis on changes in wildfire mitigation through formal policy and informal actions. We selected fires that occurred in 2009 or 2011, and reported 20 or more homes lost on official Incident Command Status (ICS-209) reports that compile daily records of building damage (National Wildfire Coordinating Group 2016). We used purposive sampling to choose study sites in a range of settings, including urban and rural settings, and a diversity of geographic locations, to examine a variety of potential community responses to wildfire.

For each study site, we first reviewed publicly available documents about wildfire history in the region, fire-related building and zoning codes, land use planning, and hazard mitigation. We then conducted semi-structured

interviews with public officials and community leaders to characterize community-level response to wildfires (for example, changes in local regulation, or participation in community outreach and education programs). This approach allowed us to characterize broad changes as reported by informants, not individual resident-level responses to wildfire events. We conducted interviews between December 2013 and October 2015, expanding upon the questionnaire used by Mockrin et al. (2016). We then combined qualitative interviews and publicly available documents to determine community-level changes in wildfire mitigation and preparation after fires.

For this chapter, we focus on three different locations where post-fire vegetation stewardship emerged as notable in informants' discussion of post-fire recovery and response. Below, we relate each location's experience with wildfire and vegetation stewardship.

1. The Highway 31 Fire, Windsor Green Fire, and North Myrtle Beach

Fire Incident and Setting

The Highway 31 fire (2009) primarily burned in unincorporated area of Horry County, SC, in both South Carolina Department of Natural Resources (DNR) land and private land. Seventy-six single-family homes were lost when the fire crossed into the city of North Myrtle Beach into the Barefoot Resort, a large residential and vacation development with golf courses. The fire caused one fatality, a first responder. Homes were mostly full-time residences, although some were used as seasonal homes. Many homeowners were retirees. The second major wildland fire that caused housing damage in this area was the 2013 Windsor Green fire, which impacted a condominium complex in unincorporated Horry County (6 buildings containing 104 condo units were lost). The condominiums were full-time residences and occupants were younger and employed (not retirees).

In recent decades, housing has grown dramatically in Horry County, driven by an influx of retirees and others attracted by the proximity to beaches (city of North Myrtle Beach), recreation opportunities (e.g., golf), open space, and low-cost standard of living. Development is nearly all in planned unit development (PUDs) or entire subdivisions, either single family homes, town homes, or condominium units, all using public utilities. Highly flammable crepe myrtles and pine straw (needles) are popular for landscaping, and are commonly found close to houses. Lots are small and housing is dense, with open space found mostly in development common areas, managed by homeowners' associations (HOAs). HOAs play an important role in overall property management,

particularly in large planned unit developments and unincorporated areas of Horry County. There are no formal regulations requiring defensible space or fire-resistant home materials in either the city or the county although several HOAs had begun to pursue Firewise certification before these fires. The area is served by professional firefighters, with a long-standing, dedicated wildland fire team maintained by Horry County Fire and Rescue.

Housing development has diminished much of the former timber estate, and remaining open space is either preserved by SC DNR (Lewis Ocean Bay Heritage Preserve) or cannot be developed because they are wetlands. The pine vegetation and wetlands are extremely fire prone, and fire suppression is tactically difficult in wetlands and bogs. Wildfire in the forested areas of Horry County has been common over the past 40 years, but in the past, housing densities were lower and homes were not lost. The Highway 31 fire and Windsor Green fire were, in this regard, novel events. Informants thought many residents in Horry County were unfamiliar with wildland fire, especially those who moved to this area from the Northeast where wildfire is not common. This unfamiliarity was exacerbated by the recent growth of Horry County, where development of new residential areas near fire-prone landscapes is relatively recent. Even those who were long-time residents spoke of adjusting their understanding of wildfire to reflect the fact that homes are now at risk from wildland fire.

“10 years ago, 15 years ago [there] was nothing... it burned, it affected all the animals in the trees, I mean, that were out there but it wasn’t necessarily a real impact on me as an individual because people didn’t live there. I think the fact that people live there now, obviously it’s created the concern, the idea that it is an issue.”

—Horry County Emergency Management⁵

Vegetation and Management Post-Fire

These two wildfire incidents, occurring in close proximity geographically and only several years apart, led to increasing community concern about the threat of wildfire to housing.

“Now, the communities that did have fires near them, they’re definitely a lot more aware now. But it took a fire in order for them to be aware that there was such a threat.”

—Horry County Planning

Housing recovery was relatively rapid after both fires, as individual homeowners and the condo complex drew upon insurance. Because of the extent and distribution of housing development, much of the wildfire mitigation work has been at the level of PUDs, and pursued

5. Throughout this paper we use a respondent’s organization, rather than title, to preserve confidentiality. Statements are not official views of these organizations.

by HOAs. In the aftermath of these wildfires, the South Carolina Forestry Commission created a new position to promote residential mitigation and support neighborhoods that are pursuing Firewise certification (the staff member is based in Horry County and has responsibility for coastal SC.) After the wildfires, an additional 12 communities in Horry County have been formally recognized as Firewise communities and others are continuing to pursue certification. Firewise communities will have to work collaboratively to maintain defensible space around homes as well as mitigate vegetation in common areas and around subdivisions.

However, community leaders expressed concerns that prevailing norms of vegetation landscaping around homes will not be easily changed. For example, after the wildfires, there was a great deal of debate within communities about the use of pine straw for landscaping, but the practice continues in many neighborhoods. In addition, administrative struggles within individual HOAs could hinder progress towards fire-adaptation and not all communities have pursued becoming Firewise. For example, the Windsor Green community became Firewise after rebuilding after the fire, while the Barefoot Resort community has thus far not elected to pursue Firewise certification. Using formal regulations to require defensible space maintenance or fire-resistant home materials lacks broad community support, although local government is interested in promoting wildfire mitigation. Informants thought awareness and concern about wildfire risk diminished with time since the fires.

Challenges also persist due to the scale and type of housing development, and the county's commitment to preserving open space. Many PUDs were built immediately adjacent to undeveloped lands, without a vegetative buffer that could be thinned or managed between the housing and fire-prone vegetation.

"Conservation and the amount of open space we have in Horry County is actually a threat because these areas are being protected for environmental reasons, but the land has to be managed. If it isn't managed then it becomes a threat."

—Horry County Planning

"Now, the problem that we run into is that most of those communities back up to basically an unmitigated, unmanaged wildland [] that's extremely flammable...You can be within 10 feet of your home and have a solid wall of wax myrtles and other flammable vegetation. So the growth of [housing] has really thrown in a huge monkey wrench on wildfires and the risk and the danger for this area."

—South Carolina Forestry Commission

HOAs must now work with the open space landowners and the U.S. Army Corps of Engineers to try to establish buffers in land *outside* their

developments. Horry County officials recognize these concerns about management and distribution of open space and are interested in revising land development regulations to facilitate buffer establishment, but much of the land available for housing in this area has already been developed.

2. The Monastery Fire

Fire Incident and Setting

The Monastery Fire (2009) burned in an unincorporated area of Klickitat County, WA, outside the city of Goldendale. Although fire incident records list 100+ structures as destroyed, most of those were outbuildings, and only 12 homes were lost (5 permanent residences, all mobile homes, and 7 second homes). This is a rural community and residents are fiercely independent. Most homes are modest primary residences or simple second homes, with a few upscale second or retirement homes mixed in. All are served by private wells, often with limited capacity, and septic systems. Formal residential landscaping is not common; homes may be surrounded by storage and outbuildings. Lots ranged from 5 to 20 acres with some larger holdings. Roads are privately owned and maintained, and access is challenging, particularly in inclement weather. HOAs are uncommon, although one larger subdivision of 5 acre lots, founded with an interest in promoting self-sufficiency, has an HOA and is a Firewise community (this subdivision was located outside the burn perimeter).

In recent decades, housing here has grown modestly, with some influx of retirees and amenity migrants, often from urban areas in western Oregon and Washington. Land is commonly held undeveloped by absentee owners. The county government is interested in encouraging housing growth and development, seeing it as an economic asset for the community. There is limited public land in the county, but large amounts of forest are still owned by timber companies. Vegetation in the area where the fire occurred is a mix of ponderosa pine (*Pinus ponderosa*), oak (*Quercus* spp.), grasses, and shrubs. Beetle infestations have been problematic in recent years, which have contributed to increased susceptibility for wildfire. However, respondents agreed that increased fire risk was to be expected in these conditions.

“I mean, we have enough large fires in the county here to where, in fact, I think it was the week before this fire, I had a big fire [of] 13,000 acres in my [fire] district and fortunately, we didn’t lose anything except an awful lot of grazing land and fencing and whatnot. It’s just a fact of life, you know?”

—Community-managed fire victims fund

The fire-affected area is served by rural fire departments, staffed primarily by volunteers. Residents have a range of experience and knowledge of wild-fire and forestry—some long-time residents and ranchers own their own heavy equipment and are familiar with wildland fire, while migrants and second-home owners are described as less familiar with wildland fire. There had previously been wildfires in the area of the Monastery fire, but housing was less extensive, and homes were not lost. Wildfires have continued to occur after the Monastery fire, but without the loss of homes.

Vegetation and Management Post-Fire

This wildfire incident, and the accompanying loss of homes, led to an outpouring of community support for those who had lost their homes, as well as some increased interest in vegetation management on individual properties. A community-managed fire victims fund was able to marshal local support and online donations from outside the region to replace mobile homes for the five full-time residents who had lost homes in the fire. A new State Department of Natural Resources (DNR) position was created not long after the Monastery Fire, supported by federal funds, with a focus on improving forest health on private lands (addressing beetle damage and reducing the risk of wildfire). The DNR employee offers technical advice about vegetation treatments and a cost-share program that helps subsidize the costs of vegetation thinning on private land, although many in the community are wary of participating in a formal government program.

So there's some paperwork involved, and a lot of the folks don't want to do that kind of stuff. But I help them through the process...I do the bulk of it and then I do compliance. So I'll go out and visit with a landowner usually a couple of times to kind of convince them that it's a good thing... There's a lot of folks that have done stuff on their own with no assistance from me other than they ask me a few questions."

—Washington State Department of Natural Resources

However, interview participants thought that local residents were more willing to speak with state DNR and fire department employees about their properties and minimizing wildfire risk after the Monastery fire.

3. Station Fire

Fire Incident and Setting

The Station Fire (2009) primarily burned land in the Angeles National Forest (NF), and was the largest fire to date in Los Angeles County (LA County),

California. After escaping initial containment efforts, the Station Fire underwent periods of rapid growth and extreme fire behavior, ultimately threatening thousands of homes in nearby communities. In total, the fire destroyed 89 homes and 29 commercial buildings, with approximately two-thirds of homes lost either in or bordering the southern part of the Angeles NF. Approximately 30 homes were lost in Stonyvale-Vogel Flats, an inholding near the southern border of the forest, located along a county-owned and paved road. Residences were a combination of privately owned homes and recreation residences (cabins leased from the Forest Service). Homeowners were informally organized by a shared water system on the private-land portion of the inholding. These were all primary, full-time residences, and residents valued the remote setting and access to the Angeles NF, but also commuted into the city of Los Angeles and nearby urban areas for work and shopping.

Los Angeles County is the most populous county in the United States and contains a complex patchwork of jurisdictions, with 88 separate cities falling within LA County, including the city of Los Angeles. Housing development around the southern edge of the Angeles NF has continued to grow over the past decades, mostly in planned subdivisions or suburban neighborhoods, with hillside locations prized for their proximity to open space and views of the metropolitan area (real estate here is quite expensive). Much of LA County is fire-prone, with a combination of fire-adapted chaparral vegetation and dynamic weather of a Mediterranean climate. Los Angeles County has a long history of wildfires causing damage to homes and threats from many other natural hazards (earthquakes, mudslides and debris flows, flooding).

“So we’ve been in this business for a very long time...In 1934 [shows picture of flood damage]...this is where the Flood Control District first got an idea of the fire-mud flow cycle.”

—LA County Department of Public Works

The southern San Gabriel foothills where National Forests abut residential development had had extensive wildfires that damaged housing in the years before the Station Fire, including the Sayre and Marek Fires. The Angeles NF has a long history of wildfire management and mitigation, including the use of fuel breaks and prescribed fire, to promote fire-resilient ecosystems and prevent destructive wildfire from affecting adjacent developments.

The Los Angeles County Fire department is responsible for wildland fire fighting, forestry, and structure protection in the unincorporated area of the county, and is active in wildfire mitigation and education. As required by the state of California, LA County has formal regulations for homes that fall within state-mapped Fire Hazard Severity Zones. Homes are required to

maintain defensible space (as much as 200 feet of clearance from the structure, depending on aspect, slope, and other environmental conditions), and must be constructed with fire-resistant home materials when built (re-roofing must also use fire-resistant materials) (County of Los Angeles 2014). Residents living adjacent to and within the Angeles NF were described as aware of wildfire risks, and worked to minimize ignitions, although many of the homes lost in the Stonyvale-Vogel Flats inholding in the Station Fire were older, and had not actively maintained defensible space. The Forest Service completed a fuel treatment around this inholding area in the year before the Station Fire, and residents had considered forming a Fire Safe Council,⁵ but had not pursued it.

Vegetation and Management Post-Fire

The Station Fire was extremely controversial, with much of the post-fire public attention focused on evaluating and revising Forest Service suppression strategies (GAO 2011). Housing recovery in the Stonyvale-Vogel Flats inholding has been limited, in large part because those wishing to rebuild must comply with current LA County codes when rebuilding. The challenges of supplying access, siting septic systems, and providing appropriate water supply (in cisterns) for fire suppression have been prohibitively expensive or infeasible for many.

“[A resident] was going to build this beautiful place. He had the drawings. He was ready to go, and then the fire came and the bridge, as he understood what they [LA County Fire] were requiring, would have cost him like a million dollars or something. So, he left.”

— Local Community Leader

If homeowners do rebuild, they will be required to use fire-resistant materials and create defensible space around their homes in order to comply with LA County regulations. Recreation residences on land leased from the Forest Service have not been permitted to rebuild. Broader vegetation recovery on the Angeles NF has been the responsibility of the Forest Service. A lengthy drought slowed vegetation recovery, and prescribed burning in broader LA County and unburned areas of the Angeles NF has also been prevented by the drought. The LA County Department of Public Works was active in forecasting and outreach about post-fire mud and debris flows, although actual damages were limited following the fire due to lack of rainfall. One noticeable change in post-fire vegetation management occurred when the Angeles NF created a new program to allow homeowners to conduct defensible space clearing onto Forest Service land, as recommended by the Governmental Accountability Office’s post-fire report (GAO 2011).

If approved by Forest Service personnel, homeowners are now allowed to thin vegetation up to 300 m around their property and on to Forest Service land, in order to comply with defensible space prescriptions required by local authorities (e.g., LA County) (Angeles National Forest 2014). In interviews, Forest Service staff acknowledged some benefits of this program, given the financial and logistical constraints that prevented them from performing fuel treatments for all homes adjacent to or within the forest, but there were also concerns about environmental impacts.

“...They let them build so close, and so that’s something that...when the next boom happens, they [need to] take into account how close they are to the forest and come to an agreement on how that’s going to be dealt with because the cost of doing the NEPA analysis is ours.”

— Angeles National Forest

However, after two seasons, no homeowners had yet enrolled in the program. Forest Service employees were simplifying enrollment processes, and pursuing group action via Fire Safe Councils.⁶

Lessons Learned— Wildfire Events and Opportunities for Vegetation Mitigation

Because vegetation mitigation surrounding homes and vegetation conditions on forests and open spaces are key determinants of wildfire damage, recommendations for local communities focus on adaptation strategies that consider unique community values, environments, and situations. Our results indeed showed post-fire responses are variable—these selected locations changed vegetation mitigation through a variety of pathways including formal, voluntary programs (i.e., Firewise, cost-share with state DNR), formal regulations enacted by the Forest Service, and/or informal conversations and education. Post-fire responses were based on the communities’ prior knowledge of wildfire, local and governmental capacity to recover and rebuild, and homeowner and landowner willingness to participate in vegetation management programs. Many solutions were dependent on changes to policies or programs that existed before the fire, and were deemed in need of expansion or adjustment after the fire.

These differences in post-fire vegetation management reflected the configuration and extent of open space, within private land and public land, as well as residents’ background with land stewardship and interest in governmental

6. D. Travis, Angeles NF, pers. comm.

programs and collective action. However, vegetation mitigation is only one piece of environmental stewardship and readiness is only one component of adaptation. Each of these communities also altered other components of wildfire preparation and mitigation (most often, suppression). We choose these three examples because informants were able to speak about the wildfire event leading to some type of change in vegetation management, but we note that we also had sites where vegetation management, around individual residences and in open space (private or public), did not emerge as key changes post-wildfire.

With a variety of settings and fire incidents, there were some similarities and differences across these three study sites. For both the fire in Washington and the fires in South Carolina, additional investment in state agency staff led to increased wildfire education and outreach, including vegetation mitigation. Even in Washington, where government oversight and interventions were generally unpopular with residents, fire chiefs and extension agents were crucial in disseminating information regarding vegetation clearing, fuels management, and land stewardship. Trust and agency-community relationships have also been identified as key in acceptance of public lands management after a fire (Olsen and Shindler 2010, Shindler et al. 2014). In both the California and South Carolina study sites, there was increased interest in vegetation management on open space or public lands to protect homes from future loss to wildfire, but these changes took different forms. Interest in vegetation stewardship in Horry County, SC, increased as residents began to see themselves as part of a fire-prone community and began working to try to implement fuel breaks between their communities and onto open space and public lands, although progress was challenging. In LA County, the public land owner (Angeles NF) changed policy to facilitate private land-owners' defensible space treatments onto public lands. However, it may be challenging for homeowners to pursue this opportunity individually, and forest managers now think Fire Safe Councils might be best positioned to take on such an effort.

Voluntary programs such as Firewise or vegetation mitigation programs were commonly pursued as a first step after wildfire, when communities were spurred to take action on wildfire concerns. Firewise certification can grow out of whole-neighborhood or community desire to change vegetation management. Contacting the Firewise organization (www.firewise.org) for assistance is the first step in the process of becoming certified. The Firewise criteria and checklists, and its assistance and certification processes, support and encourage collective action. Although Firewise programs aren't primarily intended to change broader community policies or attitudes surrounding wildland fire, the presence of a certified Firewise community may serve as

an example to surrounding neighborhoods. For communities ready to make broader governance and management changes regarding wildland fire, FAC program provides a variety of guidance and reference materials. For example, FAC recommends development of a community wildfire protection plan, and this alone can be a crucial first step in a community becoming fire-adapted, as it allows the leaders and stakeholders of the communities themselves to outline how they plan to deal with wildfire risk given their resources, knowledge, economics, politics, and community culture; and to capture these insights in a stand-alone, formal document.

While these initial management changes may help create a more fire-resilient community, continual strategy and policy updates for fire-adapted land stewardship may be needed, even as memory of past fires begins to wane (Quarles et al. 2013). Vegetation will continue to regrow and change, and with it risk for future wildfire, while public awareness and community support for enhanced wildfire mitigation and changes to natural resource management policy will also change with time since disaster (Burby et al. 2000, Carroll et al. 2005, 2011). In the study areas where residents had rebuilt housing after the fire (SC and WA), study participants were already concerned that community awareness about wildfire was fading with time from the event. A diversity of efforts, including formal governmental efforts and ongoing outreach, may keep wildfire damage, recovery, and rebuilding in view, hopefully reducing the likelihood of future loss.

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Restoring and Growing the Twin Cities' Community Forests in Times of Change

**An interview with Karen Zumach, Tree Trust,
St. Louis Park, Minnesota**

Interview conducted by Erika Svendsen
and Lindsay K. Campbell

USDA Forest Service
New York, New York

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Lindsay Campbell (LC): To get us started, could you tell us your current position, your title, how long you've worked at Tree Trust, and what your role entails?

Karen Zumach (KZ): I am the Director of Community Forestry and I have been the director since May 2016. I've been working at Tree Trust for a few months shy of 10 years, which is outrageous! My job basically includes running the community forestry program here at Tree Trust. I like to say: "I put trees in the hands of people." Whether that's in a park or in their front yard—my work is to facilitate tree plantings for communities. We also manage tree distributions for planting on private property for various municipalities. We do educational outreach and engagement with elementary school students. And we plant anywhere upwards of 3,000 trees every year with volunteers at community parks, schools, and neighborhoods throughout the Twin Cities, Minnesota.

Erika Svendsen (ES): You mentioned that it's outrageous that you've been with Tree Trust for almost 10 years, why is that? Is it just the length of time or maybe you didn't think you were going to do this kind of work?

KZ: All of the above actually. I moved to Minnesota from the east coast about 10 years ago, originally intending and hoping to work on green roofs. But I moved out here around the same time as the housing bubble burst and the deluge of green roofs that were going in here in the Twin Cities pretty much dried up—it just stopped—so it was really difficult for me to find employment doing that. But this job had come up at Tree Trust, and while I appreciated trees, I never really had much of a driving desire to go work in arboriculture and just thought, "oh well I'll just do this job for a year, it's an educational and outreach position, no big deal." And then I found myself just completely enamored with the whole process of planting trees and what that does for communities, and the social aspects of trees just pulled me right in—very similarly to the way that green roofs did, but on a far more accessible level. So, it's outrageous because I never would have thought I'd be here for 10 years and really settling into what I could consider my "forever career". It has transformed my personal path and my career in ways I never anticipated.

LC: Thinking over those 10 years, can you reflect a little bit about the work you've done with Tree Trust, both in terms of environmental stewardship, but also community development—or the "social aspects" as you mentioned? What do you think has changed over those 10 years?

KZ: For me, because I've become more involved in the inner workings of urban and community forestry throughout the state, I've come to recognize how political trees are. I never thought that would be a sentence that one would utter, because: they're trees—how could they be political? But they really are; it's a surprising thing to navigate.

For example, when I'm doing work to try to get trees into under-canopied areas of the city of Minneapolis, it has been perceived as unfair by those who are in these higher canopied areas of the city. It's just shocking to me that this is the kind of reaction that you would get from some people. I think as I've become more involved in the work and really being deliberate in my actions of doing outreach to those areas of the city that are well-canopied, trying to navigate interactions with those who deem our actions as unfair, it has been something that's been interesting for me to have gone through. I'm able to navigate things now in a much more eloquent and effective way that I probably wasn't doing before when I didn't really have the kind of exposure to working in urban forestry. I think there's a really interesting perception that some people have about nature in general—they think everyone has access to the same benefits. But that's really not true, and I've come to see that over the past 10 years.

ES: Are the under-canopied areas also low-income areas and are the higher canopied areas also higher income areas?

KZ: Yes, I mean that really plays out all over the country, right? The Twin Cities is no exception to that trend. It's pretty obvious and it's not only that there's low canopy [in low income areas], but these areas also have the greatest potential [to increase canopy]. So that includes not just those obvious areas where you would expect to see trees, but there are places like front yards and backyards where there just aren't trees like there are in other parts of the city. It's really great to be able to have conversations with people and help them understand that not everyone has the same kind of access; and when explaining that inequality and having people come around to it, saying, "oh yeah you're right, you're right, that's a really good thing you should be doing then, that's fine way to go, we've got plenty of trees here." So those are the kinds of little victories across the 10 years that I've been doing this work that I feel really grateful for, because it's not just planting a tree, it's really changing the way people think about trees and how this all plays in a greater role of our community.

LC: Can you talk a little more about how you decide where to plant trees?

KZ: Our decisions go where our contracts are, especially for the private tree distribution programs. So, for example, the city of Minneapolis does an annual tree sale for its residents where they offer low cost trees to residents to plant on private property as a way of increasing the canopy without increasing the cost of tree maintenance for the city. We've been administering that program for about 12 years now, about 1,500 trees per year.

In the past couple of years, drawing on survey data and canopy studies, we've started some conversations and the city of Minneapolis realized that there's areas of the city that are under-canopied and lower income, with lower rates of participation in this tree sale program. So this combination of those three things has driven this shift to trying to remove as many barriers to participation as possible in those areas. This results in us focusing on particular areas of the city. I think there are some decisionmakers who get it, but don't think it's necessarily fair that the city-funded program is now targeting a particular area as opposed to making it accessible to all. This is despite the trend that higher canopy, higher income areas gobbling up 25 or 30 percent of the available trees year after year. So, there has been some pushback with that.

We instituted a presale for those lower canopy, lower participating areas of the city so residents were able to order their tree first. Then the rest of the interested city residents had to enter a lottery and be selected to get their tree. That kind of distributed things around the city a little bit more evenly, not a whole lot because there was still a very high percentage of participants coming from higher canopy, higher income areas of the city which just cracks me up because: it's a \$25 tree and people are living in very expensive homes and could afford a full price tree! It's such an interesting thing to observe about people, how they value things and feel entitled to things and it doesn't change much year after year either, it's the same kind of conversations, and the same people calling and saying "how is this possible that this part of the city is, is being targeted?" And then when you explain it to them, they say, "well that's where all the money's going, all the money's going to that part of the city to fix it." But it's because there's limited resources and these are quality of life issues and we think about it like "we all do better when we all do better".

LC: We understand that in north Minneapolis you are doing greening and tree planting work in the context of different types of disturbances: invasive pests, slower-moving economic decline or disinvestment, and a fast-moving tornado. Across all of these possible disturbances are there differences or similarities in terms of your tactics for re-greening? Or is it more that each of these disturbances is just another moment where you can think

through messaging and strategies for putting trees in the hands of people? Can you reflect a little bit about working in the context of disturbance?

KZ: Our narrative for everything that we're doing right now, for the majority of the cities we work in, is about that slow-moving disturbance. It is talking about the emerald ash borer (EAB) and the fact that we are going to lose so many trees in such a short period of time. It is kind of taking advantage of that disaster in such a way that makes people more aware of the importance of trees. I use the term 'advantage' very loosely of course, but people are really starting to notice these large trees coming down in large quantities. It is the kind of thing that gets people's attention and really gets people talking about those trees in their community. So, disturbance is for sure part of our conversation when we're engaging in outreach and education and connecting with the people in north Minneapolis and beyond.

Its six years later and we're still talking about the [2011] tornado and helping the communities in those areas of the city replace the trees. Twenty years from now we're going to need those trees. They've been hit with a double whammy in that part of the city: still not recovered from the tornado, and then that huge loss of 6,000 or 7,000 trees from the EAB. Twenty-five to 30-inch diameter trees coming down on the streets and boulevards being replaced with much smaller trees. Six years later, the canopy is smaller and now the summers are hotter. All of those things are starting to become part of the conversation. We're talking with new homeowners who are moving into these areas of the city and just can't believe they bought a house where there aren't any trees. They want to know how to get them. I think it is an opportunity for us to really elevate trees to a new level because people are really starting to recognize what it's like to live in a place without them.

At the same time, it is hard because we're fighting so many other things. It is a whole lot harder to grow a tree now than it was 30 years ago and I think it is going to be a transformation for the cities here in general. I don't think people are really ready to get their head around that yet so we provide them with that tree, but make sure they understand that this is part of a bigger picture. If you have a boulevard tree that has been planted, you know it's your job to water it too, and those trees aren't going to get big without you—we are trying to make this be kind of a village response.

LC: You said it's hard to grow trees now. Did you mean that this is the case because of the heat, or because of cost, or because of the trees' susceptibility to invasives, or all of the above?

KZ: It's kind of all of the above: dealing with these longer stretches without rain and these strange weather patterns. We have more straight-line winds and bigger thunderstorms. I think that's a trend that is undoubtedly going to continue. When we're talking about these larger areas of no trees, they're working against a lot of other forces like wind exposure. There's not the protection of the others that those trees had before. I think there's a lot of effort in getting trees in the ground, but all of us have a role to play in ensuring that these new trees survive and thrive by receiving ongoing maintenance and care.

LC: It sounds like the memory of the tornado is still really powerful in north Minneapolis for those who were there. You also mentioned newcomers coming in and saying 'what's going on with this bare landscape'? And they want to transform it. And then with the EAB and loss of the larger canopy trees; there are folks who've probably been in this place and maybe didn't even realize what they had until it was gone?

KZ: So, when I say that we have this really interesting opportunity to talk about trees in a different way, we also need to talk about tree management in a different way. The Minneapolis Park Board (they are responsible for the management of the city's urban forest) is cutting down every single one of their 40,000 boulevard ash trees. The decisionmakers at the Board have decided that pesticides are not an option and that removal and replacement is the most efficient way to manage this pest. Thankfully, the department is being pretty thoughtful about it. They try to remove no more than 20 percent of the trees on a particular block, but the city of Minneapolis was set up with an urban street tree design that was block-based so there are blocks of just ash trees and then there will be another block of just honey locusts. In the areas where they're infested, they have to take down all of the trees. Historically, Minneapolis was 96 percent planted elm before Dutch elm disease, if you can imagine that. They had to essentially restart after Dutch elm disease. They didn't replant with 96 percent ash, it was 20-30 percent which is pretty typical across the state, but it's still a large percentage.

LC: Stepping back from the weather events and invasive pests, what about the context of either economic disinvestment or reinvestment? You talked a little bit about newcomers, so I'm assuming that might go along with neighborhood transformation and different demographic shifts, but do you use a community forestry approach?

KZ: At this point it's voluntary, so we're not driving in the streets of north Minneapolis and saying 'oh 22 to 27 X, Y, Z Street could use a tree.' We have this free tree program, we do outreach to those neighborhood groups to let them know that their members can come to us.

LC: So you are really focused on the household or the residential landscape?

KZ: Right. The city-owned properties are a very complicated story here. City-owned properties are under the purview of the city, the boulevards and parks are under the purview of the park board, which is a separate taxing entity. So our only place of impact in Minneapolis per se is within those private properties.

I'm sure it happens everywhere but when you give somebody a free tree and you don't have any buy-in, you drive by a dead tree. We've constantly been trying to find that place, the appropriate level of buy-in that's going to ensure the success and vitality of these trees. It's been a struggle because we still haven't really found that perfect recipe of what it is going to take to be successful.

Trying to create that sustainability, what we call our Green Team Program has been a challenge that we've been working really hard at improving through using the volunteer networks that exist here in the cities of change. We have essentially a Master Gardener Program that's focused on tree care. They're pretty well known throughout the Cities and just they're a great corps of about 100 different volunteers that are available to help schools, to help cities do tree care, and it's been a great thing for us to try to enlist them to reach out and work with schools beyond our timeline.

We have a lot of them that are working year after year with us, which is really fantastic. They're kind of an extension of our very small community forestry program and really invaluable to us because we wouldn't be able to get half as much done without them so, it's important.

ES: Karen, with this group and others that you're planting trees with, could you say anything more about people's intentions and what motivates them?

KZ: We just surveyed this past cohort of [tree] recipients through the Minneapolis Tree Program to get a sense of why they were participating, and how the program went for them. The first question is: Why did you participate in this program? The overwhelming response (people were allowed to select more than one choice), was basically because they were losing trees in their

community, or they had lost a large tree on their own property previously. So I think there is that recognition when someone has a tree and loses a tree, that if there's a way for them to get another one that seems to be a pretty big driver for them to participate. Coming in a very close second to all of that was "I can't resist a deal." I had that as one of the answers. Like, I can't pass up a \$25 tree that would typically cost me \$150-200. So I imagine there is a little bit of both of those kinds of things pushing and pulling. At our community tree planting events, where we're planting in parks around the cities with volunteers, the overwhelming driver for them to come out is because they want to plant a tree for the next generation. We really do capitalize on the idea that we need these trees more than ever because we're going to be losing so many trees. Having those conversations and really inspiring to folks and thanking them for participating here today, but also making sure that they're going home and talking with their neighbors and making sure they know, for example, what an ash tree looks like and how they will need to be making a decision on what they want to do with their tree.

With every planting that I do, I really talk about the quantifiable environmental benefits that tree provides. I try to help people understand what that 20" diameter ash tree is doing for us—just standing there, and think about how many of them there are in our communities. When those numbers are put together, the magnitude of this issue really becomes evident. We hope this kind of information creates advocates at the same time. I don't know how effective we've been with that. At the end of this planting season we'll be resurveying volunteers to see what kind of behavior change we're seeing from that activity, because a lot of them have come back throughout the year. Our planting window is very small here in Minnesota. We have about a 6-week window in the spring and about 8 weeks in the fall and then, well, winter comes. We have to get a lot of work done in a pretty short period of time and a lot of that involves people coming back multiple times in multiple events. This year is the first year that we really were pretty aggressive in that education and advocacy piece, teaching that this is an important thing that you need to know about.

ES: Has anything unexpected come out of your volunteer stewardship programs and the potential loss of more trees?

KZ: We have this group of small business owners from Minneapolis, most of them are from south Minneapolis, they are landscape contractors and tree care companies and residential contractors and they're all working together to improve their city. They call themselves the Autonomous Collective. They are raising money through a fundraising campaign to their customers. So

their clients are working with them to help us plant trees in north Minneapolis. The Collective has been doing a really pointed campaign talking about trees, talking about the tornado, talking about EAB and also talking about a way for their clients to help a part of the city that is desperately in need of trees and the multitude of benefits they provide. So far, they have raised \$20,000 for planting trees in north Minneapolis.

This project started with just two people, one was a former employee of Tree Trust. He was a youth employee when he was very young and now he owns his own landscape company. He wanted to figure out a way to help others and this is just something that he came to us about. We said, "We don't have funding for our north Minneapolis Program this year. Is that something maybe you guys might be interested in doing?" They just took this and ran with it. They and their staff are going to be coming along with us to private properties and planting these trees in the fall on a one-day event that they pretty much funded entirely through their clients and will be fueling this event with their employees and their staff. I think it's going to be really interesting to see how people's perceptions change after that activity because they have been so instrumental in raising the funding for it, and telling the story about it, and then implementing it. So that's an exciting one.

LC: They had their own company and then working together in this really novel way to bring in new resources.

KZ: It's amazing really. They've created a nonprofit because, as small business owners, they needed to get insurance for this event, and they were a little leery about going onto private property and protecting their assets. We were more than happy to offer whatever we could but they wanted an extra layer [of protection], so they wanted to become their own nonprofit and they wanted it to be the Autonomous Collective. But apparently there's somewhere in New York that has already taken the Autonomous Collective name so now they're now the Autonomous Collective of Minnesota (chuckle).

LC: Stepping back, you've already shared a lot of lessons, but can you reflect on some of your proudest moments or learning moments over these 10 years?

KZ: Yes. When the mayor of Minneapolis called us after the tornado and wanted us to be that "tree first responder" to what had happened, that for me was a really big deal. Mostly because I didn't totally understand what our role could be, and then to be called upon pretty quickly to get in there and figure out a way to get trees back in the ground [was significant]. To know the first thought

he had was to get in touch with us was, for me, a pretty proud moment. It was one of those things where you watch this happen on TV and you want to figure out what you can do to help. Then we were immediately tasked with helping. That was a really great opportunity for us to be able to respond in a way that didn't require a whole lot of trying to convince people to let us help. It was that we were asked to help first that was really great right off the bat for us. It really connected us to people that we had already had some sort of connection with through our youth group that had been working in north Minneapolis. That was a pretty exciting moment for me.

I've been doing a lot of advocacy work lately at the state level, trying to get funding for EAB. This has opened for me some new avenues of talking about trees and engaging with legislators, talking about environmental justice. These things are so inherently important to all of the goals that the state has regarding climate change and clean water, and I'm working to bring urban and community forestry to that conversation.

I think all the things along the way in my 10 years of working with people in planting trees and volunteering, working with volunteers, and working with elementary school kids. I feel like all of those things built me up to be in a place to help decisionmakers tie it altogether. I don't know that I would be able to speak as passionately about trees without having those experiences. Like having a first-grader tell me why trees are amazing, and hearing them say things like "well because they give us oxygen and because they clean the air." They're really excited about planting a tree for their school—watching that transformation happen. Or having a woman be just so grateful for getting a tree planted in her yard after she lost a tree in the tornado. I think recognizing those human connections has really made it a whole lot easier for me to talk to decisionmakers about trees' importance than if you ask me to do it in 2007 when I first moved to Minnesota.

ES: Do you ever think that what your organization is doing is not only good for the environment but also helps to strengthen our democracy—to make a better city?

KZ: No, but I certainly will now! You know it's funny you say that because we have the Super Bowl coming to town. So, they come in and they all start to do a pretty significant effort to be green. They have a greening initiative that comes with the Super Bowl and they partner with nonprofits. They are partnering with us to administer some urban forestry grants to cities across the state. They're not huge, but they are \$4000 grants. Whatever they are, it is their urban forestry initiative, which is great. They had a kickoff, where they have a shovel-passing. A golden shovel that gets passed from the previous host community to the

new host community. It was passed from Houston to Minneapolis this spring. We ended up planting in a park in Minneapolis that was in the middle of an area of the city with a large Somali population. An area with a lot of public housing, and a rec center right next door where we requested if we could have some of the kids from the youth group there to come help plant trees with us and members from the Minnesota Vikings.

So, we're cleaning up after the NFL events, and it's me and two of my staff who are also women. A Somali woman and her very elderly mother came by and were telling us that her mother had just arrived here from Somalia. She was just standing there watching us and she couldn't believe that three women were doing this work. She wanted to help, so she ended up picking up shovels and handing them to us to help us clean-up. It was one of those moment where I realized that I would have never had this opportunity to connect with these two women from these vastly different areas if I hadn't been there planting trees that day. So, it ended up offering me this really great opportunity to connect with people that I hadn't previously. You never know. I think we just all have to be open, you know? It's all about how we connect with the opportunity. I think that's very important for us all to keep in mind.

LC: Just one last question: Can you reflect a little bit about your future goals and what's next on the horizon for Tree Trust?

KZ: I think it will be interesting to see what's next. I think we're kind of in that place right now of growing pains and we're kind of at capacity within our own framework for our staff. I have two people that work with me and we have, I think, 25 plantings happening this fall. It's really been: "what's our role going to be in this response to emerald ash borer?" For me, right now that is really what we're focused on, because we're talking about a couple of generations before we'll be able to restore that canopy to the pre-invasion levels.

A void to fill is being a private property supporter. Just talking about Minneapolis and their numbers, 40,000 trees on public property but then another 160,000 trees on private property; I think our role is going to be diving into helping residents and property owners come back from this, and taking advantage of this opportunity to make people understand trees in a different way before they're gone. I think these are the two big drivers aside from feeling really strong about wanting to build advocacy within our own networks. Also making sure that this conversation about trees and this loss of trees that we're going to have doesn't just become one of those things that's "Oh I remember the days of emerald ash borer"—just like they wax on about the days of Dutch elm disease. Not allowing it to fall out of the public

conversation and where the money goes, because I think that trees are going to play a really big role in how we survive in the next century.

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Worcester's Response to Asian Longhorned Beetle: Reforestation, Stewardship, and Sustainability

Peggy Middaugh
Worcester Tree Initiative
Worcester, Massachusetts

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In 2008, an invasive insect, the Asian longhorned beetle (ALB) was discovered in Worcester, Massachusetts, the second largest city in New England. For the previous 12 to 15 years the beetles had quietly spread in the dense maple canopy in the Greendale and Burncoat neighborhoods and likely piggy-backed on firewood and vehicles to other nearby towns. Trees were weakened and the health of the urban forest compromised. The insect, a native of China, had most probably arrived in Worcester on wooden shipping pallets at the end of the last century before regulations requiring treatment of shipping pallets were implemented.

In the 2001 book, "Trees At Risk", author Evelyn Herwitz documents a history of open space preservation and tree canopy growth in Worcester during the 19th century, only to be followed by decades of decline and neglect due to lack of funding, disease, and natural disasters. Worcester's fondness for large shade trees throughout its history included chestnuts, elms, and maples. Chestnut blight and Dutch elm disease took their toll on Worcester's urban forest in the early 1900s, before an historic hurricane swept through the city in 1938 and thousands more trees were lost. Fourteen years later the devastating tornado of 1952, one of the most powerful ever to be recorded in the United States, cut a swath through the Burncoat and Greendale neighborhoods, leaving 94 people dead in central Massachusetts. Houses and businesses were destroyed, trees uprooted, and the landscape was left in shambles. Spurred by the tree losses the city began an aggressive planting program of maple trees which lasted for over a decade. Norway maples were favored because of their fast growth, setting the stage for future disaster 50 years down the road. An inventory conducted by the Worcester Department of Public Works and Parks in 2005-2006 showed a total of 17,113 street trees. Eighty percent were maples (Freilicher et al. 2008).

Asian Longhorned Beetle Discovery

In August 2008, Donna Massie, a homeowner living in Worcester's Greendale neighborhood discovered several unusual but captivating black and white large beetles in her back yard. After searching the Internet, she contacted the U.S. Department of Agriculture/Animal and Plant Health Inspectional Service (USDA/APHIS) office to report what she thought looked like an Asian longhorned beetle (ALB). The next day, representatives from both APHIS and the Massachusetts Department of Agriculture (MDAR) showed up on her doorstep to confirm the bug's identity and begin the long and painful eradication process. Thanks to this curious and engaged community member, the spread of this invasive pest was checked. It was too late for the Burncoat and Greendale



Figure 1: Greendale Street before and after tree removals.

Photo by Ken Gooch, MA Department of Conservation and Recreation, used with permission.

neighborhoods and surrounding towns, but perhaps her actions saved the expansive maple forests of northern New England (Figure 1).

Community Response

The response by federal and state officials was quick and collaborative. The Animal and Plant Health Inspectional Service (APHIS) was the federal agency in charge of assessment and eradication. With Worcester at the epicenter, Asian longhorned beetle (ALB) was also found in the surrounding towns of Boylston, West Boylston, Shrewsbury, and parts of Holden. APHIS, with the State Department of Conservation and Recreation (DCR) and local officials, hosted public meetings to inform residents about the extent of the infestation and the protocol for tree removal. The public meetings were often contentious, as anxious residents struggled to understand the fate of their neighborhood. An APHIS policy of removing both infested and noninfested host trees (those susceptible to ALB) was controversial.

Tree removals began in the winter, early in 2009. Large cranes invaded the neighborhoods removing both public street trees and trees on private properties.

The initial reaction of the public was grief, denial, anger, sadness, and eventually resignation. Stories spread quickly among friends and colleagues about not recognizing their own street and getting lost in their neighborhood where they had lived for years (Figure 1). U.S. Representative James P. McGovern (D-MA, 2nd District) and Massachusetts Lieutenant Governor Timothy P. Murray, both residents of Worcester, had anticipated that once the neighborhood trees began to fall, the economic and emotional costs would start to take a toll. Late in 2008 they pulled together a working team to form

a private, nonprofit entity that would move quickly to engage with community residents and give them a sense of hope and inclusion in the reforestation effort. They each committed funds to initiate The Worcester Tree Initiative (WTI) with a goal of planting 30,000 trees in 5 years (Worcester Tree Initiative, n.d.). The first reforestation kickoff, a tree giveaway event led by WTI, was held at Burncoat High School in April, 2009. Hundreds of residents were trained that day and 300 trees were planted. WTI was off to a good start!

Urban Reforestation

Three agencies were charged with reforestation: City of Worcester Forestry Division planted street trees and trees in public parks; Massachusetts DCR planted trees in private yards where trees had been removed; and WTI gave away trees for residents to plant in their yards. WTI also coordinated plantings at schools and worked with community partners to plant trees in neighborhoods. All of the trees were free to residents. A list of acceptable species (non-ALB host species) was shared by all three agencies and maintained by DCR. In the interest of diversity, no more than 10 percent of any one species was planted in the community (Figure 2).

The City of Worcester Forestry Division led the street tree planting effort assisted by Department of Conservation and Recreation staff the first year, in 2009. Plantings began on those streets hardest hit by tree removals in the Greendale and Burncoat neighborhoods. Many residents came out of their houses to thank the planting crews. Beginning in 2011, the WTI partnered with the city to conduct door-to-door outreach, answer questions, and recruit “stewards” to help care for the trees newly planted in front of houses.

DCR planted trees in private yards of those residents who lost trees to ALB. DCR staff met with residents to determine where to plant trees on their property and what species to plant. DCR provided residents with a packet of information, which included pictures of approved tree species and worked with them to choose their trees. Later that season, a crew returned to plant the trees in those yards. Residents were responsible for watering the newly planted trees. Over the period of 6 years, 3,000 trees were planted.

The WTI oversaw three tree-planting programs: tree giveaways, school plantings, and community plantings.

The Tree Giveaway program was designed for residents living anywhere in Worcester, or the surrounding ALB impacted towns, which included Boylston, West Boylston, Shrewsbury, and Holden (Figure 3). Residents could show up at an event, attend a 20-minute tree planting demonstration and training class and then take home a tree to plant in their yards. Training and registration was mandatory so that the condition of the tree could be

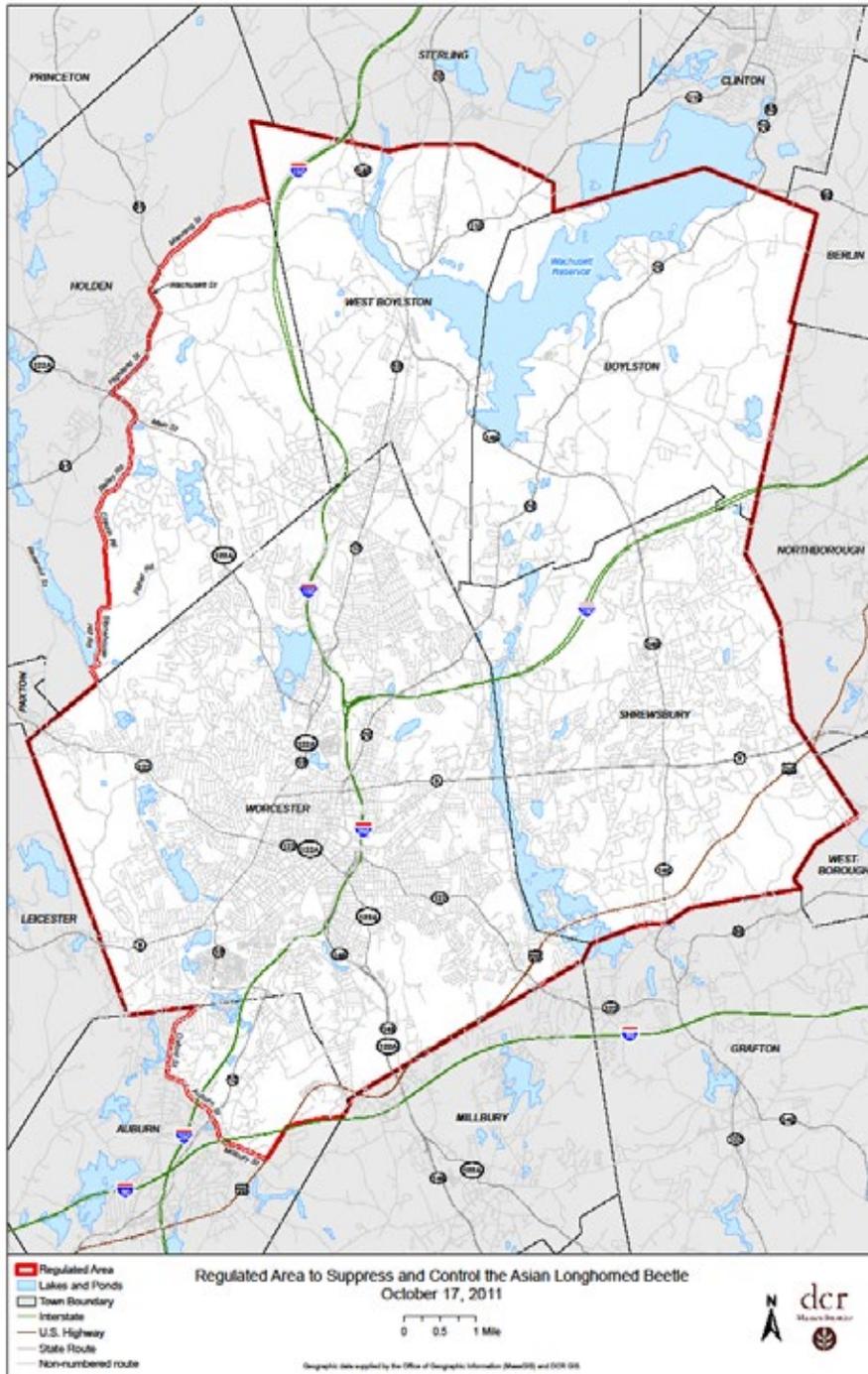


Figure 2: Regulated area to suppress and control the Asian longhorned beetle. DCR, State of Massachusetts, used with permission.



Figure 3: Tree giveaway.

Photo by Derek Lirange, Worcester Tree Initiative, used with permission.

checked at a later date. Participants also received educational materials. The trees were delivered in containers, and varied in size from 3 feet to 8 feet tall. Tree giveaways were held in places throughout the city and in each of the ALB impacted towns. There were five or six tree giveaway events scheduled each season, on both weeknights and weekends.

In the first year, trees were ordered from a local nursery and distributed to people at an event on a “first come, first served” basis, one tree per household. This process proved to be cumbersome as participants arrived without knowing which species would be available and had many questions before they could make a decision about which tree to take home. In subsequent years the process was changed to a preregistration method which proved to be much more efficient. This also allowed people to take multiple trees because it was known ahead of time how many were available and how many people had signed up. We initially felt that bigger trees were better but eventually realized that some people preferred smaller trees because they were easier to transport and plant. Six thousand trees were given away at tree giveaway events in the first 5 years of the program.

Many partnerships developed through the Tree Giveaway program helped with the Worcester Tree Initiative’s success. The partnership between the WTI and the DCR was particularly crucial. From the beginning in 2009, DCR staff conducted trainings and provided technical expertise and advice to WTI staff on a daily basis. USDA Forest Service provided training and educational materials and support. Partnerships with the Worcester Youth Center, Clark University, College of the Holy Cross, and Clark Street School provided host sites for tree giveaway events. These partnerships often led to future



Figure 4: Tree giveaway.

Photo by Derek Lirange, Worcester Tree Initiative, used with permission.

collaborations. The relationship with Holy Cross led to a large community planting as part of their Tree Campus U.S.A. designation. Worcester Youth Center became a core partner of our Young Adult Foresters program in 2011.

The School Planting program was a hands-on educational experience for students in grades kindergarten through 12 and was available to any school in Worcester and the surrounding ALB impacted towns. Initially it was difficult to connect with school principals to get permission for the program. WTI reached out to the Assistant Coordinator of Schools for the Worcester Public School system and his involvement opened up the line of communication with all of the principals. By 2015, trees had been planted at 50 schools with 4,000 students participating. In Worcester, this program was a collaboration between WTI and the City of Worcester Forestry Division. WTI coordinated the event with the school principal who was required to sign a contract holding the school responsible for watering the trees. City of Worcester Foresters planted the trees with students participating. School plantings were a great way to build awareness of the value of urban trees. Unfortunately, many of the school trees planted in the early years did not survive due to lack of watering and careless maintenance. It was after WTI recognized this problem that the mandatory signed watering contract was added to the program.

The Community Tree Planting program connected WTI staff with existing community groups to plant trees in their neighborhoods and develop long-term tree stewards. Examples of collaborative projects included:

- The fruit trees planted on a vacant inner-city lot for Bhutanese refugees to cultivate was a partnership of three agencies (Figure 4).

Worcester Common Ground, a housing agency, took possession and fenced the land; Ascentria Social Services connected WTI to the refugee farmers and a translator; WTI purchased the trees, provided training, watering bags known as “gators”; and access to water. A community ceremony was held and dozens of children and residents in the neighborhood learned about the value of trees.

- Blackstone Headwaters Coalition, a local watershed group, received a grant from the U.S. Environmental Protection Agency to plant trees in two urban neighborhoods to reduce stormwater runoff. Residents and small businesses planted a total of 100 trees—both street trees and private trees. WTI provided expertise on tree planting, purchased the trees, and conducted extensive community outreach. City of Worcester Forestry Division planted the street trees.
- Dodge Park, a small neighborhood public park, had most of its trees removed due to ALB. USDA, DCR, and volunteers from colleges and local businesses planted and watered trees, maintained walking trails, and beautified the park. Dodge Park Rest Home, an adjacent business, provided water for watering trees.

Tree Maintenance: Sustaining the Urban Forest by Engaging the Community

With an aggressive street tree planting program underway (800–1,000 per year), the city did not have the capacity for maintaining all of the newly planted trees. A door-to-door survey conducted by WTI staff in 2011 revealed that people in the community were mostly thrilled with the plantings, but did not know how to help. WTI saw this as an opportunity to engage the community in taking care of the trees, and begin to build a constituency of long-term advocates. Residents concerned about their urban forest were trained and guided by WTI to engage in tasks such as watering, mulching, removing stakes, pruning broken branches, and eventually structural pruning to prevent future hazardous situations.

Young Adult Foresters (YAF) began as a partnership between WTI, the Worcester Youth Center, and the City of Worcester Forestry Division. The program addressed two pressing community needs: (1) the need for hundreds of newly planted city street trees to get watered in the spring and summer,



Figure 5: Young adult foresters water street tree.

Photo by Derek Lirange, Worcester Tree Initiative, used with permission.

and (2) the need for disconnected young Worcester adults ages 18-24 to be employed in meaningful jobs. In 2011 the WTI developed the Young Adult Forester program to meet these needs (Figure 5). The City of Worcester Forestry Division provided addresses of the trees; the Worcester Youth Center hired the youth and provided basic skills training; and WTI provided program coordination, tree skills training, hired a youth supervisor, provided a watering truck and equipment, set up a tracking system, and conducted outreach.

There were challenges as the partners all learned to work together. The Young Adult Foresters program started with 12 youths and two supervisors, but within 2 years trimmed the workforce to 4 youths and 1 supervisor working 4 hour shifts, which was a more effective model. Four hundred trees were watered twice a week with this program. Four high school youths were added to the team during the summer. All of the youths who worked in the program gained knowledge and appreciation of trees. Most claimed to love the program and applied for multiple years. One student claims that her YAF experience was the impetus for majoring in environmental science in college. Hopefully the Young Adult Forester experience will encourage the youths who participated to continue their stewardship of trees well into the future.

While the Young Adult Foresters watered 400 street trees during the summer, the other 400–600 street trees planted yearly by the City of Worcester Forestry Division also needed care. The WTI developed a “Stewards in the Streets” program which engaged resident volunteers to help care for the remaining newly planted trees. All ages were welcomed to join at three increasing levels of commitment.

First Level of Commitment: Hundreds of residents were recruited

through door-to-door canvassing to water and steward the street tree planted in front of their house. Door knocker cards with watering instructions were either handed to the resident or left behind if no one was home and reminded with a phone call or email. Most people contacted this way were willing to help and thankful that they had been notified.

Second Level of Commitment: Several volunteers signed up to be neighborhood tree stewards and watched over all of the newly planted trees in their neighborhood. They also took on more of a leadership role in their community by completing 10 hours of training provided by WTI staff, which gave them a higher level of expertise.

Third Level of Commitment: For those wishing to be involved in tree stewardship throughout the winter, WTI created “Tree Pruning Workdays” where teams pruned street trees up to 6 years old. Pruning tasks included trimming broken branches, removing low branches that obstructed the sidewalk or road, and correcting serious structural problems on these young trees. WTI staff work alongside volunteers, providing them with the skills and confidence to do this work.

The Stewards in the Streets volunteers learned to observe trees differently than in the past. With heightened awareness, they would notice if a tree seems stressed. With many newly trained eyes on the street invasive pests can be discovered early on and thus prevent a large infestation.

In July of 2010, six ALB infested trees were discovered by an alert grounds crew member in the parking lot of a hospital near the Arnold Arboretum in Boston. After 4 years of surveys and treatments, no other signs of ALB were found and ALB was declared eradicated in Boston. Thanks to one person with heightened awareness who took charge, Boston was able to declare ALB eradicated in 2014 while Worcester continued the struggle.

WTI programs were modified and tweaked as problems and inefficiencies were uncovered during implementation. But some of the lessons learned throughout our 7-year campaign have a broader scope and may be useful to anyone working to promote long-term stewardship of an urban forest. These lessons include the following:

1. **Most people love trees.** They would like to help protect them if they have the time. Do not be afraid to ask.
2. **Develop clear, structured programs for volunteers to join.** Be clear about time commitment and expectations.
3. **Develop local partnerships and realize it takes time.** Partnerships are based on building trust. Be patient. Go to meetings and events

to listen and learn about each community from its residents.

- 4. Involve elected leaders.** They can be powerful allies and they can help spread the word about your program. Trees are an easy topic to support! Elected leaders can also help build your network and draw media to an event.
- 5. Keep people informed** when their property is being impacted. When a tree is being planted in front of someone's house, let them know what is going on. Even if they cannot make changes, they want to feel included. Taking time to inform people up front reduces conflict later on.
- 6. Empower residents to help prevent future infestations.** Once volunteers have been trained, they observe trees differently than in the past. With many newly trained eyes on the street invasive pests can be discovered early on and thus prevent a large infestation
- 7. Have concrete goals that can be measured and shared.** WTI's goal of planting 30,000 trees in 5 years kept people engaged as they could see progress and wanted help meet the goal.
- 8. Make sure to say thank you.** Send quick notes, in person, by email, by Facebook or Twitter. Give recognition to volunteers, partners, and financial supporters. Awards are great if not overdone.
- 9. HAVE FUN!** Trees make people happy. Build friendships and teams and celebrate!

Conclusion

Trees are an integral part of a community and serve an enormous public good. They provide health benefits, wildlife habitat, clean the environment, and add substantial economic value (Canopy.org, n.d.). Worcester residents are currently in a period of heightened awareness of the impact that trees have on their lives due to the Asian longhorned beetle infestation and the loss of 30,000 trees.

Millions of dollars have been spent on the reforestation effort in the past 8 years, and 5,500 street trees have been planted. But municipal budgets are tight; other priorities will prevail. As in the past, funding for the planting phase does not translate into funding for long-term care.

In “Trees At Risk,” Herwitz (2001) makes the claim that “any hope of saving Worcester’s urban forest rests in the hands of concerned individuals who value shared greenery as much as their own backyards—and can motivate others to do the same.” The work of the WTI is based on this premise. Over the past 7 years WTI has trained hundreds of individuals to be “tree stewards” who will continue to complement the work of Worcester’s foresters to maintain and care for street trees. With this collaborative system in place, we can be assured that Worcester’s urban tree canopy will thrive well into the future.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Reflections on Two Decades in the Field of Place-Based Environmental and Community Change

**An interview with Rick Magder, a freelance consultant
working near Philadelphia, and former Executive
Director of Groundwork Hudson Valley**

Interview conducted by Erika Svendsen
and Lindsay K. Campbell
USDA Forest Service
New York, New York

Svendsen, Erika; Campbell, Lindsay K. 2019. Reflections on two decades in the field of place-based environmental and community change; An interview with Rick Magder. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 116-129. <https://doi.org/10.2737/NRS-GTR-P-185-paper8>.

Lindsay Campbell (LC): Could you describe the nature of your work with Groundwork Hudson Valley, as well as the Groundwork USA network, in terms of leading community development and environmental stewardship efforts, in the face of what we would call “slow moving” changes such as economic disinvestment? Do you have any reflections on the work in the context of such change?

Rick Magder (RM): Much of my perspective derives from my experience growing up in the Detroit area, where I witnessed the consequences of a 30-40-year community decline, if not more. At the heart of the work of organizations like Groundwork is recognizing that there are both the immediate efforts that you are working on, and the need to use those efforts to accomplish a long-term change for the people and the community. If it takes 30 or 40 years for things to collapse completely, it might take 60 or 70 years to bring a place back from these kinds of physical and social declines. Patience is always key.

If there was anything I, personally, was able to bring to the work at Groundwork, it is the recognition that the little things you’re doing annually need to add up to something bigger in the long run. It is like the old “making soup” metaphor: the ingredients are the little improvements that get made each year. They do not always seem connected to each other, but eventually they need to combine into something that works together and of course tastes great. You might be doing a tree planting on a street corner, but you’re also looking at the park that is there, you’re thinking about the senior citizens in the neighborhood, and perhaps the tension they might be having with teens in the neighborhood, you’re thinking about the schoolyards, you’re thinking about the nearby creek, etc., so you have to work with a sense of holistic intention, then collectively, over time you can have an immense impact. The Groundwork model is especially suited to this cross-sector thinking and broad-based impact around a place, or defined geography.

LC: It sounds like you’re talking about nested scales—the planting in the context of the park, and the school, and the watershed—and also a long-term timeline. But just to put a finer point on where you were going: why greening? Why this kind of investment where there are so many needs? What role does environmental stewardship have to play in this complex tapestry of cities like Baltimore, Detroit, or Yonkers?

RM: I have a personal and a professional answer to that question.

It is incredibly important that what you’re doing for a living is something that resonates with you personally. There are a million issues associated with

social and economic decline of communities—housing, jobs, social safety net; but the beauty of a place, the health of the rivers, parks, watersheds, and the sense of neighborhood—that is what resonated for me. It is what I care about. Like many, I see poetry and beauty in the urban landscape and the incredible on-the-ground “realness” of the families, seniors, youth, parents, teachers, and shop owners who work and live in a specific place. It took me a long time to figure this out, how important places and landscapes are to me, even though issues of education, literacy, jobs, youth, health, etc., are no less important to our communities. You have to do what drives you at deep level, so you have to look deeply within yourself to find it. It cannot be found externally.

From a field-oriented perspective, the most visible, tangible expression of social and economic decline is the physical landscape. When I talk about our work, I show pictures of Detroit—acres and acres of vacant property, or Gary, Indiana, or Buffalo. Blight and built-structure abandonment are the visual expression of social and economic decline—along with trashed rivers and vacant lots. Of course, when people think about better functioning places, they have beautiful rivers, tree-lined streets, gorgeous trails, etc. These places do not have vacant lots, but classic parks like Rittenhouse Square here in Philadelphia. That is the symbolic expression of communities that are highly valued and where investment has been made. People with money will pay for that social expression, and people without money can't—and if they're living around parks with needles, it is equally symbolic in a negative way. There are also nonsymbolic things, too, about disinvestment like actual and serious health risks, increased crime, psychological trauma—so the landscape has real impacts on people's lives, their sense of hope and possibilities, their property values and more.

These deeper impacts of greening work, especially the notion of “renewing what is possible” for people is really important. It has been an uphill climb to get local leadership to understand that, especially in places like Yonkers. When I started in the late 1990s, the urban greening field was mixed up with this notion of beautification, and people thought Groundwork was about “Keeping Yonkers beautiful,” which devalued it, and people thought we should just “put a few flowers around things.” I think it's been a bit of a struggle with the field in general—not so much in the last decade—but certainly prior to that. People who weren't in the field would certainly ask “why is this important?”

Erika Svendsen (ES): What, changed Rick? And why?

RM: We have demonstrated success, whether you're looking at the Indianapolis Cultural Trail, or Center City Philadelphia, or the daylighting project on the Saw Mill River in Yonkers (Figure 1), or Spicket River trail in Lawrence, MA—that these kinds of transformations in the physical landscape

have a fairly impressive impact on reversing economic and social decline. Now, you have a generation of millennials that are much more interested in living in urban centers, in part due to the success of all this work, with fewer wanting a house in the suburbs. It is evident now that you can have both—a beautiful environmentally green place and a vibrant, neighborhood centric urban area. It is also more sustainable of course. Fixing the schools is another matter, but if that happened, more and more people would live in the cities.

The big urban centers—including Philadelphia—are redesigning themselves every year to encourage biking, walking, and park improvements, while promoting a more exciting urban life. One problem is that no one has, really, come up with a solution to mitigate the negative impacts of such urban design improvements on low-income neighborhoods. If you look at the Indianapolis Cultural Trail, it is a highly designed and spectacular urban amenity, along with a storm water mitigation project, that has led to all sorts of cool restaurants, new housing, and music venues. However, there are still neighborhoods within just a block or two that are in great need and deterioration. So the question that is constantly asked is, “Who are these improvements for? Who is the urban greening movement serving?” For example, if you paint a wonderful mural on a vacant wall that addresses cultural identity, or history, or social issues, what is it achieving for the overall neighborhood? So there’s been some pushback on the success of these things in reversing decline, in that it takes an incredible effort to create a balanced community in the long run and there just isn’t the commitment to do that in most places.

LC: Those are really great examples of things that get to a larger scale, when you’re trying to shift from, “Oh, is it just beautification?” to really being a community development engine. I think it’s a powerful pattern that you’ve observed in this field.

RM: I would say that Groundwork recognizes these challenges as well as anyone, and it has tried to make its interventions more equitable, especially by engaging youth and young adults in all its projects and creating pathways for them to drive these projects but also to be the next generation of people who would work on them. Not only Groundwork organizations have done this, of course, but recognizing that landscape change needs to bring along with it local jobs, access to work, transit connections, affordable housing and more is one of Groundwork’s strengths. In Yonkers, we even led a Community Benefits Agreement Alliance for more than 3 years in the face of major development pressure. People asked why we were leading that process, and we said that our work focused not only on the urban landscape, but on the impact such changes would have on the entire social ecosystem.

Figure 1: Saw Mill River daylighting project waterfall, tidal basin, and fish ladder in the City of Yonkers, Hudson River Valley, NY.

Photo by Donna Davis/Ms. Davis Photography, used with permission.





LC: Yeah, it's like finding this piece of the puzzle. We all know that greening isn't the silver bullet, right? It is an important leverage, but then, who do you have to work with in coalition or in solidarity to make sure you're not displacing the very people you're trying to serve?

ES: It's hard to create a balanced community, as you say. So one thing is to make sure that everyone in that community can stay in their homes, have equity in that community—which is different from just staying in the community, but have some sort of equity, voice, and status in that community. But at the same time, work with these newcomers to have a sense of responsibility. You know, no one wants to be guilted into anything these days or they may feel like, "Wait a second, I've got a right to live here like everyone else." But I wonder if the next step for greening is, not only do we bring people out the door to a tree planting, but how do we use it as a way that people can see their rights and responsibilities to a place in a new way?

RM: Yeah, that's a really good point. One of the organizations in Philly that I have done some work with is the Fairmount Park Conservancy. There are neighborhoods around Fairmount Park that are low-to-moderate income places but Center City is encroaching and there is real concern [about gentrification]. So the organization's staff, with support from local foundations, have been working thoughtfully to try to manage these changes. One strategy has been the creation of the East Fairmount Park Alliance, which is simply a forum, that meets every quarter or so, and includes key stakeholders from the surrounding neighborhood. It tries to at least create a place where conversations can be had about changes that are coming. You can't just ask people in a gentrifying neighborhood to step up and get involved, you have to have a structure that allows people to move into these conversations and find solutions.

LC: Thank you for those reflections. The next question is sort of the flipside of the first two sides of the same coin. The first was about working in the context of disinvestment or disturbance, but can you reflect on how this notion of social resilience or social-ecological resilience resonates for you, in the communities where you work, with your staff, with your various organizations? Do you see your work as working to strengthen resilience?

RM: I didn't initially. I was just trying to make places that were perceived to



Figure 2: Science Barge sustainable farm and science center, near the city of Yonkers, Hudson River Valley, NY.

Photo by Donna Davis/Ms. Davis Photography, used with permission.

be downtrodden look and feel better. It just angered me every day to drive by a vacant lot, or see no trees on a street, or view bottles, trash, and tires on the banks of an otherwise lovely stream. My motivation was just literally, “What can I do to make a difference here?” And to this day, I still get thrilled by the impact of altering those landscapes.

But I think, over time, a couple things happened. Where we combined a lot of projects together, like the daylighting [of the Saw Mill River], and the Science Barge, and the public art, and the farmer’s market (Figure 2). All of a sudden, you had this whole array of things that all complemented each other to revitalize a whole district. I started thinking about this amalgamation under the broader notion of resiliency, in terms of how all these things hold each other up and created a higher level of impact on people. All social issues work the same way, in terms of resiliency. It is never just one thing to get done to have a real long-term impact on education, jobs, or communities.

It is not just all about landscape change, we found too. The work in transforming people is really at the heart of it all, especially the work with kids and senior citizens. We interviewed some of our youths and volunteers for a film, and the senior citizens spoke so eloquently about how much the work we did sustained their lives in a deep way. Actually, one of our longest running Community Supported Agriculture (CSA) members, well into her 90s, showed up to my party when I was leaving, and told me how important our work was to her having a sense of community. She gave me a gift for our garden outside of Philly. It was so sweet and made me realize how important this



Figure 3: Youth Corps member Wilder Maturana at the South County Trailway, 2017.

Photo by Felipe Ramirez/ Groundwork Hudson Valley, used with permission.

work is in terms of creating a sense of belonging and cohesion for someone who might have been isolated otherwise. To this day, she still walks her rather heavy CSA share down the street and to her home. Maybe the exercise is what sustains her too.

And then, of course, the work with our youth, which took some time to grow and evolve (Figures 3 and 4). It was when we brought Curt Collier into our organization (still the youth director at GWUSA) and we moved gradually to a model where we were working with fewer kids but more intensively with them over many years. The impact on individual lives was amazing. One young woman, who got involved with us as a small kid in a Forest Service-funded project at a public housing site, became one of our very best youth leaders. Her growth over her 4 years of high school with us was iterative, but because we could mentor her along the way, she went on to work at Yellowstone National Park and came back to Groundwork to work on the Science Barge. We all collectively said, "You know we cannot do this work for a year with a kid, you have to build a sustaining relationship if you're really going to build resilience."

And that was true with senior citizens as well, building the relationship over many years really mattered more than anything else. Or in the case of downtown Yonkers, having the impact over many years as well. I was there for a generation, and it took that time to build a relationship with the community and see the impact. You could see the change in the people we were serving. So, if you're talking about resilience it has to be a long-term engagement,



Figure 4: Youth Corps members Kenny Ortega and Erick Rosa at the South County Trailway, 2017. Photo by Felipe Ramirez/ Groundwork Hudson Valley, used with permission.

long-term strategy, it can't be quick like even 2 or 3 years, it has to be a progressive thing.

One year at Rocky Mountain National Park, at the Groundwork USA youth summit, Curt had the youths do skits for an audience that included a range of federal leaders. One group enacted an experience of what it was like to work in urban greening in their community, with each member of the ensemble taking a different role—youth, parent, teacher, friend, etc. They told a story about how they would be putting a garden in, or planting a tree, or cleaning up a river, and their parents and their friends would laugh at them, saying things like “The work you are doing is so stupid, it is leading nowhere, you're going to be like a gravedigger or something”—and how hard it was for them to be able to, in their lives and their cultures, to legitimize the things they were doing. They had to defend it in a lot of ways, but by building a relationship with the whole family and making a visible difference in their immediate neighborhoods, and giving the kids a real paycheck and a trip to Yellowstone, we were able to demonstrate to the whole extended community that this wasn't just stupid work and that there were jobs and a future for these kids and their communities.

LC: Two things you said just really resonated with recent work. I don't know if you, have you seen the documentary *City of Trees*? The film follows Parks and People in Washington, D.C., and its

short-term green jobs program that they ran with American Recovery and Reinvestment Act money, stimulus money and the film watches the winding down of the funding. It's a tragic story for a non-profit running out of the grant money and also the jobs ending for these young adults, who you could see are on this pathway for the potential for transformation. When you say, it can't be 6 months, it can't be 9 months, it can't be 2-3 years—it's got me thinking about our own projects working at a public housing site now that the grant is ending. In thinking about stewarding the landscape and building relationships with people—when are you “done?” It feels like we stepped in and tried to intervene in the system and now we're going to be out of there and it's really hard.

RM: You know I'm sure there were some impacts, but when you're talking about real resilience, I think it's a different timeline and a different level of commitment—and perhaps that signals the need for new types of organizations and mechanisms to support this work. There's a conversation in Philadelphia about “Rebuild,” which is an initiative to rebuild parks and rec centers and libraries with revenue from a sweetened beverage tax. It may raise about \$500 million for park restoration, and a big part of it is a “civic compact.” Fairmount Park Conservancy may play a big role and the question is: “How do you sustain this civic compact after the million-dollar renovation is completed and you move on to the next one. What does it really mean to have this civic compact?” You need to create the social engagement infrastructure, so that once these things are completed, it stays in place. Groundwork was designed as a social enterprise that would promote long-term civic engagement. So, whether it's called Groundwork or something else, if you're really going to have a civic compact and have a real impact over generations, you can't just walk away. You have to have a structure that continues to work on these complex things with the neighborhoods.

ES: Sounds like what you are saying is that we need to invest in capacity building, social organizations, programs and people as we do design, construction and planting.

LC: Yes. Let's move on to the next question. You've already shared so many lessons, but stepping back from your career thus far, could you reflect a little bit about some of your proudest moments or learning moments?

RM: It was interesting when I was leaving Groundwork in 2016, my staff said what they really appreciated about working for me is that I allowed them to



Figure 5: Youth Corps members Renise Wyllie and Kenny Ortega at the daylighting, 2017.
Photo by Groundwork Hudson Valley, used with permission.

flourish, to find their own passions. I kept them focused on the big picture, but did not micro-manage them. I really enjoy helping people find their own passions, because once you do, you almost work for free. It didn't come easy, I couldn't completely figure out what I wanted to do for a long time. You can also expand this idea to helping the community and people in the community find their purpose.

Some of the greening projects I've seen around the country, can seem really surprising that people would have such intense passion about their little piece of a neighborhood that might be up against an industrial park, or a train line, or barely a sliver of grass—but this is their *thing*. Some of them have spent decades working on these small plots, and I might think, "really?" But, I love the drive, the passion, the enthusiasm that makes them so devoted. All work places need to pursue that for their employees, and all people need that in their lives: a sense of ownership, pride, and personal stake in changing things. I am really proud that I was able to make that happen within and outside of an organization. I know it meant so much to me in my own life that I could be equally passionate as well. And sometimes those little projects add up to something big, or surprise you with amazing results.

In terms of community impact, I'm most of proud of the collective impact we had in downtown Yonkers. Over a course of about five blocks, you could tour two phases of the newly opened up Saw Mill River, walk by mosaics

and murals we installed, read the wonderful interpretative signs about local history and watersheds, grab produce at our food co-op and urban farm run by our youths and seniors, watch the fish and turtles in the new habitat we helped create along the river—which is a U.S. Fish and Wildlife Service Urban Wildlife Refuge partnership site, by installing a fish ladder, and see all of the people looking over the edge of the tidal basin, where the salt water hits the fresh water of the Saw Mill (Figure 5). Eventually, 400 yards further, you reach the Science Barge, our sustainable farm and environmental education center floating on the Hudson River. All of that together is amazing to me.

Another great moment was being in Yellowstone with the Groundwork USA National Green Team from around the country and climbing to the top of this mountain at sunset and being kind of amazed that I helped to create such a phenomenal moment for kids every year now. Sometimes you don't know where things are going to lead, you follow your instincts and it's just kind of nuts what you end up in terms of impact and experiences.

LC: When you were talking about these really modest sites, I was just back at this street on the Gowanus Canal in Brooklyn, where probably 10 years ago Erika and I took our Northern Research Station Director, who is now retired. We were sharing with him a vision that we could see of this place, these organizations, and the possibility for transformation. But we were standing on this dirty street end, along one of the most polluted waterways in the country and talking about how this street end actually connects to our National Forests. We try and tell people on many of our site visits and walking tours, "Don't just look at the bioswale, but think about the people behind this kind of thing. Think about all the organizations and networks that are made up of individuals that it took to make this change to the environment happen."

RM: Right. You can't think of it just as the bioswale at the end of that lot, but what that improvement will lead to next. It's a catalyst, or the spark that leads to something bigger, hopefully. After all, these things are not static or just a moment in time, but part of a bigger story.

LC: Just one final reflection, can you tell us a little bit about some of your future goals? You've obviously made a big change in career and location and so what's next?

RM: I hope to continue to have a direct impact on community landscapes in need of long-term change, here and around the country, and to empower and change the lives of people in the neighborhoods and communities in those places.

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Seattle's Community Emergency Hubs: Public Spaces as Post-Disaster Organizing Tools

Laura Landau

New York City Urban Field Station

New York, New York

Landau, Laura. 2019. Seattle's community emergency hubs: Public spaces as post-disaster organizing tools. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 130-143. <https://doi.org/10.2737/NRS-GTR-P-185-paper9>.

As the impacts of climate change continue to manifest throughout the world with greater frequency, addressing the question of how to best prepare for and recover from disasters is more crucial than ever. Evidence shows that beyond ripping through physical infrastructure and claiming lives, disasters also damage social networks and community bonds, making the impacts perceptible long after houses are rebuilt. The importance of social infrastructure in disaster planning is becoming more widely researched and considered, and it is consistently shown that communities with strong social ties are better prepared for the inevitable effects of climate change (Aldrich 2015). Recognizing this, many cities have begun to implement and support preparedness and response plans at a community level.

Public space is a crucial tool and resource in determining how to build more socially resilient communities. There has been significant research proving that connection to place and neighborhood contributes to increased civic participation, better social bonds, and higher gross domestic product (Johnston 2015). Additionally, public space has long been used as an organizing tool in the wake of disaster (Low 2006).

The strongest community plans rely on physical spaces and foster community ties that can be relied on during emergencies. As communities begin to recover from past disturbances, they need to continuously anticipate future emergencies and disasters. Alongside community-based attempts to bolster disaster response, cities across the world are creating plans and policies to help build preparedness at the neighborhood level. The goal of these plans is to help communities become better informed and prepared in the event of future disasters.

In Seattle, WA, the inevitability of future earthquakes has prompted community members to focus on emergency preparedness. Because the timing and the exact damage of the expected earthquake are unpredictable, the Seattle Office of Emergency Management (OEM) seeks to draw upon the things they can control, such as community response, by establishing a Community Emergency Hub program. Seattle's Community Emergency Hubs program draws upon social resources, community assets, and proven disaster response strategies in order to create a framework for communities to adapt to their own needs. Hubs attempt to address the gap between community and city response to disaster by allowing for more grassroots efforts that are informed, rather than dictated by the city government. This chapter will focus on the importance of social capital and public space in disaster resilience, and introduce a unique model in Seattle that centers disaster response around physical space. The chapter will conclude with recommendations for practitioners on how to use this approach as a prototype for communities across the country.

Background: Social Capital and Place Attachment in Community Resilience

Seattle OEM relies on existing social ties to create and implement Hubs throughout the city, and participation in Hubs has in turn enhanced these bonds for many community members. Social ties are important in emergency planning and response because disasters cannot be understood without looking at the social impact they have. Disasters become disastrous not because of physical damage alone, but because of how they are managed politically, institutionally, and socially; areas that are equally affected geographically will differ in their recovery based on environmental, economic, and community vulnerability. According to Daniel Aldrich, director of the Security and Resilience Studies Program at Northeastern University, one of the greatest threats of disaster is the displacement and broken social networks they cause (Aldrich 2015). Eric Klinenberg's book "Heat Wave: A Social Autopsy of Disaster in Chicago," addresses the importance of social networks in the outcome of the 1995 heat wave. In addition to the expected inverse correlation between neighborhood median income and damage suffered in a disaster, he points to the crucial role of social infrastructure. Communities with more social ties—fostered by active commercial corridors and social networks such as block clubs—fared much better than neighborhoods with similar demographics that were suffering from disinvestment and broken social networks (Klinenberg 2013). This concept applies to recent disasters as well.

Researchers from John Jay College and the Institute for Environmental Sciences and Technology found that between the Lower East Side and the Rockaways, New York City neighborhoods with similar levels of physical damage from Superstorm Sandy, the Lower East Side was at an advantage because of its pre-existing civic infrastructure. Both neighborhoods had a high concentration of public housing and poverty, but the Lower East Side had stronger social cohesion due to the number of community organizations that had worked together in the past, primarily on anti-gentrification activism. The history of community involvement on the Lower East Side allowed for a more effective response and recovery process after the storm (Graham et al. 2016). This can be explained by the varying levels of social capital in different communities.

The term social capital is primarily used to discuss the potential and the actual social networks that can be relied on in times of stress. In 1915, Louis Hanifen defined social capital as "the good will, fellowship, mutual sympathy, and social intercourse among a group of individuals and families who make up a social unit" (Aldrich 2015, p. 256). It can be more broadly understood as the "community/network relations that affect individual behavior" (Shimada

2015, p. 378). Sociologist Robert Putnam, author of “Bowling Alone,” explains social capital in the terms of networks and norms that have value in their social reciprocity (Putnam 2001). Social capital is typically measured by community involvement (volunteer engagement, registered voters, etc.), as well as through surveys that inquire the level of trust among neighbors. Aldrich has done extensive research on the importance of social capital within the context of disaster planning and recovery. Social capital is crucial in communities that face disaster because the most frequent first responders are not national aid groups or police, but rather neighbors and friends (Aldrich 2015).

Aldrich, Putnam, and other researchers identify multiple forms of social capital that can and should be utilized in disaster relief work. The first and most essential form according to Aldrich is *bonding social capital*, which refers to the closest social groups (family and close friends) and is often formed based on similarity of location, background, and income. This is the most helpful in disaster situations because so many people rely on family and close friends as their primary networks in the case of emergencies. Next is *bridging social capital*, which connects people at an organizational level. Examples include schools and places of worship, which have the possibility of also bridging differences in race and class.

Finally, *linking social capital* connects regular citizens to people in positions of power, such as elected officials and traditional first responders. Connections to people in power act as a kind of social insurance, as communities with strong ties to leaders are less likely to be overlooked following disaster. The Ninth Ward in New Orleans is an example of a community with strong bonding social capital, but the lack of linking social capital there contributed to overwhelming displacement following Hurricane Katrina. Without support from the government, decisionmakers saw the neighborhood as low priority; housing was torn down and left in disrepair, preventing residents from returning to their homes. Those forced to move following Katrina lost their main networks, depleting the original social strength of the neighborhood (Bier 2006, p. 243).

In the aftermath, it became clear that the systemic failure of the response to Katrina was not the fault of any one organization or person, but rather the lack of coordination between the many players, from communities to every level of government. The cyclical relationship of social capital, community cohesion, and resilience shows the importance of building networks and improving lines of communication as part of disaster planning. All three forms of social capital play an important role in reducing the impact of disaster, both before and after the event (Aldrich 2015). All three are employed in the Seattle Hubs, with the connection to OEM working to enhance linking social capital through communication with government.

Social capital is also seen as an asset in community development. Asset-based community development (ABCD) emerged out of a response to the needs-based development that focused on what communities were lacking, rather than a more positive approach of looking at their strengths. ABCD encourages communities to search for unrecognized assets—anything from specific skills community members can offer, to the very relationships that form that community (Mathie and Cunningham 2003, p. 476).

In addition to social assets, physical assets are an important part of organizing for disaster response. Place attachment, or the importance of psychological ties to place, primarily looks at the relationship between people and their residences or neighborhoods. Place attachment can be defined as an effective bond between people and places (Low and Altman 1992). At an individual level, it is impacted by a combination of the memories connected to a specific place, and the extent to which a person's values are reflected in the space around them. It can also be applied at the community level, suggesting that communities with stronger attachment to place benefit from higher social cohesion (Brown et al., 2003). Place attachment has also been linked to neighborhood cleanup and revitalization (Manzo and Perkins 2006, p. 337), suggesting that individuals in communities with higher place attachment invest more time and energy in their neighborhoods.

The development of place attachment has helped explain the importance of community investment in disaster recovery. Resident attachment to place is correlated with higher economic outcomes and civic engagement. "There is an important and significant correlation between how attached people feel to where they live and local GDP growth" (Loflin 2013). Loflin explains: "What most drives people to love where they live (their attachment) is their perception of aesthetics, social offerings, and openness of a place." People who feel connection to and investment in their communities are more likely to form strong social ties and be civically engaged, subsequently creating resilient communities.

A common exercise to identify community assets is asset mapping. Geographically mapping community assets helps residents visualize the strengths of their neighborhood and identify the places, including open and green spaces, which can be used to their advantage. In their new Community Emergency Planning Toolkit, New York City Emergency Management (NYCEM) encourages communities to create neighborhood asset maps in order to identify potential spaces and resources that can be used in disaster preparedness. In Seattle, Hubs are often based out of these same spaces. Residents typically identify spaces that already serve as natural meeting points as Hubs, including churches, playgrounds, and community centers. Figuring out how to use these shared spaces is an important step toward building social capital and resilient communities.

Emergency and Disaster Preparedness

Planning for disaster requires an understanding of the resources and the capacity, both physical and social, of the specific community. Resilience at the community level can be defined as “the collective ability of a neighborhood or geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks.” (Aldrich 2015, p. 255) It can be further broken down as a combination of economic development, social capital, information, communication, and community competence (Sherrieb and Norris 2010, p. 228).

Community resilience looks different from one community to the next. The variables used to measure potential resilience indicators, such as the number of civic organizations per block, are dependent on each geographic space and the people who live there. Across the board, communities with economic, social, and geographic vulnerabilities have a harder time returning to their previous state following a disaster or stressor. Community resilience plays a large role in disaster recovery, which can be divided into multiple phases of impact, recovery, and reconstruction (Shimada 2015, p. 373), and is widely discussed in this book.

One of the strengths of the Seattle OEM Community Emergency Hubs is the adaptability of the program to change from neighborhood to neighborhood to reflect the needs of each specific community. Taking into consideration the specific assets of each neighborhood, both social and spatial, the model can be used as a starting point for any community looking to organize around resilience and emergency preparedness.

Community Emergency Hubs

Seattle residents are working with OEM to build communities that are better prepared for any number of emergencies, from low-level flooding to the impending earthquake. Community Emergency Hubs developed after the major snowstorm in Seattle in 2009, nicknamed “snowmageddon”.¹ The city had no recent experience or plans in place to handle that much snow, and subsequently, the storm led to traffic issues and stranded some Seattleites in their homes. Meanwhile, community leaders in Seattle had long been noticing potential issues that could arise in the case of emergency. For example, residents in West Seattle only have one bridge to access major hospitals, meaning they could potentially be left on their own without medical care in the case of a large-scale disaster. Cindi Barker, Seattle resident and member of the Precinct Advisory Committee noticed that even during small-scale disasters such as a windstorm in 2006, people naturally came together in shared spaces looking for

1. Debbie Goetz, pers. comm., April 15, 2016.

information and support.² Volunteers such as Ms. Barker connected with OEM, to establish the Seattle Emergency Hub program.

Community Emergency Hubs are an effort to ensure that neighborhoods at least have a basic starting point to create an important layer of preparedness. Seattle OEM consistently teaches community members to prepare to support themselves and each other for 7-10 days before a government response will be in place to provide disaster assistance. The Community Emergency Hub program in Seattle is a strong example of a place-based model that activates a specified location in the case of an emergency. Hubs are simply predetermined “places where people go after an emergency to help each other” (Seattle OEM 2016). Some Hubs are part of a larger community emergency planning effort across Seattle, called Seattle Neighborhoods Actively Prepare (SNAP), and exist within neighborhoods that actively organize around emergency preparedness. Others are the first step to beginning a community conversation around resilience, and some are simply a place to meet up, with no plan or promise of a specific disaster response. This variation comes from the fact that both Community Hubs and communities themselves are self-defined by residents. Some self-defined communities organize around houses of worship and other spaces with inherent social ties, and others are based entirely on geographic proximity. All have access to resources, such as toolkits, trainings, and direct communication with OEM, and complete a step-by-step process to organize and test a disaster plan.

Hubs are documented on a Seattle OEM map, which anyone can access to find their nearest Hub. In addition to the city’s resources, volunteers have created a Hub Captain’s Network, operating independently from OEM. Hubs can opt into this network to receive more regular communication about best practices, resources, and annual practice emergency drills. The Hub Captains Network, led by Cindi Barker, also operates a Website and a live “NeighborLink” map with help from Seattle Central College web developers. The NeighborLink map shows Hubs, Community Emergency Response Team (CERT) locations, SNAP neighborhoods, and block watch groups, with contact information for each.

In November 2016, there were 67 designated community emergency Hubs across Seattle (Figure 1). A closer look at the map showed some gaps within the central Seattle area, and demographic analysis of central Seattle provided a few explanations as to why Hubs had not been established in the same quantity there as in other neighborhoods. Debbie Goetz, Community Planning Coordinator with Seattle OEM, suggested the following possibilities. First, these neighborhoods tend to have more renters versus homeowners. There are also more young people in central Seattle, who may connect more on

2. Cindi Barker, pers. comm., October 29, 2016.



Figure 1: Map of Seattle Community Emergency Hubs, 2015.

Seattle Office of Emergency Management, used with permission.

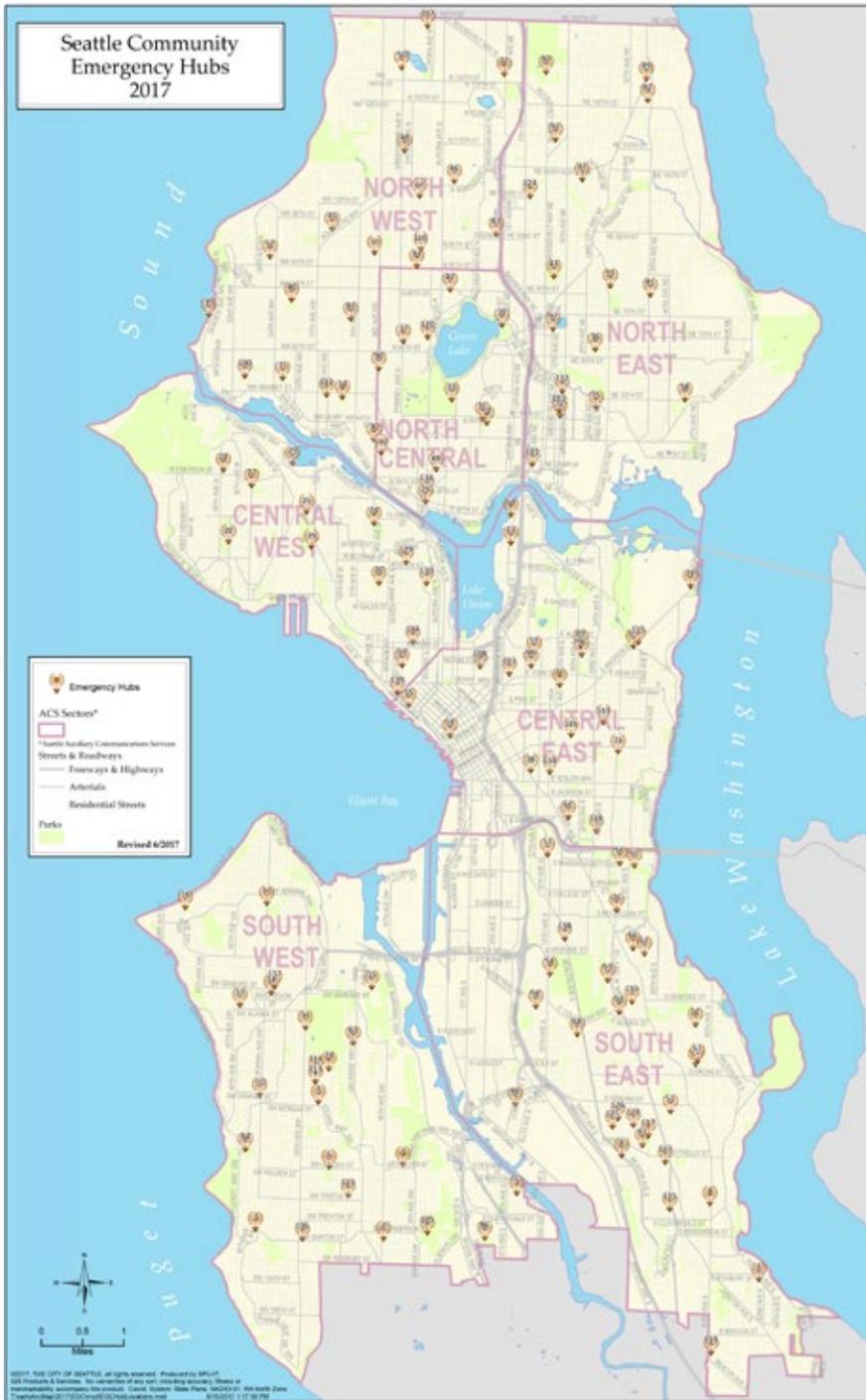


Figure 2: Map of Seattle Community Emergency Hubs, 2017.

Seattle Office of Emergency Management, used with permission.

social media than in person. Finally, some of the neighborhoods in central Seattle have less social cohesion, or have less trust in government and are thus less likely to choose to participate in city programs.³ In order to rectify this and ensure that Hubs are available to residents in every neighborhood, OEM looked to the P-Patch community gardens. P-Patch community gardens are overseen by the Seattle Department of Neighborhoods, and encourage communities to engage in urban environmental stewardship through community gardening, market gardening, youth gardening, and community food security programs. These gardens are natural Hub locations because they already have both social networks and established ties to place, and many are located within the Hub desert.

In April 2017, following a series of community meetings to bring gardeners on board, all of the P-patch community gardens were added to the map as Hub locations. These gardens are already sites with community ties, and are therefore natural meeting spots for people looking to connect with their neighbors. Beyond just increasing the number of Hubs, the addition of these gardens has presented some exciting new collaborations. One community had an existing Hub in Magnolia Manor Park, a place they had identified as a spot where people tend to congregate. Once the P-patch garden within the park became a Hub, the two decided to join forces. The city introduced the Hub organizers to the community gardeners, and now they are committed to coming together in the event of an emergency. The latest Hub map, updated in June 2017, shows 139 Hubs spread across the city (Figure 2). An interactive online map allows users to enter their address and view all of the nearby Hubs they can reach.

Two factors make this program stand out among other community preparedness plans: first, community Hubs are place-based, beginning with a physical point of connection. This ensures that there is a base expectation of what will occur in a response: regardless of the plan details, people will have a place to go to meet with others. Second, community Hubs are entirely determined and governed by community members. Each Hub represents a different community, and therefore has a different mission and process to achieve its unique goals. Becoming a Hub is straightforward; it simply requires a community to designate a location and submit an online registration to be added to the Hub map. Hub members, along with all Seattle residents, are eligible to apply for grants if they want to begin organizing together as a group.

One important tactic the Hub program employs is the leveraging of existing community organizational structures to avoid creating unrealistic amounts of work for communities or to replicate work that has already been done. Hubs are sometimes centered on existing communities that are looking for a

3. Debbie Goetz, pers. comm., October 25, 2016.

way to be better prepared in the event of an emergency. Churches and faith-based communities, ethnic community groups, and community gardens all have existing social networks. When there is not a clearly identifiable community, designating a Hub can actually help build social capital and better establish social cohesion, like when a group of neighbors decides that their local park or playground can serve as a Hub, and then reaches out to others to increase involvement and build social ties.

While the Hubs have thankfully yet to be tested by a major disaster in Seattle, there have been a series of trials and drills to test the efficacy of the Hubs and encourage people to become familiar with their disaster plan. In July of 2017, eleven Hubs, both newer and more experienced, participated in drills simulating an actual crisis. West Seattle Blog (<http://westseattleblog.com>) wrote about the event:

The scenario citywide was: Sixth day after a big earthquake. Three of West Seattle's Hubs were part of it. For the Sunrise Heights Hub at EC Hughes Playground and the Junction Hub behind Hope Lutheran Church, it was their first drill. We visited both. "If we can't communicate, we can't allocate," observed Junction Hub captain Delores Kannas. "Our big goal is to match resources with needs. Different people will show up, and it will evolve."

Because of the success of the program, there is an effort to establish community Hubs in neighboring King County organized by Seattle-King County Public Health, and partnering with Medical Reserve Corps volunteers. Although needs vary greatly by city and community, the basic principle of the Hub program—identifying a place to go in the event of an emergency—can be applied anywhere. As the program grows, it is important to recognize both the strengths and limitations of community Hubs.

Lessons and Takeaways for Other Cities

- 1. Identify a physical meet-up place:** While different emergencies may call for different kinds of facilities, having at least a tentative meet-up point can make preparedness plans more accessible to community members who were not able to take part in the entire planning process. Hub Captain Cindi Barker suggests that the best approach to emergency preparedness is a combination of place-based and community-based. A place is an important first step to organize around, but without community support, a place is not going to be able to accomplish anything. Likewise, a community without a meeting place will have trouble attracting people

and getting their efforts off the ground.⁴ In addition, mapping these meet-up points offers residents who have never participated in preparedness planning the chance to know where to go in the event of an emergency.

- 2. Emphasize communication between city government and the community:** The volunteer-led Hub Captain network serves as a link between Seattle OEM and the communities they serve. Barker meets with Debbie Goetz monthly to discuss issues of concern in the Hubs and receive updates on the growth of the program, such as the P-Patch expansion. This is an important way of bridging the gap between community-level organizing and city-level planning, to ensure that efforts are supported and not duplicated.

- 3. Consider unique assets and weather conditions:** Different cities have different needs when it comes to disaster. In Seattle, many Hubs are outdoors in parks, playgrounds, or gardens because these places are visible and will be safer than buildings in the event of an earthquake. Other cities may be preparing for flooding, extreme heat, or other weather conditions that would make meeting outside impossible. Hubs can be adaptable depending on the weather and the available assets within a community. Cities looking for indoor spaces can consider meeting up in libraries and even supermarkets, and can look into the use of trailers or modular sheds in outdoor spaces. Online resources can also be employed to create virtual “Hubs” in communities that have the ability.

Conclusion

In considering Community Emergency Hubs, a few general themes have emerged. First, communities are strongest when they have high levels of social capital and cohesion, allowing community members to look out for one another and work collaboratively following emergency. Second, place-based approaches to disaster response can help ensure that in the event of a disaster, people will be able to come together and assess their needs and resources in real-time. Finally, plans that provide a structure of connectivity, space, and communication strengthen the resource sharing and spontaneous efforts that are bound to emerge after an emergency. Using the Seattle Hub model as a template, communities can begin to create personalized plans that improve disaster response and boost resilience.

4. Cindi Barker, pers. comm., October 29, 2016.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Designing and Managing Resilient Recreation Landscapes

Matt Arnn

USDA Forest Service

Washington, D.C.

Arnn, Matt. 2019. Designing and managing resilient recreation landscapes. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 144-155. <https://doi.org/10.2737/NRS-GTR-P-185-paper10>.

Landscape architects are professionals who design, plan, and manage the land, and so it is a profession that is essential to defining the character of our National Forests and Grasslands. There are key points of entry and engagement where we have a chance to make a first and lasting impression for the public when they come to visit their public lands. Providing quality recreation experiences is perhaps one of the most relevant, as many people come to understand the value and meaning of their landscapes through recreational visits (Figure 1).

Outdoor recreation activities occur in numerous places across the American landscape, on and outside of the National Forests and Grasslands. They take place in neighborhoods, undeveloped woodlots and streams, city and state parks, county open spaces, and a vast array of Federal and Native American lands. For many, these settings are their introduction to the natural world, a beginning point for engaging in a healthy outdoor lifestyle. But the reality is these landscapes are changing. Climate change, natural disasters, and other disturbances are altering the health of our public spaces and in turn what they look like. These changes are forcing us to examine, and in some cases reconsider, how we design and manage for recreation.



Figure 1: Project-level recreation site design decisions are challenging. Being responsive to, and ultimately respecting the landscape and unique sense of place require balance, consideration, and integration of numerous concerns in the context of increasing demand for access and opportunity, and limited financial resources. Understanding the setting is the foundation of site design—providing for people’s experience of a particular place with intrinsic natural and cultural features.

Photo by Katherine Hawkins, Share the Experience Photo Contest, used with permission.

Forest Service Landscape Architecture and Recreation—A Brief History

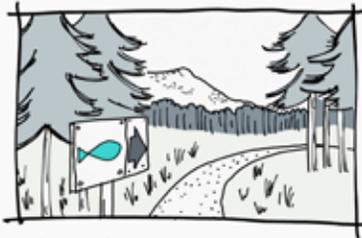
USDA Forest Service landscape architects have a long history of composing recreation settings and experiences. Our first recreation professional, Arthur Carhart, was hired in 1919. Carhart trained as a landscape architect and contributed greatly to the development of the idea of wilderness, in addition to conceptualizing and building some of our first recreation sites. 2019 is the centennial of his hire and his studies of how recreational opportunities could be woven not only into the landscape, but also into the fabric of our agency.

Initially, the focus of the Forest Service landscape architect's work was squarely on the experience of the recreational forest user. But as our National Forests became a primary source of timber harvest, helping to feed the growth of suburbia after the World War II, we compromised many of our recreational roots and values in deference to the large-scale extractive logging practices of the times. In 1976, public outrage at the visual impacts from Forest Service clearcutting led, in large part, to the passage of the National Forest Management Act (NFMA), which placed specific requirements for National Forest managers to create management plans to protect natural resources while providing for multiple uses. With the NFMA in place, the agency began to craft a systematic approach to managing for scenery. The effort was guided by R. Burton Litton's landmark publication, "Forest landscape description and inventories - a basis for land planning and design," which introduced terms and concepts that later evolved into the Forest Service's visual management system (VMS) (Litton 1968). These "environmental design arts" for scenery emphasized the natural "characteristic landscape," as a scenic composition of form, line, color, and texture elements, using "landscape design" concepts, principles, and variables (Figure 2).

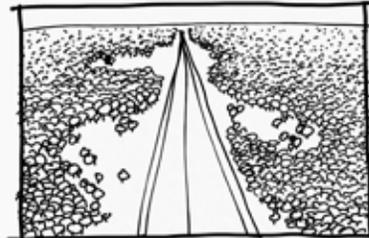
While timber harvests increased in size and scope through the 1980s, VMS became a fundamental method for protecting scenery values through visual mitigation. A large workforce of trained landscape architects was hired to implement this system, peaking at 300 in the mid 1980s. The 1990s saw changes in forest management and greater attention to environmental protection, including increased opportunities for public involvement in management decisions. This opened the door to updating VMS to the current scenery management system (SMS), which incorporates more social and ecological context to establishing desired conditions for scenery.

SMS is built on foundational concepts of primary aesthetic qualities (e.g., naturalness, variety), regional context (landscape character and sense of place), criterion judgments (scenic attractiveness and integrity), and local sensitivity to change (landscape visibility and constituent analysis). These basic notions are well corroborated by empirical research on people's scenic

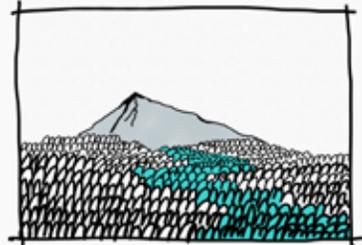
Visual Management System Concepts



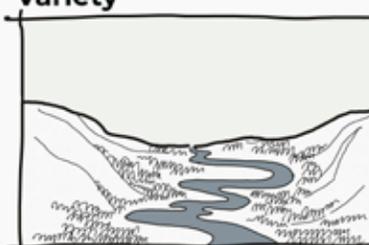
Direction



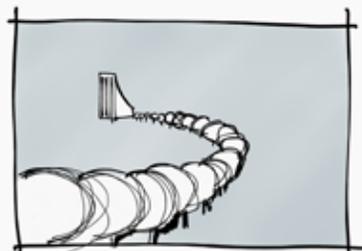
Variety



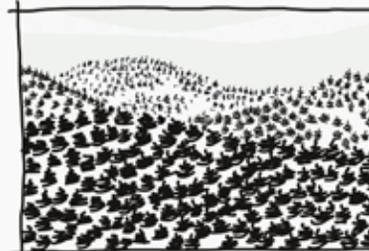
Color



Line



Sequence



Texture

Figure 2: The character of a landscape is the overall impression created by its unique combination of visual features (such as land, vegetation, water, and structures) as seen in terms of form, line, color, and texture. These examples of analytical factors and compositional types are useful in recognition and description of scenic resources. The overall impression created by a landscape cannot be rigidly classified. However, Litton references a number of terms that are useful in describing the character of a particular landscape, or, as is more often the case, segments within the landscape.

Image by USDA Forest Service.

quality perceptions and as a foundation for aesthetic landscape assessments. They are widely accepted as valid and critical components for determining scenic character in forest-level landscape planning.

In the past several years the USDA Forest Service has updated the guidance and direction for how land and resource management plans (forest plans) are to be created and revised. Within this regulation (referred to as the Forest Service 2012 Planning Rule) the role of scenery has been reinforced through stronger connections made between desired conditions for scenic character and recreation. The rule makes it mandatory that units address scenic character, on par with attention to other resources. As plan components for scenery and recreation must be balanced with other resource considerations, an opportunity exists for creating integrated goals and desired conditions for Forest Service settings, which in turn can help create more shared ownership of scenic character outcomes and more resilient landscapes.

Scenery Management and Resiliency

The opportunities for broadening this shared stewardship of scenery resources is increasingly apparent in light of the intensifying multiple-use demands on National Forest System (NFS) lands. Increased agency focus on restoration and forest resiliency projects requires that scenery management objectives be viewed as part of the purpose and need for sustaining desired character, instead of being viewed as a potential obstacle to ecosystem investments. Another balancing act is the amplified interest in and applications on NFS lands for renewable energy projects (geothermal, hydropower, wind, and solar) and their ecosystem services with the potential cumulative effects to scenery across the larger landscape. While visual impacts and mitigation practices for renewables may be similar in scale and scope to those for traditional extractive resource practices like mining and timber, there seems to be a greater willingness to accommodate them on our public lands because of the benefits they provide.

Forest Service Landscape Architecture— The Current Day

We now have about 120 landscape architects practicing across the agency, most of whom work within the National Forest System (NFS). Put simply, they are tasked with heightening the public's connection to a particular place through memorable outdoor recreational experiences. That connection is our best chance to engage a stewardship ethic and to map out sustainable intersections on our National Forests—the integration of social and ecological

places and processes. As an example, a landscape architect practicing on an individual forest or grassland is often charged with balancing the effects of land management and resource extraction on the scenic resource (the main role of the 1980s) with enhancing the recreation experience (Arthur Carhart's original charge) and preserving it for future generations. This is what we have begun to refer to as sustainable recreation. Here, landscape architects are trying to settle both the experience of recreationists and the negative impacts of their recreation use (Figure 3).

A key challenge of our time is for the recreation community to more fully acknowledge our country's increasing diversity. When the Forest Service began, most Americans were no more than a generation from working the land, and populations weren't concentrated in urban areas as they are now. People of color would have limited options to recreate on public lands. We



Figure 3: The *Sustainable Recreation Site Design Guide* (SRSDG) is a national technical guidebook of best practices and processes for implementation of sustainable recreation design into Forest Service projects at the site scale. Recreation uses and values are important aspects of the ecosystems we manage, and sustainable recreation design enhances the ecosystem benefits these landscapes provide. Recreation site design influences the experience of those interacting with built improvements and natural surroundings. Several foundational principles infuse each stage of project development to help achieve sustainable outcomes. Planning and design decisions to preserve the character of place should be: relevant, local, flexible, holistic, strategic, and inclusive. The outcome of sustainable recreation design is a constructed and operated site which gives form to social, ecological, and economic values.

WHITTEN DESIGN CHARTER

NOV. 30, 2007

connect to
farmers mts
memorial walk

NORTHEAST ZONE



memorial birch grove

MEMORIAL WALK
MEM PLANTINGS

Journey begins
from metro
stop.

organize
memorial
plantings
to create
visitor/
employee
experience

basinwalk



path
treebed
native grasses



NOV. 30. 2007.

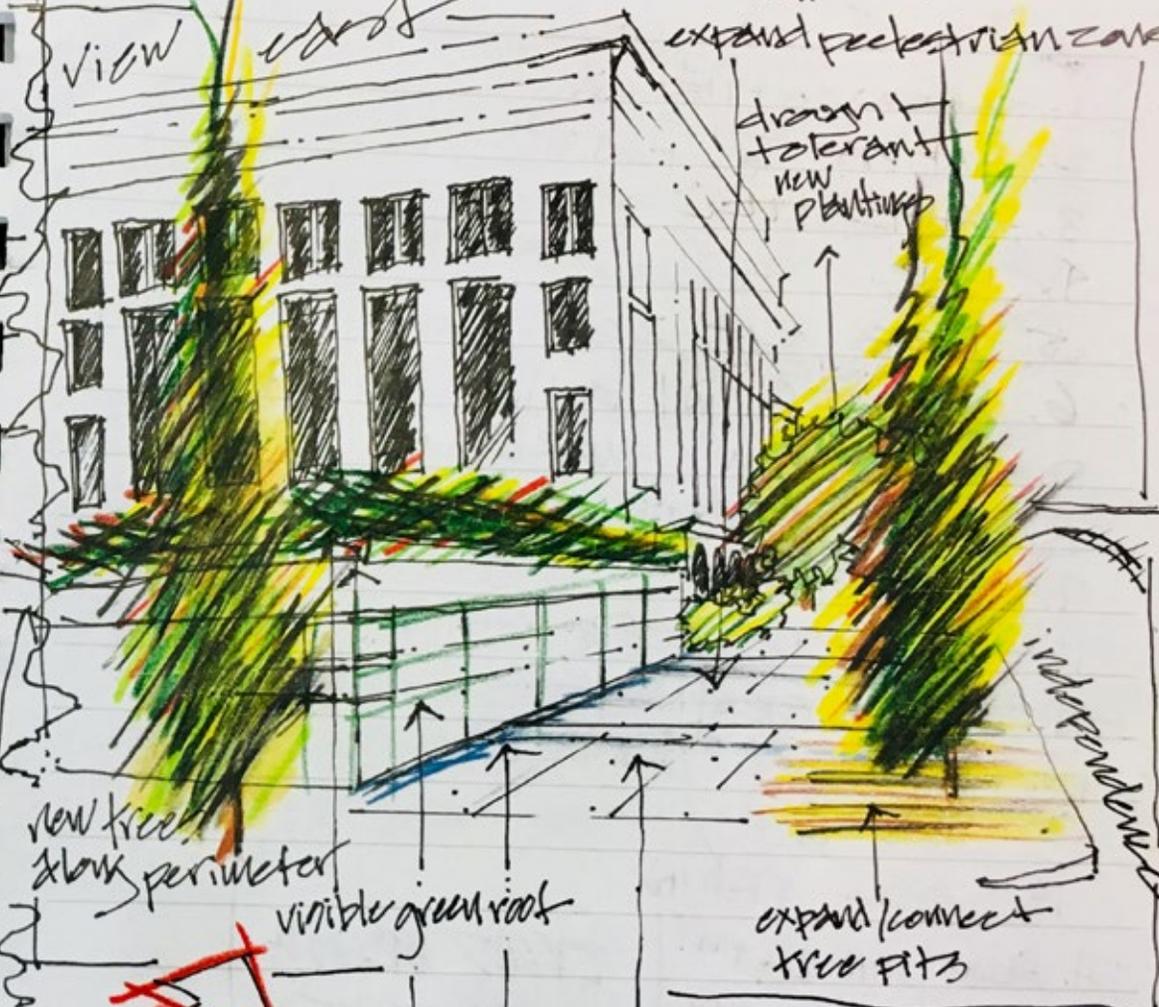
SOUTHWEST PAGE 2

view

west

expand pedestrian zone

drought tolerant new plantings



new trees along perimeter

visible green roof

expand/connect tree pits

permeable pavers

direct water to pits

cable trellis on face

sustainable site principles make "backdoor front"

existing parking terrace grade to collect rainwater. pavers asphalt on parking level

PREVIOUS SPREAD

Figure 4: Design is the integrative, creative, and iterative process used to develop planned solutions and accomplish desired outcomes. Good design connects people to the outdoors, giving everyone opportunities for memorable experiences and making them feel welcome. This applies to our most concentrated urban sites, as well as iconic destination landscapes. It recognizes the quality of design affects the quality of experience, and should tell a story about how we should respect the landscape’s sense of place. Public planning workshops, or design “charrettes,” provide forums to help designers better understand community priorities and concerns, and vice versa. They can help unwrap the functional needs of the users and daylight how people will actually use the space. A designer’s sketch book is an important tool for capturing public input and ideas and for communicating concepts that will ultimately result in a built landscape.

Credit: Matt Arnn, USDA People’s Garden Design Charrette, 2007.

can no longer base our recreation planning on the preferences and experiences of one segment of our visitors and remain relevant to an increasingly diverse, urban audience. These shifts in population demographics underscore the importance of pairing well designed and connected recreation on National Forests with thriving urban green spaces to which the majority of our population are exposed every day. Vibrant local parks and urban tree canopies, along with conservation education, can inspire a stewardship ethic and drive diverse users to our public lands for quality, sustainable recreation experiences (Figure 4).

Working with Disturbance and Resiliency

Disturbance and resiliency have shaped our thinking about public landscapes over the years. Disturbance compels us to move away from the traditional focus of design—which is on *form*—to a focus on resilient *function*, so that our systems have a greater likelihood of being able to recover more quickly after future disruptive events. To me, recovery is about the capacity of natural systems to self-repair—recovery to a previous state, or to a new one. We seem to be caught in this cycle of unprecedented environmental change and disruption to the modern landscape: climate change, for example, has us dealing with more frequent and more extreme weather events. The 2017 Atlantic hurricane season alone has been catastrophic, featuring 17 named storms. Over 2 months after Hurricane Maria ravaged Puerto Rico, (1 week after Irma came through) the El Yunque National Forest remained closed and without electricity. The services provided by our public lands and open spaces are increasingly at risk right now, and as a response, we find designers, planners, and natural resource professionals alike are joining together to retrofit sites and work with communities so that recovery can happen more quickly and purposefully in the aftermath of extreme events. We now need adaptive, multi-layered systems that can maintain vital functions and that are also more multifunctional and

cost effective, using strategies like biomimicry (creating solutions to human challenges by emulating designs and ideas found in nature) and designing cobenefits or multibenefit strategies like revegetating stream banks with flood tolerant native pollinators that buffer stormwater and provide habitat.

Risk avoidance is another important strategy. This means having the confidence to put the brakes on a proposed project, leave the landscape be, let it self-repair. Andy Warhol once said, “I think having land and not ruining it is the most beautiful art that anybody could ever want.”

Over the past several years, Forest Service landscape architects, engineers, and recreation managers have recommended the movement of camping and lodging, roads and bridges, pump stations and sewer systems out of high risk floodplains to reduce long-term investment in operations and maintenance and to create safer recreation sites. In the past, the landscape was driven out of the design and the philosophy was: “This is where people want to be, therefore we’re going to build into the structure to support them where they want to be.” Today, our approach is based on “This is what the landscape can support” (Figure 5).

Zooming out from a site scale, the Forest Service estimates that since 2010, more than 102 million drought-stressed and beetle-ravaged trees have died across 7.7 million acres of California forest and the Rocky Mountains. The loss has major implications for future vegetation management strategies, timber practices, watershed protection as well as recreation



Figure 5: The Catwalk Recreation Area on the Gila National Forest is a unique recreation opportunity in southern New Mexico providing hiking access on an elevated catwalk along the Catwalk National Scenic Trail on Whitewater Creek. The original catwalk was built by the Civilian Conservation Corps in the 1930s as a recreation attraction, following an old mining pipe route used to bring water to an ore processing plant in the 1800s. The recreation site has been rebuilt in recent years due to a loss from post-fire flooding. This conceptual tourism poster was developed as an example of ways to attract visitors to this historical and scenic recreation experience. The poster is done in the style of the WPA tourism posters for public lands popular in the early 1900s, in order to invoke the historical legacy of the site while celebrating its relevance to today’s visitor.

USDA Forest Service. Graphic design and artwork by Jessica Dunn, FS landscape architect.

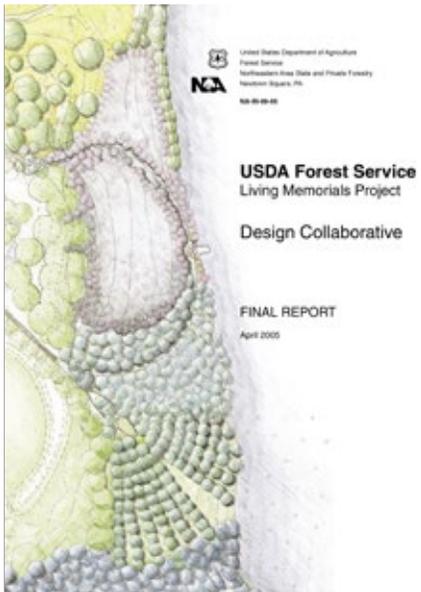


Figure 6: Responding to the public's desire to honor and memorialize the tragic losses that occurred on September 11, 2001, Congress authorized the USDA Forest Service to create the Living Memorials Project, utilizing the resonant power of trees and green space to create lasting, living memorials to the victims of terrorism, their families, communities, and the Nation. Cost-share grants and technical assistance supported the design and development of more than 50 community memorial projects in the New York City and Washington, D.C., metropolitan areas and southwestern Pennsylvania. The Living Memorials Project also provided a unique educational opportunity for landscape architecture students and their academic institutions. The LMP Design Collaborative joined design students and community members in a common cause, to envision public spaces that would allow people to gather and find balance after 9/11, build a mutual learning experience in creating a memorial, and also challenge the use of traditional brick-and-mortar tributes.

access and infrastructure. Restoration in these landscapes involves both science and management activities, as well as people's perceptions. The science tells us that historically, these forests were less dense because frequent low to medium-intensity fires controlled fuels and created mosaic landscapes. Today, management activities to restore the forest might focus on thinning some of the unhealthy and overstocked stands and landscape architects are designing vegetation management plans with people's perceptions in mind. Visitors can have highly personal connections to places. Landscapes may change and evolve; how accepting are people of this reality, based on their understanding of the ecosystem? How will people perceive a forest is much thinner; will they understand that these activities ultimately help the forest to become more resilient to future disturbances, including both fire and bark beetle?

We are only just beginning to understand how important people's connection to place can be. At the same time, climate change, natural disasters, and other disturbances are changing what our special places look like and forcing us to examine, and in some cases reconsider, how we design for recreation. As we seek to build more resilient landscapes, we will need to foster a dialogue with the public in hopes that we can design sites that can withstand disturbance while still facilitating people's connection to place.

Given the realities of climate change, we know that seasons are becoming shorter for different recreation activities and longer for others. We are

closing off rivers to rafting and fishing due to climate-induced drought. We are decommissioning campgrounds that are increasing susceptible to extreme weather events and fire, and we are opening up ski areas to all kinds of new experiences, such as mountain biking and ziplines, to capitalize on the expanded summers and increased temperatures. All of these changes are creating much, much more challenging recreation settings and opportunities for managers and for people.

But we don't necessarily understand yet what the reaction of the public will be or how their recreation choices will change based on these adaptive strategies and design solutions that we paid for. What are people seeking in their recreation experiences? Should we be retrofitting our campsites or our boat launches or our trail systems, because these are the essential activities that people come back for? Should we preserve a fishing hole because that's where their father or mother took them when they were growing up? Ultimately, this choice is not only about the fishing, but also about the connection to place? It doesn't have to force some kind of action, or force people to become stewards.

In the end, our purpose as designers, planners, researchers, and natural resource professionals is to engage a *stewardship ethic* with people through the different tools that we have (Figure 6). Landscape architects practicing on our public lands have an acute opportunity and responsibility to foster resiliency by tapping that sentiment, by connecting people to place and by creating memorable outdoor recreational experiences.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Public Life: Case Study from Charlotte, NC

Shin-pei Tsay

Make Public

New York, New York

Tsay, Shin-pei. 2019. Public life: Case study from Charlotte, NC. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 156-169. <https://doi.org/10.2737/NRS-GTR-P-185-paper11>.

From Seattle to Boise and Memphis to Boston, city agencies, civic institutions, and community residents are collaborating with neighbors to reinvent their public spaces. In many cities, shrinking budgets and outdated policies make public space investments challenging. In areas where there is little funding for formal parks and squares, which require large capital budgets and costly maintenance, local residents and stakeholders are focusing on small spaces that have been overlooked or forgotten: the abandoned lot in the neighborhood, the patch of green next to the formal park, or the bus stop.

These kinds of public space design interventions happen in many different ways. Activating the public realm in neighborhoods that have experienced decades of neglect requires new approaches to build trust with neighbors and focus on their potential rather than the barriers. Could public, shared, and everyday spaces help bridge that rift between neighbors?

This paper will discuss a public space project in a rapidly changing and historically underserved neighborhood in Charlotte, NC. A private urban design practice founded in 2000, Gehl (<http://gehlpeople.com/>), was invited by a local foundation to study the potential role public spaces could play in enhancing social inclusion. Once the study was completed, a public space pilot project was identified to test the findings. Gehl conceived of the pilot project and provided technical assistance to the community group undertaking the project. Gehl Institute (<https://gehl institute.org/>), a research and advocacy nonprofit 501c3 founded by Gehl in 2015, was paid to evaluate the social impact of the pilot project.

Though the project in Charlotte obviously involved outside organizations initially spearheading the effort, what was interesting for the project participants and stakeholders is that the final pilot project was the result of the local community leaders. Our discussion will show that many projects have the potential to build social cohesion and local leadership, so long as the process can be responsive to local leaders as desired outcomes shift.

Background

It is easy to overlook everyday public spaces all around us. The strip of green next to the highway ramp, our sidewalks and streets, or the vacant lot everyone passes by on the way to the bus stop, and the bus stop itself, are all considered everyday spaces. In fact, everyday spaces comprise more of any city's public spaces than parks. About 70 to 80 percent of an average U.S. city's public spaces are composed of streets, while 30 percent is relegated to parks. Even in cities that are struggling with revitalization, one could argue that more resources should be spent on everyday spaces than currently are being spent.

How space and resources are allocated has some basis in the work of Gehl. Gehl often works with local stakeholders, city staff, and foundations to collaborate with communities to create a public space intervention. Their work builds on research methods pioneered by Jan Gehl, a Danish urbanist who has devoted his career to articulating how people use spaces and how spaces shape people. Jan Gehl's book "Life Between Buildings" (2011), was a rebuke of the modernist trend of separating uses and creating spaces without people. Gehl's research methods consist of basic tools: counting the kinds of activities people like to do, the kinds of people that walk through a space, how much space is set aside for different uses. While this data analysis plays a big role in informing design, it is rarely or consistently collected by people who are designing spaces.

Since its founding, the Gehl methodology has continued to evolve the data collection and analysis for many different contexts. The process is oriented toward participatory approaches, with the intention of meeting people and communities where they are. The practice has worked in over 250 cities around the world on everything from the public space master plans for Moscow and the revitalization of plazas in Amman, Jordan. But perhaps more importantly, the approaches have been used to understand existing conditions on which spaces could be co-developed with community members, particularly marginalized groups that are often left out of the discussion.

The process has a built-in requirement of creating a baseline analysis, calling for regular, consistent data-collection efforts. Both are useful when persuasion and "evidence" are needed. For communities with a history of divestment, this could be particularly useful because of the expressed need to see a change in demand (or behavior) in order to attract additional funding. Few elected officials will fund the programming of a vacant lot. However, once they experience its potential and have the data to show its positive impacts, whether through the increase in numbers of people using the space, walking to the space, or meeting new people, these same officials may change their minds.

The Gehl Institute, based in New York City, was founded to deepen the knowledge base of research methods that are aimed at systemic change in the

field of urban design. Funded in 2015 by the James S. and John L. Knight Foundation (Knight Foundation), Gehl and Gehl Institute collaborated on design interventions and evaluation in several Knight Foundation cities¹ to catalyze use of public spaces and study how such uses could promote social interactions in public space, particularly among people of different socioeconomic backgrounds.

Knight cities are where the Knight brothers once published newspapers. Unfortunately, many of the

1. Knight Foundation cities are Akron OH; Charlotte, NC; Detroit; Macon, GA; Miami; Philadelphia; San Jose, CA; St. Paul, MN; Aberdeen, SD; Biloxi, MS; Boulder, CO; Bradenton, FL; Columbia, SC; Columbus, GA; Duluth, MN; Ft. Wayne, IN; Gary, IN; Milledgeville, GA; Myrtle Beach, SC; Palm Beach County, FL; State College, PA; Tallahassee, FL; and Wichita, KS.

Knight cities have also experienced recent population loss due to major shifts in their economic base activities and have experienced growing inequities. Most are once-thriving cities currently without flexible funding for public space investment. Studies and temporary pilot projects are a useful tool to convince elected officials and budget officers that public spaces are a worthwhile investment.

For the “socioeconomic mixing” project in Knight cities, Gehl and Gehl Institute developed additional survey questions and analytical approaches in addition to those typically used by the Gehl practice to evaluate several design interventions. The background research is discussed in the Public Life Diversity Toolkit 1.0 and 2.0. (Gehl Institute, n.d.)

Places are often not designed to foster a sense of belonging from the start. Municipal government priorities such as return on investment and the cost-benefit may overtake the goal of strengthening social connections. Yet social determinants of community, such as knowing neighbors, the density of social interactions, and the innate ability of communities to self-organize, attest to community resiliency when there is no immediate crisis at hand, as studies now show. From Eric Klinenberg’s seminal study about the preponderance of single, socially-isolated individuals who were victims of the Chicago heat wave (Klinenberg 2002) to the recent paradigm developed by 100 Resilient Cities (Rockerfeller Foundation, n.d.), both research and practice show that community resiliency is as much about social relationships as it is about hard infrastructure. Social cohesion may be particularly important in neighborhoods that have been historically disenfranchised.

About the Site: Five Points, Charlotte, North Carolina

As one of the Knight cities that is experiencing a renaissance and increasing wealth, Charlotte was an easy choice for the foundation and the project team. Local stakeholders were keen on the assessment of its public spaces. Multiple civic institutions, such as Center City Partners, a downtown development civic organization; the Charlotte local Knight Foundation program office; and an emerging local advocacy scene, communicated the potential for change.

Charlotte is a thriving mid-size, low-density city. As a historic regional trade center, it experienced decline with deindustrialization and subsequent population loss, but was buffered from effects of the loss of manufacturing because it served more as a financial center rather than a manufacturing core. Additionally, universities and corporate headquarters provided economic anchors for jobs. Today, it is a city to which professionals and young families flock.

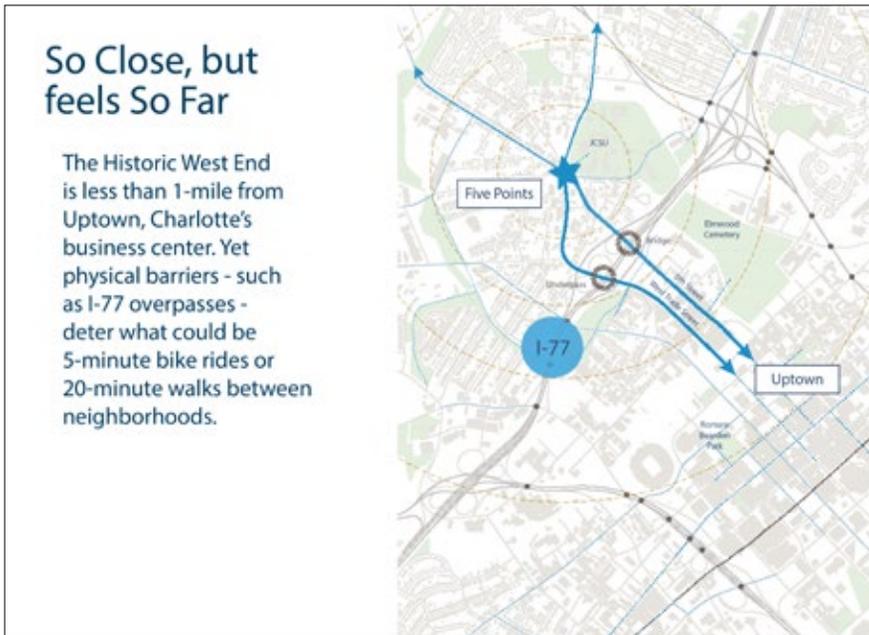


Figure 1: Map of Charlotte showing the Historic West End neighborhood and Five Points project in relationship to Uptown, the central business district.

Image from Gehl, used with permission.

While it is a historically wealthy city, Charlotte does not have a wealth of public spaces. It falls below the median among low-density cities for the amount of parkland within city boundaries, at 6.4 percent compared to 7.4 percent among its peer cities (Trust for Public Land 2016). Its modern investments primarily centered on big infrastructure projects. The emphasis on a few formal, large-scale physical projects, such as a highway that encircled the downtown and dividing neighborhoods, landscaped parks, or outer-city residential buildings, meant that everyday public spaces were neglected. Like most other cities across the country, Charlotte took advantage of the federal transportation program, the largest infrastructure program in postwar United States, to build roads and highways. Highways were viewed as strategies to modernize the city and considered a sign of progress.

Over decades, these infrastructure decisions and practices contributed to the emptying out the city center because they encouraged development outside of the downtown. Many who did not have the option of picking up and moving out of the cities endured the remaking of neighborhoods and in some cases, overall decline. They are often of lower-income, minority populations. Development occurred along social and racial lines, sowing division. Neighborhoods literally became more segregated over time and experienced varying levels of amenities, investment, and thus benefits.

West End Historic Neighborhood is one of those neighborhoods. A thriving, black neighborhood, it was victim to infrastructure decisions in the mid-century. It is only 1 mile from uptown, the business center of Charlotte (Figure 1). Yet, the neighborhood is cut off by highway ramps and overpasses, making a 20-minute walk or 5-minute bike ride an option of last resort.

Five Points intersection in the Historic West End was selected because of its geography (Figure 2). It is a neighborhood gateway on the main street and is directly connected to the long-term transit plans for the neighborhood. But perhaps more importantly, it had strong community leaders who were interested in galvanizing the engagement side of the process.

The empty lot in Charlotte that became known as Five Points Plaza was just that, an empty lot. It is located in the Historic West End, a historic African American neighborhood just outside of the ring highway (Interstate 77-Route 16) that encircled the downtown core, where many potential open spaces were neglected from lack of investment. As young professionals moved into the neighborhood and the transit agency planned an extension of the Lynx light rail line to the neighborhood, long-time residents leaned into opportunities to engage their new neighbors rather than shunning them. J'Tanya Adams, a community organizer and business leader, said, "We're not going to be trying to restore anything, because we aren't going to lose anything. We are going to build on what we have. We plan to transition in a thoughtful way."

Before a single piece of wood was placed to demarcate the new public spaces, Adams held numerous community meetings to gather input about what should happen in their public space. Community meetings led to the desire for a public space the community could call its own, a space they could program and manage on its own, and this process led to Five Points Plaza.

In a break from conventional designer relationships, the design team was relegated to technical assistance while Adams led the community engagement process, at her insistence. Historic West End residents had experienced numerous broken promises with urban planning initiatives, where ideas were excitedly discussed by city officials but implementation never materialized. Even in cases when city officials solicit feedback, residents often felt that proposals did not reflect the desires and wishes of the residents. It was imperative to the community leaders and institutional stakeholders that the process designing Five Points Plaza did not end with the same lack of results.

As a result, the plaza consisted less of formal design than of basic amenities that the community requested. The design team did not design an installation that they may have originally envisioned. Instead, they bought picnic tables, chairs, paint, and other basic materials to demarcate the space and make it comfortable for visitors. A local business man volunteered to install

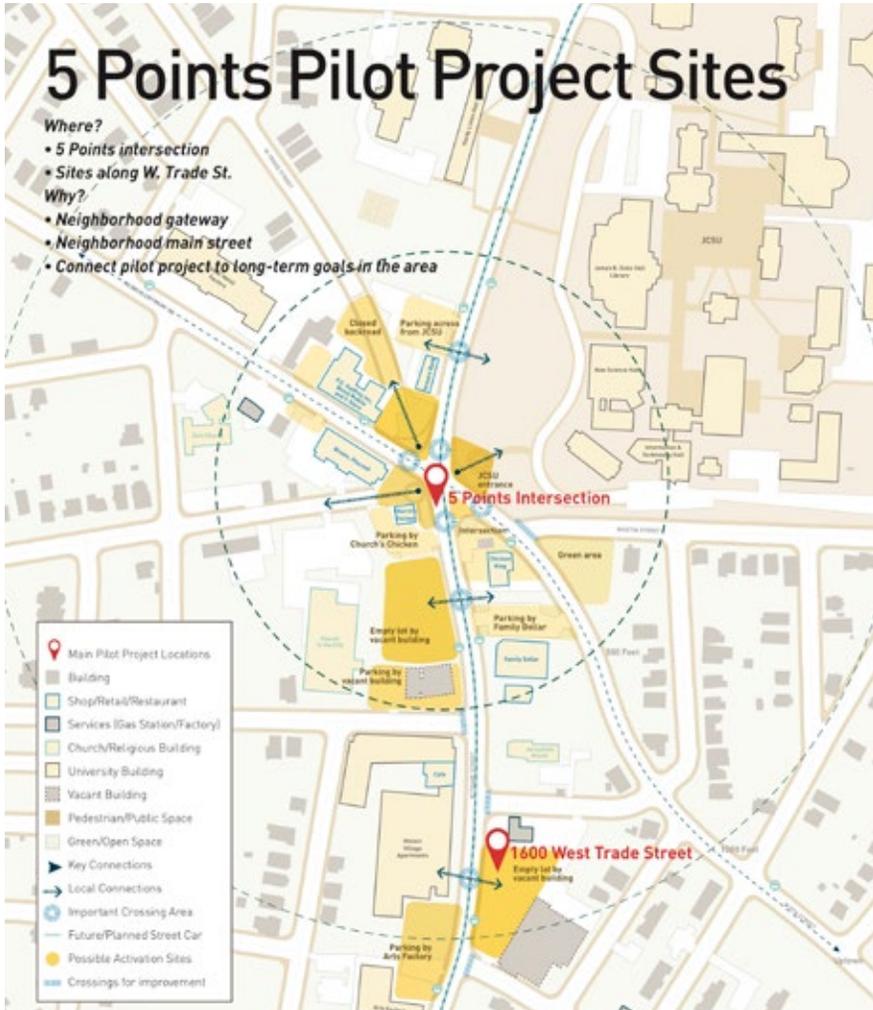


Figure 2: Five Points intersection in the Historic West End was selected because of its geography. It is a neighborhood gateway on the main street and is directly connected to the long-term transit plans for the neighborhood. But perhaps more importantly, it had strong community leaders who were interested in galvanizing the engagement side of the process.

Image from Gehl, pilot project Historic West End (Charlotte, NC) design brief, 2016.

the perimeter fence that the city required for permitting. Other neighbors contributed to painting the mural and setting up the space. Historic West End organized the calendar of events and programming for the space.

Research Methods

In Charlotte, the pilot project for a new public space was conceived by analyzing observational data about how people walked through the neighborhood and how they used space, data from interviewing neighbors, and intercept surveys.

The public spaces were not chosen by chance. The Gehl team used a study methodology called the Public Space, Public Life (PSPL) survey designed to better understand people and their use of public space, thus positioning people and their needs at the center of design practice. Additional research approaches were added because of the special nature of this project, all of which are documented in the Public Life Diversity Toolkit 1.0 and 2.0 (Gehl Institute, n.d.).

New survey questions were added in the PSPL in the first phase of project development and co-developed with local partners. These questions were necessary because of the lack of pedestrian activity. Whereas people using space in high-density areas often revealed patterns of use, low-density cities had the challenge of having very few people in public space. Thus, additional questions are necessary to fully understand the needs and desires of the neighbors.

- What do you like about your city?
- Why do you visit or stay in a particular place?
- What would you like to do more of in your neighborhood?

The data were collected at popular destinations to gauge what people like to do; this is typical practice in low-density cities. (In high-density cities with high pedestrian volumes, observational data may make these questions less necessary.) Researchers were careful to temper it with the awareness that such data are limited and cannot be viewed as representative. In sum, qualitative data should be examined relative to each other and considered against the larger context, and not on its own (Figure 3).

To better understand the role public spaces play in a neighborhood or city, it is important to understand the historic, social, economic, and community context for the space. The research framework employed in this case study considered interactions and dynamics that occur from individual



Figure 3: Five Points Plaza was a pilot project in the Historic West End of Charlotte, NC.

Photo by Cherie Jzar, used with permission.

interpersonal interactions all the way to the regional system level. The team considered means of assessing the social impacts and performance of public spaces against each of those geographic scales. Figure 4 illustrates the interdependencies between the spaces people take up and peoples' ability to form different levels of social structures, whether it is close relationships, knowing the neighbors, or even being able to get to a job and participate in the regional labor market.

Public space improvements linked to social cohesion ultimately come alive at the block or district (group of blocks) level. For example, research studies (Gehl 2010) have shown that people like to walk down streets with active facades, where the building wall shows a change in pattern at about every four seconds. That rhythm in the surroundings keeps a person moving down the street, engages the eye, and makes walking enjoyable for nearly all people, regardless of background or demographic. Another example is the observation of people lingering in public spaces. Usually people linger if they feel comfortable and safe.

Social interactions can take place in a variety of ways in public space (Gehl Institute). Policy outcomes tend to emphasize direct interactions, often measured through transactional metrics, such as total sales receipts or volume of sales. Yet observational analysis revealed that a wide range of social interactions may take place without direct interaction. People share space quite contentedly without speaking to a stranger or buying something (Figure 5).

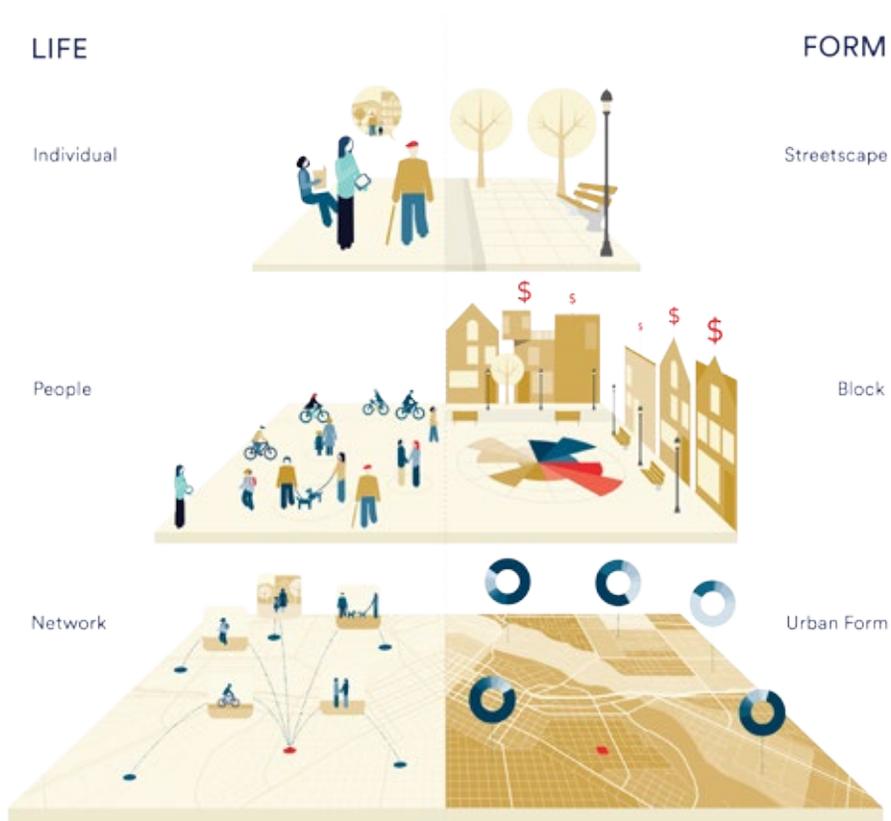


Figure 4: Life-Form Analysis: Social connections can be observed at the individual, block, or regional level.

Image from Gehl Institute, Public Life Diversity Toolkit 2.0, 2016.



Figure 5: Spectrum Social Mixing: Observable social interactions in public spaces tend to fall along a spectrum of familiarity. A solo or single person may know no one there whereas strangers might share the space in passive contact. The strongest observable connection is among friends, where there is a high sense of familiarity.

Image from Gehl Institute, Public Life Diversity Toolkit 2.0, 2016.

The Charlotte project tested methods of measuring the social connections and a sense of stewardship of public space. Because both spaces would be new and established in neighborhoods where there was little physical evidence of public stewardship of open space and social interactions, responses would provide clues to how community gathering places could bring people together and potentially foster larger feelings of belonging. Our questions in the evaluation of the social dimension of the projects include:

- Would this project bring more people to the area?
- Would it bring a greater diversity of people to this area?
- Would it encourage interactions?
- Would it foster a sense of pride and ownership?
- Would it increase time spent in public space?
- Would the project change the Department of Transportation's practices to facilitate such spaces?
- Would the pilot project change the city's perception about public spaces that could be funded in the long-term in Historic West End?

Multimethod research approaches were applied to understand the impact of the changes in public space. Observational data, interviews, intercept surveys, and additional surveys were distributed. The data-collection methods often were conducted in partnership with community members. The team organized observational analysis and intercept surveys on site after the installation of the public space project. There were two intercept survey efforts, one during the initial week of installation of Five Points Plaza and another a month later. We also used online surveys and Facebook comments, which can provide some insight but should not be perceived to be representative of the larger community. Questions about sense of pride and ownership and long-term impact would ideally have additional follow-up evaluation.

Findings

Our survey had a small number of respondents, and this is reflective of lack of public space and pedestrian activity in the neighborhood on a normal day. Given that community involvement in a public space is not typical of the

neighborhood, and even walking around the neighborhood was atypical, some of the findings were encouraging.

In terms of basic behavior, nearly 30 percent more people walked in the neighborhood after the launch of Five Points Plaza than before. More people walked to the plaza and to other destinations in the neighborhood. This is promising for the transit extension and future transit extension. Walkability is critical to any transit stop's success.

Surveys collected from visitors to Five Points Plaza reflected a greater number of and diversity in social interactions, far more than took place previously. Seventy-six percent of visitors to Five Points Plaza reported recognizing people they did not plan to meet and 90 percent interacted with someone that did not accompany them to the space. Furthermore, 50 percent of the interactions were with people that they did not know. In a strong showing of stewardship in a neighborhood, 63 percent of the respondents said that they would like to participate in maintaining the plaza after visiting Five Points Plaza.

As a result of the process for making the space, the staff of the Department of Transportation and Urban Design have created a guide to public plazas based on the success of Five Points Plaza. The process helped the city agency uncover legal barriers that were previously invisible to them and presented an opportunity to remove or update legal requirements so that more public space projects could take place through the entire city.

In terms of long-term impact, the Five Points Plaza pilot project maintained Historic West End's funding eligibility. The neighborhood had been slated to be eligible for funding from the City of Charlotte's Comprehensive Neighborhood Investment Plan, but had to demonstrate viability and community support of the project every 2 years to stay eligible. The success of the pilot project showed that there was demand, but the final determination for capital funding will not occur until 2018.

Conclusion

Everyday spaces have a tendency to be overlooked, hidden in plain sight. The Public Life Public Space survey helped reveal the potential of the Five Points intersection as hub for the Historic West End neighborhood. But more importantly, the leadership by a local community member in organizing engagement, soliciting feedback for the design of the space, and bridging the long-time residents and the short-term residents, cemented the public space's success with residents. Though the project did not come from the community itself, the community chose to view the presence of Gehl as invitation to participate and help strengthen relationships between the existing and new residents.

The evaluations demonstrate how public life can be made tangible and the results can be plugged into official processes and policies that advance broad city goals. Five Points Plaza served as a proof-of-concept on which the Charlotte Department of Transportation developed a public plaza guide to help other neighborhoods open public spaces. Monica Holmes in the City's urban design department said, "It's great because we can now use that project as something to hold up to say, 'Look! We've done it before. We don't have to reinvent the wheel.'" Tellingly, the positive experience with Five Points Plaza inspired the city to integrate pilot projects into its Comprehensive Neighborhood Improvement Program, a more than \$60 million capital construction program.

While this was not a community-led project, the engagement process, conducted in collaboration with local leaders and city officials, led by a local leader, resulted in an open-mindedness toward pilot projects. The Historic West End community is more willing to work with city agencies after the Five Points Plaza project.

The use of data on how people actually behave and how they would like to use space to inform the design of Five Points Plaza led to enthusiastic acceptance of physical improvements of an overlooked space. For the Historic West End, the experiment encouraged people to share space, even for a little while. Rather than a temporary space, perhaps more and permanent everyday public spaces are needed throughout the city's neighborhoods in order to foster public life that is welcoming to all, especially in places where relationships between stakeholders could stand to be strengthened after years of neglect.

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for the facts and accuracy of the information presented herein.

Recognizing Urban Environmental Stewardship Practices as Indicators of Social Resilience: The Case of Living Memorials

Heather McMillen,¹ Lindsay K. Campbell,²
and Erika Svendsen,²

1. Hawai'i Department of Land and Natural Resources,
Honolulu, Hawai'i

2. USDA Forest Service, New York, New York

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Urban environmental stewardship (UES) is the act of caring for the environment to enhance the quality of life for the greater public good (Burch et al. 1993) “with the underlying assumption that doing so will improve the social-ecological functioning of specific urban areas” (Connolly 2013, p. 76). Indeed, a critical motivation for urban environmental stewards is to nurture places that are valuable for social as well as ecological reasons (Krasny et al. 2014, Tidball 2014). Though important, the contributions of UES to ecological resilience (e.g., promoting biodiversity) are under-recognized (Barthel et al. 2005), yet the contributions of UES to social resilience are perhaps even less recognized (Clayton and Meyers 2015). Natural resource agencies, including our own, the USDA Forest Service, tend to focus on ecological resilience (Benson and Garmestani 2011). This is likely because natural resource management (both the academic field as well as the practice) emphasizes the biophysical resource rather than social structure and organization that cares for, governs, and benefits from the resource. More integrated fields of study (e.g., those that are based in social-ecological systems and biocultural approaches) and practice are increasingly recognizing the need to address both, and in fact, understand the reciprocity and synergy that exists between the biophysical and social worlds.

While we believe ecological and social resilience are inherently interrelated, here we focus on social resilience, “the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change” (Adger 2000). Research suggests social resilience “may be more influential than environmental resilience in determining the outcome of a collapse and recovery scenario” (Maher and Baum 2013, p. 1470) and that the “capacities for human (rather than environmental) transformation that lie at the heart of adaptation” (Tanner et al. 2015, p. 23). Applied at the community level, social resilience is the “existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise” (Magis 2010, p. 401). We contend that supporting social resilience at the community level is especially important in dense, urban areas (Meerow et al. 2016) and so it is our focus in the community-managed, green spaces we describe here.

UES groups can strengthen the networked ties between civic, government, and private sectors thereby giving rise to new social innovations and practices (Connolly et al. 2013, Fisher et al 2015, Svendsen and Campbell 2008, Svendsen et al. 2015), which are components of social resilience. But, how do we know social resilience when we see it? Are there empirical examples of social resilience that can be identified in real time, and therefore more readily supported and promoted through programs and policies? To answer

these questions, we focus on a particular kind of UES, the care of living memorials created in response to the losses suffered due to the terrorist attacks on September 11, 2001 (9/11) (McMillen et al. 2017b, Svendsen and Campbell 2010). As 16 years have passed since 9/11, we are also able to consider if the benefits of stewarding these living memorials are limited to the specific reasons they were created and to the specific sites where they were created? Or is there evidence that their effects expand outward to other sites, issues, and scales beyond the immediate site? In other words, do we see evidence that the care of these living memorials promotes social resilience more broadly, beyond recovery from 9/11 and beyond the specific sites themselves? Can living memorials to 9/11 be seen as both indicators of resilience to a specific disturbance and demonstrations of general resilience, as they adapt to subsequent social-ecological disturbances over time? In the following discussion, we break the theoretical construct of social resilience into its components and then we identify specific empirical examples of these components to illustrate how these concepts occur and can be observed in practice. We conclude by describing how these living memorials have contributed to general resilience or the adaptive capacity of communities to respond to disturbances and we draw on these examples to propose future research.

Background and Methods

The Living Memorials Project (LMP) was initiated by the Forest Service in 2002 to support those who had experienced loss due to 9/11 and wanted to commemorate their loved ones or remember the events of the day through the creation of nature-based, living memorials. The initial phase of the project included funding to support communities' efforts in creating their living memorials and then documenting the memorials and their meanings. Since this initial phase, the LMP continues as a longitudinal research project to document the creation and evolution of living memorials and to deepen an understanding of the roles of community-managed greenspace and stewardship in social-ecological resilience. Over time, we understand these living memorials to be part of a patterned human desire to "do something" that is life-affirming and recovery-oriented after a personal or communal disturbance. The LMP includes data that were gathered through semi-structured interviews ($n = 117$ memorials), site observations, and photo documentation (2002–2004). (For full results from the 117 interviews, see Svendsen and Campbell 2010). Here we report on follow-up research, conducted in 2015–2016 on a subset of living memorials in the NYC metropolitan area (New York, New Jersey, Connecticut). Site visits and interviews were conducted (July–October 2015) at 19 living memorials and 22 telephone interviews were conducted (September

2015–April 2016) with stewards from additional sites that could not be reached for a site visit. Interviewees were men and women, primarily between 30 and 50 years of age, and they represent a range of people who were affected by the events of 9/11, from surviving family members to community members to coworkers to religious and civic leaders, among others. We also took photographs to capture memorials' overall design, specific features of interest, and events held on site.

Using three social-ecological resilience frameworks (Berkes and Ross 2013, Chapin et al. 2009, Rockefeller Foundation 2014), we deductively coded our qualitative data from recorded and transcribed interviews. Working iteratively between the theoretical frameworks and the dataset, we identified five indicators as most significant for contributing to social resilience across scales and site types: place attachment, collective identity, social cohesion, social networks, and knowledge exchange and diversity. In the following section, we identify and interpret how these abstract concepts are manifested through UES at the living memorial sites.

Results

These living memorials reflect the place-based resources, attitudes, lifestyles, and cultures of the communities that created them. Most were initiated by individuals, informal groups, and civic organizations rather than by government agencies—though they often collaborate with the public sector for access to space and resources. They vary greatly in form, from single trees to forests, and involve both the rededication of existing green space as well as the creation of new green space. They are in forests, oceanfront, parks, community gardens, town centers, found space (e.g., traffic islands, vacant lots), and on school and hospital grounds. They honor victims from among the nearly 3,000 who perished, as well as responders and survivors. Some of these sites have changed over time to commemorate other events and losses in addition to the initial event of 9/11; and the creators of these sites bring the social learning, relationships, and practices that were fostered on one site to their interactions with other sites and groups. The creation and ongoing stewardship of memorials both demonstrates and supports social resilience in a number of ways.

Place Attachment: Demonstrated Through Site Selection, Caretaking, and Planning for the Future

In some cases, an existing attachment to a particular place drove the decision to create the memorial there; a process that, in turn, heightened the attachment to place. For example, in Babylon (Long Island, NY), a beachfront site was chosen because surviving family members had fond memories of spending



Figure 1: Babylon Hometown Memorial, Babylon, NY: a dunescape restoration site with multiple meanings.

Photo by Heather McMillen, used with permission.

time with their loved ones at the beach. Although they were from different places in town, “the one thing [we] had in common, we’re a coastal community. Everybody went to the beach.” Once the memorial was created, another layer of meaning and attachment was formed and enacted through memorial ceremonies and rituals, acts of planting and maintenance, and visitation for quiet contemplation. In addition, a number of environmentally friendly oriented projects, done in service to the larger community and in commemoration of those affected by 9/11, have been created at the site. There are native species plantings, bird houses to support native birds, and plans to create a demonstration site for sustainable energy (Figure 1). This site illustrates how the social resilience of the community has inspired the promotion of ecological resilience as well, a demonstration of the interrelationships between social and ecological resilience.

Stewards in Babylon and at other sites expressed a strong sense of pride in their sites for their physical appearance, but also for the important (sometimes sacred) roles they serve in honoring those lost, supporting those grieving, and offering a place for reflection. The attachment stewards feel to their site is expressed through the rights they feel to the space as well as their responsibility in maintaining it. One widow whose husband died in the World Trade Center has adapted her will to allow for the ongoing maintenance of the Richard Cudina Memorial in Lebanon, NJ, after her death. Other stewards demonstrated strong place attachment through carefully training the next generation of volunteer stewards to ensure their site carries on beyond their tenure and is maintained in the long term (Figure 2). Striking examples of



Figure 2: Knowledge transfer during stewardship at “An American Remembrance in the Manalapan Arboretum,” Manalapan, NJ.

Photo by Heather McMillen, used with permission.

place attachment as well as the ability to bounce back from disturbance have been demonstrated when stewards defended their sites from development and restored them following significant damages resulting from Hurricane Sandy.

Social Cohesion and Collective Identity: Seeing as a Group

The process of working together in creating and maintaining sites helped to foster and reinforce a sense of shared identity. “Being in that location brought a sense of community and camaraderie and that sense of building something together... a sense of purpose together” said one steward of the Living Memorial Grove (NYC, NY). Others referred to the process as “community building work” and reflected on the “natural kinship all of us felt in being New Yorkers [while working together at the memorial]” and how “we have tears together.” In this way, living memorial sites are social innovations, community-based responses to facilitate the mourning process by offsetting feelings of helplessness, strengthening social support and well-being, and enhancing the appearance of the neighborhood. Stewards referred to the sacred nature of the collaborative work saying, “We were grieving and our desire to do something... action in grieving...typical New Yorker reaction...all of us felt like we needed to do something...Digging by hand was a manifestation of some kind of spirituality.” Creating an identity not only as those in mourning, but as survivors who encourage growth and life has been an important thread woven into the narrative of many memorial sites. At the same time, many sites include literal and symbolic demonstrations of patriotism (e.g., American flags, eagles, and the

colors red, white, and blue), calling upon a collective identity people that some people feel as Americans, and perhaps in distinction to other groups who they perceive as “other.” It is important to bear in mind that crafting of collective identity is a process that can both bind or divide; we must attend to processes of both inclusion and exclusion that occur in the formation and expression of collective identities.

Memorial anniversary events at the sites can also reinforce the identity and social cohesion of the group, for example when bagpipes are played to commemorate fallen fire fighters and police officers, when signage and speeches are in Russian, or when a Native American tradition is adapted for other populations. In some cases, a strengthened sense of identity and cohesion among some can lead to exclusions among others. For example, many stewardship groups described struggles in defining who counts as being “from” a community in placing names on memorial plaques. Defining who is “from” a place can be challenging in an era where people often move several times from their childhood home, to where they are educated, to where they later live and work as adults. Other groups struggled with defining who “counted” as a 9/11 victim, given that there were delayed losses of life related to stresses and exposures of survivors and first responders who worked in recovery efforts. We also see examples of sites that seem to be less resilient or adaptive. Those that are rigidly focused on 9/11, or on the death of one person, without expanding their narrative and outreach risk losing relevance as the community inevitably shifts its focus over time. These sites seem brittle, rather than flexible, and so they become vulnerable as the original stewards progress in age, and new generations have no direct memory of or less attachment to the time of 9/11. We found examples of adaptation, however, with sites adding additional names on these plaques to include these later victims and with sites expanding their narrative to commemorate victims of other acts of terrorism, war veterans, and all children; and to promote peace.

The residents of Russian descent who created a memorial at their neighborhood park in Coney Island, Brooklyn, NY (Figure 3) changed their name from the “Russian Family Group” to the “September 11 Family Group” in order to signal their broader inclusiveness, as they support public school group tours, involvement from local politicians, and family days for all neighborhood residents of any descent. Overall, the bonding that happens at these events can promote the formation of support networks that go beyond site boundaries and existing social groups, and these have the potential to promote resilience more broadly. These stewards explained how creating the 9/11 memorial brought them together. Previously, they had not known each other but 15 years later, their families had grown together and supported each other through unexpected life events.



Figure 3: September 11 Family Group, stewards of memorial in Coney Island, Brooklyn, NYC. The event brought them together as friends.

Photo by Heather McMillen, used with permission.

Stewardship Expands the Breadth and Scope of Social Networks for Individuals and Organizations

As group identity is reinforced, social cohesion can be strengthened and social networks can be expanded—other well described indicators of social resilience. Community engagement has long been associated with social integration. Stewardship, as a form of community engagement, facilitates interactions among diverse groups, allowing for opportunities to develop relationships and expand their social networks. For example, at the Garden of Healing in Staten Island, NY, the Summer Youth Employment Project, Federated Garden Club, Veterans, Fire Department, Public School 23, Gateway Rotary, Boy Scouts, an artist group, a poetry group, and students from the College of Staten Island all joined in the work with the Garden Club stewards. At Sterling Forest in Tuxedo, NY, family members affected by 9/11 were joined by survivors of violence from Sierra Leone in planting trees to restore the forest and recovering from their losses. At the Crescent Beach Flagpole Memorial in Staten Island, NY, creating the memorial and carrying out subsequent commemorative ceremonies became an extension of their annual block party when the whole neighborhood gathers to socialize.

We found that through the processes of creating and maintaining memorials, stewards develop new or strengthen existing relationships at both the interpersonal level and the organizational level. Interpersonal relationships among stewards can be much like those among members of support groups who help each other cope with and recover from a difficult event or experience. These relationships did not end with commemorating the

events related to 9/11; they became social resources that were drawn upon in response to other disturbances, from the inevitable changes in one's personal life to acute external events including Hurricane Sandy. For example, although the storm destroyed the Crescent Beach Flagpole memorial, the relationships among neighbors endured. "Just because the site came down, I don't think the relationships diminished...we still see those people in the neighborhood." When Sandy damaged the power lines in his neighborhood, the chief steward and his friend (an electrician) helped their neighbors return their electrical power and "people were so grateful. Oh, how we ate! There was always dinners coming every night to us from those we helped out."

Individuals can also serve key roles within networks of individuals and organizations involved in community recovery. For example, the creator of a living memorial, The Sunflower Project NYC, who was also a long-term volunteer at Ground Zero, went on to become a member of a Certified Emergency Response Team. Some of the friends she made in the process even went on to respond to Hurricane Katrina in New Orleans, and she applied her training in the recovery efforts following Hurricane Sandy.

Another example is found with a widow who lost her husband who was a firefighter. In addition to her initiatives at the Sterling Forest memorial, she also started a nonprofit organization to support resilience training for firefighters and others in disaster response. Her organization was also very active after Hurricane Sandy because many firefighters live in the Rockaways, NY, a coastal peninsula greatly affected by the hurricane.

Finally, we see that stewardship organizations have capacity to alter or expand their programs in response to different disturbances. The Daffodil Project was created as a response to 9/11 and originally focused on distributing bulbs for individuals and groups to plant in NYC parkland to commemorate recovery from the event; however, in response to Sandy, organizers expanded their efforts and the reach of their bulb distribution to neighborhoods most affected by the hurricane. The disturbance created by Sandy was seen as an opportunity to expand their outreach and involvement beyond parks to: public schools; the New York City Housing Authority garden and greening program on public housing grounds; individual residents with places to plant; senior centers; and street tree stewards working on the streetscape. The need created by Hurricane Sandy gave the project and the sponsoring organization, New Yorkers for Parks, a renewed sense of purpose—to be more involved with neighborhoods, especially in the Sandy affected areas. The Daffodil Project is now focusing on returning open spaces to normalcy after Hurricane Sandy, and working with neighborhoods that are under-resourced. For some groups, 9/11 is still a resonating narrative, for others, less so. Across sites, we see that people and organizations involved in the stewardship of specific living memorial sites

can become involved in supporting others in need as well as supporting their fellow stewards in coping with and responding to other challenges.

Promote Knowledge Exchange and Diversity: Learning from Others in the Past and Present

We also see living memorials as sites that promote the exchange and transmission of diverse kinds of knowledge. As with biological diversity, a diversity of ways of knowing is a resource to draw upon in developing creative and adaptive responses to disturbance. Examples include integrating Native American perspectives and traditions on healing; experimenting with coastal restoration plantings; and integrating interfaith programming about peace, tolerance, and understanding. Some sites also foster the retention and transmission of stories with lessons about adapting to disturbance, be it natural, personal, or political. In addition to the informal sharing of information that happens among stewards as they tend their sites, stewards also shared examples about involving school groups at the sites to learn about history, remembering those who died, and teaching about ethics. Stewards referred to their sites as a “keeper of history” and a way to “keep the memory alive.”

For example, John Bowne Agricultural High School in Flushing, Queens (NYC) has taken on the responsibility of caring for those seedlings grown from the “survivor tree” that survived at the crash site in Manhattan, also referred to as Ground Zero. The 9/11 survivor tree, like other survivor trees, are those that have witnessed and withstood extreme disturbances and become compelling symbols for communities seeking to respond, recover, and reconnect following a tragedy (McMillen et al. 2017b). This individual tree that survived the destruction on 9/11 at the Twin Towers in New York City (NYC), and its progeny have become symbols of resilience, strength, and unity. Their propagation has become an integrated lesson in history, tolerance, and horticulture. The faculty member at the school who runs the program, described the impact on students: “[The students who care for the trees] were emotionally attached [to the trees]...for a lot of reasons...it really helped them through difficult times having caretaker roles, and then through us, they were taught about 9/11 and then became the teachers for other kids about 9/11... even if they didn’t live at that time...As an educator I see the importance of this project not only for education, nursery stock, but, my God, the importance of not forgetting. Three thousand died at this site, but this tree can give meaning to them, so it was powerful.”

The distribution of offspring from the survivor tree has created a network of sites and communities that are connected and inspired by the tree (McMillen 2017a). We documented six living memorial sites in the NYC area that had planted survivor trees (Figure 4); however, the distribution of these



Figure 4: Survivor trees unite communities and inspire resilience. From left: Survivor tree at 9/11 Memorial and Museum (previous site of Ground Zero in Lower Manhattan, NYC); sapling planted in Manalapan, NJ, that was grown from 9/11 survivor tree; sapling planted in Coney Island, Brooklyn, NYC, that was grown from 9/11 survivor tree.

Photo by Heather McMillen, used with permission.

Concept	Indicators	Examples from LMP Sites
Social Resilience	Place Attachment	Signs of territory marking and place naming (e.g., signage and stories) Diversity of place meanings within the group Planning for ongoing care of site by the next generation
	Collective Identity	New identity emerges in response to 9/11 Stewards reinforce an identity associated with their site through ritual practices Shared group narrative connected to the site evolves as context evolves
	Social Cohesion	Group makes decisions together about the site and its use Individuals engage in shared stewardship activities together Individuals engage in acts of reciprocity on and off site
	Social Networks	Group expands their work beyond the physical boundaries of the site Group uses existing social networks to disseminate new information Dominant narratives of group influence policies and programs at larger scales
	Knowledge Exchange & Diversity	Knowledge and personal experience are shared in multiple ways within group Practices (e.g., related to conservation, horticulture, lifeways) are shared New knowledge and traditions (e.g., survivor tree) are adopted, adapted, and integrated

Figure 5: Examples of empirically observable stewardship practices.

Photo by Heather McMillen, used with permission.

trees goes beyond 9/11 memorial sites. Other sites that plant the tree as a symbol of resilience and renewal following other tragedies include Joplin, MO, to commemorate recovery from the 2011 tornado; Newton, CT, to commemorate recovery from the 2012 attack at Sandy Hook Elementary School; and Orlando, FL, to commemorate recovery from the 2016 Pulse Night Club Shooting (USDA Forest Service 2017).

Discussion

We described the specific practices through which these indicators of social resilience can be observed in living memorials. Here we discuss how these practices translate to other sites so others can recognize and evaluate social resilience at the community level through: attachment to place, collective identity, social cohesion, social networks, and knowledge exchange and diversity (Figure 5). These suggestions of how to recognize resilience are meant to help “train the eye” of both researchers evaluating the near term and future sustainability of stewardship practices as well as practitioners aiming to support stewardship and strengthen communities’ readiness for and recovery from disturbance (see also Svendsen et al. 2014). We see these living memorial sites as both indicators of social resilience to the specific disturbance of 9/11 but also as indicators of general resilience. In other words, the creation and maintenance of some memorials (described above) strengthen adaptive capacity and the ability to respond to subsequent disturbances following 9/11.

Demonstrating Social Resilience Over Time

We believe attachment to place undergirds and is a prerequisite for other indicators of social resilience (cf. Campbell and Wiesen 2009). These attachments may not and need not be homogeneous within the community. In fact, communities with a “diversity of place meanings” and multiple kinds of attachment to place may be more resilient and adaptable to social change (Stedman 1999, p. 769). The broader importance of these concepts for managers is that stronger connections to a place, through both sense of place and place attachment, are tied to pro-environmental behavior (Bendt et al. 2013) as well as the inclination to develop or participate in climate adaptation planning processes (Kudryavtsev et al. 2012), which has implications for strengthening general resilience more broadly.

Many urban environmental stewards act upon a sense of rights and responsibilities to a particular garden, memorial, or park. To recognize place attachment at the community level, we recommend looking for signs of: territory marking and place naming (e.g., through signage and stories), plans for

transfer of site stewardship into the next generations (e.g., individual leadership turnover, new organizations formed), and the strength of the local protective response if the site is threatened by change (e.g., memorial as preservation strategy in the face of development pressures). Community-based stewardship is not only momentary or ephemeral; when place attachment is strong, we expect that we will see these acts of claiming territory and managing it over time despite changing external conditions and changing internal group dynamics.

To recognize collective identity around a specific site, one can examine: who is included or excluded in tight-knit groups; whether stewards articulate an identity associated with their site (e.g., garden, living memorial) through ritual practices; whether a new identity emerged following an acute event (e.g., first responders, 9/11 family members); and if the group has a shared narrative connected to their site (Fominaya 2010). These identities can be expressed publicly through spoken narratives, written statements, and/or physical acts (Proshansky 1983). When collective identities are site-specific or place-based, there can be clear overlap with some of the practices described as part of place attachment above. Other identities may emerge through communities of interest or shared experiences (e.g., 9/11 survivors) that are not place-bound, but rather are relational links spanning across space. While the evidence we presented from LMP sites shows clear attachment to place, many of the actions undertaken by stewards might also be explained by a more personal sense of place identity (Kearns and Forrest 2000). For example, selecting a memorial site may be entwined with one's own personal identity as much as it reflects an attachment to a particular place. We find that stewardship of a specific site presents an opportunity for groups to express a particular collective identity or to negotiate multiple identities through shared creation and management of land.

Social cohesion can be understood by considering the strength and number of bonding ties within the group as well as the degree to which: a group makes decisions together about the site and its use; individuals engage in stewardship activities together; and individuals engage in acts of reciprocity on and off site. Collective decisionmaking is an indicator of a cohesive group with governance capacity (Campbell 2016).

We believe that the strength of social networks can be indicated when: a group expands their work beyond the physical boundaries of the site; a group uses existing social networks to disseminate new information; and when newly formed weak ties among members emerge (including those related to enhanced trust and reciprocity). Going beyond the specific management of the site, we see the way that interaction and sociability enabled through site stewardship, for example, can strengthen reciprocity among

members. Through the acts of planting, weeding, and collectively creating a living memorial, stewards have greater opportunities to know each other and strengthen social bonds that go beyond the memorial site itself. The strength of social networks is also indicated when dominant narratives of the group become entwined in policies and programs at larger scales. For example, community-based narratives calling for local memorialization of 9/11 have challenged existing rules that limit the creation of new memorials in parks, and policies have been modified. Finally, a community's desire to plant on urban public land also challenges rules, catalyzing modifications to community and public land management practices.

Resilience is expressed in the narratives used to leverage resources for these spaces. Living memorials, in particular, make special use of the flora planted in their sites to tell stories and keep memories alive, including survivor trees as well as other flora with symbolic resonance (McMillen et al. 2017b). We encountered examples of living memorial stewards keeping development and land use changes at bay because of the significance of their sites and the stories they represent. Resilience can be detected through: examining how knowledge and experience gets shared and disseminated; the degree to which material practices (e.g., related to ecological conservation, horticulture, lifeways) are shared; and whether the group adopts, adapts, and/or integrates outside traditions for their own purposes. Increasing the opportunities for new ideas from outside and exchanging knowledge within the group itself can expand the group's understanding of its purpose and relationship to other people, events, and issues, thereby creating a stronger and more solid bridge to other groups and issues.

Conclusions: Recognizing and Supporting Social Resilience

In this chapter, we have illustrated how UES can enhance social resilience through: attachment to place, collective identity, social cohesion, social networks, and knowledge exchange and diversity. Social indicators of resilience reflect dynamic processes critical to sustainability goals and objectives (e.g., Hicks et al. 2016). In NYC and other urban areas, UES is an important component in community-based recovery programs as well as in long-term sustainability planning initiatives. In the examples we shared here, we see that the meanings and effects of the LMP sites go beyond 9/11 and beyond the specific footprint of the sites. With population growth and climate change issues at the forefront of urban policies throughout the world, it is expected that civic stewardship groups will continue to respond to disturbance and change through acts of creation, management, and caretaking. These stewards exhibit a sense of rights

and responsibilities connected to place attachment and identity. How these acts are identified and interpreted by decisionmakers will relate to the successful development and adaptation of sustainability and resilience plans, including with a greater attunement to the dynamics of social resilience. We see the creation, ongoing maintenance and evolution of these LMP sites as first part of the response to disturbance, then critical to the recovery of the community, and—as we have seen over time with the evolution of sites—they have also become part of the readiness or adaptive capacity of communities to respond to and recover from subsequent disturbances. Future research and practice should explore how to cultivate and support stewardship over time, including times when there are unexpected shifts or transitions in resources, conditions, and governance. Such work may inspire and shape the practice of collaboration across agencies and among managers, practitioners, and researchers as we learn more about how resilience is demonstrated and activated in our cities and towns.

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Cultivating Sacred Kinship to Strengthen Resilience

Kekuhi Kealiikanakaoleohaililani,¹ Heather McMillen,²
Christian P. Giardina,³ and Kainana Francisco³

1. Hālau 'Ōhi'a—Hawai'i Stewardship Training, Hilo, HI

2. Hawai'i Department of Land and Natural Resources, Honolulu, HI

3. USDA Forest Service, Institute of Pacific Islands Forestry, Hilo, HI

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Our *aloha nui*⁴ (profound affection) to you, dear readers! We are part of Hālau ‘Ōhi’a, an intensive native Hawaiian stewardship and lifeways training program created to enhance the capacity of natural resources and conservation professionals to engage self, others, and place. The goal of this chapter is to share our collective professional and personal experiences in Hālau ‘Ōhi’a from the perspective of both *kumu* (program developer and master instructor; Kekuhi) and *haumāna* (students; Heather, Christian, Kainana). We describe the pedagogy and epistemology of Hālau ‘Ōhi’a and we share specific exercises from our practice that you can adapt and use in your own places. We believe these practices can inform a larger community of professionals interested in green readiness, response, and recovery because they can enhance personal, community, and global resilience through the cultivation of sacred relationships to place. (For more information see: Hawaiian Skies 2017, Kealiikanakaoleohailani and Giardina 2015, McMillen 2016 in Literature Cited section).

Through Hālau ‘Ōhi’a, we have come to honor three foundational principles for building community-based resilience. First, personal resilience is enhanced when we embrace multiple ways of knowing the world the around us. Second, community resilience is enhanced when we recognize and engage our many diverse and intimate familial relationships, including those with all other beings in our communities. Third, global resilience is enhanced when we embrace the notion that we are reflections of our Earth—biogeochemically, evolutionarily, socially, and spiritually—and that by exploring these connections through mythical texts and creation stories, we heighten our appreciation of our interrelationships with each other and with our places across time and space. In this chapter, we share the skills practiced in Hālau ‘Ōhi’a as a multiscale approach to strengthening personal, community, and global resilience.

What is Hālau ‘Ōhi’a?

A *hālau* is a place of learning and literally means “many breaths”; *‘ōhi’a* (*Metrosideros polymorpha*) is the most important native tree species in Hawai’i (Figures 1 and 2).

Partnership and financial support have come from USDA Forest Service-Pacific Southwest Research Station, Friends of Hawai’i Volcanoes National Park, Kamehameha Schools, and The Nature Conservancy. Over the past decade Hālau ‘Ōhi’a has grown from an idea to a formalized and funded program that has reached over 80 conservation professionals from 30 different federal, state, and nongovernmental organizations. Collectively these professionals possess a range of skills in native species

4. As one of the official languages of Hawai’i, Hawaiian words are not foreign and so need not be italicized; however, they are italicized throughout the chapter for the ease of reading.



Figure 1: 'Ōhi'a (*Metrosideros polymorpha*) blossom

Photo by Heather McMillen, used with permission.



Figure 2: 'Ōhi'a tree inside Kīlauea Iki, the crater adjacent to the main summit caldera in Hawai'i Volcanoes National Park.

Photo by Heather McMillen, used with permission.

propagation, environmental education, ecological restoration, invasive species management, agroforestry, geography, marine biology, agronomy, anthropology, ethnobiology, communications, ecology, astronomy, navigation, and more. Participants include those with native Hawaiian ancestry and those with other ancestries; those who were born in Hawai‘i and those who arrived later in life. As with the larger group of participants, our (the authors’) ancestry and experiences are diverse. This is an important aspect of this training. For native Hawaiians, there is clearly an element of reconnecting or strengthening cultural connections. But the larger motivation of our collective group stems from recognizing that native Hawaiian perspectives and practices provide a blueprint, a pathway, and a portal for entering into what we contend is a more effective way of engaging stewardship and promoting resilience. We see the approach of Hālau ‘Ōhi‘a to be broadly relevant and broadly accessible, including beyond the context of Hawai‘i. Here we integrate four perspectives on our collective learning through Hālau ‘Ōhi‘a.

Participants in Hālau ‘Ōhi‘a are asked to engage deeply the philosophy of *aloha* (Figure 3). Literally translated, *alo* means “face-to-face” and infers engaging in an exchange with what is in front of you. *Hā* means “breath” or “life.” *Aloha* means an exchange of sacred breath with a being that is loved. *Aloha* has been described as a mode of interacting with the world that operates at the level of the individual, but is most fully expressed in community with other beings, human and nonhuman, animate and inanimate. To live one’s life with *aloha* requires engaging that part of oneself that allows for empathy, compassion, kindness, affection, veneration, commitment, reverence, and gratitude for all aspects of life. The philosophy of *aloha* is not unique to Hawai‘i; it is a Hawaiian expression of a globally common indigenous perspective on well-being, one that is focused on family, community, and the environment, and that reflects an understanding of the interconnections among “social, cultural, spiritual, environmental and psychological aspects of health” (Donatuto et al. 2014, p. 356; cf Salmón 2000). *Aloha* is a knowledge-practice-belief system that is akin to other holistic systems based on “connections between human beings, nature, and spiritual beings” (Donatuto et al. 2014, p. 356). In the context of Hālau ‘Ōhi‘a, proficiency in the practice of *aloha* comes through consistent, life-long practice that exists in all aspects of being. Hālau ‘Ōhi‘a’s pedagogy, defined here as

Key Concepts in Hawaiian

- Aloha:** philosophy for interacting with the world; exchange of sacred breath with a being that is loved
- Hālau:** place of learning, literally “many breaths”
- Ki‘i:** reflection
- Mele komo:** poetic text that asks permission-to-enter
- Mo‘okū‘auhau:** genealogical chant
- ‘Ōhi‘a:** *Metrosideros polymorpha*, an endemic tree species in Hawai‘i with extremely high cultural and ecological value
- Ohana:** family

Figure 3: Key concepts in Hawaiian.

Participants in Hālau ‘Ōhi‘a are asked to engage deeply the philosophy of *aloha* (Figure 3). Literally translated, *alo* means “face-to-face” and infers engaging in an exchange with what is in front of you. *Hā* means “breath” or “life.” *Aloha* means an exchange of sacred breath with a being that is loved. *Aloha* has been described as a mode of interacting with the world that operates at the level of the individual, but is most fully expressed in community with other beings, human and nonhuman, animate and inanimate. To live one’s life with *aloha* requires engaging that part of oneself that allows for empathy, compassion, kindness, affection, veneration, commitment, reverence, and gratitude for all aspects of life. The philosophy of *aloha* is not unique to Hawai‘i; it is a Hawaiian expression of a globally common indigenous perspective on well-being, one that is focused on family, community, and the environment, and that reflects an understanding of the interconnections among “social, cultural, spiritual, environmental and psychological aspects of health” (Donatuto et al. 2014, p. 356; cf Salmón 2000). *Aloha* is a knowledge-practice-belief system that is akin to other holistic systems based on “connections between human beings, nature, and spiritual beings” (Donatuto et al. 2014, p. 356). In the context of Hālau ‘Ōhi‘a, proficiency in the practice of *aloha* comes through consistent, life-long practice that exists in all aspects of being. Hālau ‘Ōhi‘a’s pedagogy, defined here as

the method and practice of teaching, and epistemology, or foundational collective knowledge system, requires that participants cultivate multiple ways of knowing our biology, minds, spirits, communities, and the places where we live, work, play, and engage. To begin this practice, we ask you to: *inhale, exhale, observe, and repeat: A (ah)- LO (loh)- HĀ (haahh) to the beings that surround you. Aloha sun, aloha cool breezes, aloha person walking down the street, aloha scent of gardenia flowers, aloha squawking birds, aloha heartbeat, aloha 'ōhi'a tree, aloha delicious breakfast, aloha computer, aloha Earth!* (Figure 3).

The Hālau 'Ōhi'a pedagogy is focused on cultivating sacred, *aloha*-based relationships. We share our approach because we have learned that by encouraging our bodies, minds, and spirits to holistically understand and embrace *aloha*, we greatly enhance our capacity as conservation professionals to express *aloha* for ourselves, each other, and our places. In the context of this paper, our hypothesis is that an *aloha*-based strategy to green readiness, response, and recovery will increase social and ecological resilience in times of distress and disturbance by building emotional, psychological, and spiritual resilience at personal, community, and global scales. The first step of this process requires a personal shift from viewing conservation as organizationally-driven management of biophysical objects to the sacred stewardship of an array of family members. This deeply familial and internalized connection to place requires additional skills, views, and methods that are rarely taught in schools following a western approach to professional resource management. For this reason, Hālau 'Ōhi'a seeks to create a space where kinship-based approaches and associated skills are actively engaged, developed to proficiency, and celebrated by resource managers in professional and personal contexts.

The remainder of this paper consists of further description of our epistemology and then a description of and instructions for practicing specific skills to cultivate sacred kinship relationships. These exercises include: creating your own *mele komo* (chant requesting permission to enter) and *mo'okū'auhau* (genealogical chant), and the practice of deeply engaging stories to reveal their meanings across universal, community, and personal levels.

Multiple Ways of Knowing our Environment

Engaging multiple ways of knowing our environment entails being willing to freely and nonjudgmentally engage the material and immaterial, the conscious and the subconscious, and the rational and nonrational. This approach asserts that, as conservation professionals, we limit ourselves when we compartmentalize the professional and personal, the biophysical and the emotional, and the intellectual and the spiritual, and that such compartmentalization reduces our ability to effectively steward and be stewarded. Acknowledging this holism

into our personal and professional lives is liberating because it allows us to become proficient in engaging multiple perspectives, views, and epistemologies, and thus allows us to create diverse opportunities to expand our capacity to know and steward our environment. We suggest that such proficiency also allows professionals to more effectively understand and engage the diverse ways communities view and engage their worlds, and such understanding is a path to strengthening programmatic capacity to foster green resilience.

A critical element of multiple ways of knowing is a conscious shift from learning *about* the objects of a place for management purposes to placed-based learning *from* the diverse members of a community for stewardship purposes. In Hālau 'Ōhi'a, we request permission to enter into a space (e.g., our classroom, a forest, a community center), and as we do this, we wonder: *What will I learn from this place; Who will provide me with this learning; What will the lessons mean for me as a person, a professional, and a community member; How will this experience further my practice of aloha?*

A *mele* is a Hawaiian poetic text. A *mele komo* is a *mele* recited as a chant that requests permission to enter, and it prepares us to enter into a space by opening ourselves to learning. This is the first skill that is taught in Hālau 'Ōhi'a because requesting entry into any space is fundamentally respectful of that place. More deeply, the *mele komo* reminds the practitioner of their relationship with a place that is a source of sustenance for individuals, that allows for the well-being of our families and communities, and that with our stewardship will continue to sustain in every sense of the word our interdependent kinship networks. Perhaps most importantly, the *mele komo* renews our sacred, ideally intergenerational responsibility for and commitment to stewarding place.

This *mele* (Figure 4) follows the traditional Hawaiian form for *mele* but it is a contemporary chant composed specifically for Hālau 'Ōhi'a. This *mele* highlights that Hawaiian culture is a living and ongoing process that continues to embrace both old knowledge systems and perspectives and new contexts.

Mele Komo

**Two million lives in the seeds of 'ōhi'a strewn
about from near and far in Hawai'i**
*Ua lū kinikini ka hua 'ōhi'a lehua mai 'ō a 'ō o
Lononuiākea*

Carried on the wings of the wind
Halihali 'ia e ka 'ēheu hulu makani

**Caressed in the warmth of Honuamea-volcanic
earth; nourished by Kānehoa-Sun**
Hī'ipoi 'ia e ka Poli mahana o Kānehoa, o Honuamea

**We are rooted, tapping the source of
water-unfurling, peaking towards full bloom**
Ua a'a, ua mole, ua mōhala a'ela

**A diversity of hues-brilliant scarlet, golden,
salmon, and the rare white**
'O ka 'apapane, 'o ka mamo, 'o ka nuku 'i'iwi, 'o ka 'āhihi

**We are blankets of 'ōhi'a forests that extend
beyond the horizons of my vision**
Mai hiki lalo a i hiki luna e waiho nei i hālī'i moku lā

It is done with the simple offering of the voice
Ua 'ikea! A he leo nō ia.

Figure 4. Mele Komo composed for Hālau 'Ōhi'a by Kekuhi Kealiikanakaolehailani.



Figure 5: Hālaiu ‘Ōhi‘a students sit on woven *lauhala* (*Pandanus* spp.) mats in their classroom, a transformed seminar room at the Institute for Pacific Islands Forestry in Hilo. Each class meeting includes the creation of the *kuahu* (hula altar) (lower right corner) adorned with *kinolau* (plant embodiments of gods) gathered by students, followed by a discussion of the multi-level significance of the plants. The *kuahu* is the focal point for the classroom setting as it represents a microcosm of the world we endeavor to create as well as a portal for creating and entering into a sacred space where discussions can holistically engage a range of topics.

Photo by Kainana Francisco, used with permission.

In the case of this particular *mele*, the chanter is drawn to the image of the growth cycle of ‘ōhi‘a from the spreading of its tiny hair-like seeds to the elements that help those seeds take root. The poem declares that encased in the dried calyx of a single *lehua* (‘ōhi‘a flower) (Figure 1) are hundreds of seeds waiting to create forests of ‘ōhi‘a blanketing the landscape. Finally, the ‘ōhi‘a displays its variety of colored blossoms until each flower’s vitality seems to fade. Through engagement of the *mele* through chant, the participant engages core foundational elements to the deep learning process: *What is my relationship to the elements in the text? How does this relationship connect me to this place that I am requesting to enter? How am I connected to this community of learners entering this place with me? What lessons do I need to learn today?*

There are multiple levels of interpretation for this *mele komo*—the literal and metaphorical, the personal, regional and global, and the biological, emotional, psychological and spiritual. And so, for example, when we ask *WHO are the seeds?* you, as the reader, might guess that the seeds are the image of the ONE chanting, including you as you read the text. As with sacred texts broadly, the seeds, the wind that distributes the seeds, the caress of the earth and sun, the roots, the blooms, and the vision and promise of dark green forests are embedded with multiple layers of meaning that intertwine the chanter, community, and ecological system. One interpretation of this process is that it creates a portal for engaging the multiple relationships that define place. Entering this portal requires that we accept the sacred responsibility of being a contributing member of the larger family, with the promise that assuming



Figure 6: Kumu Kekuhi leads Hālau 'Ōhi'a in learning the hula for Hi'ilawe, a waterfall in Waipi'o Valley, Hawai'i Island, following their field stay in the valley.

Photo by Kainana Francisco, used with permission.



Figure 6: Multifamily and multigenerational members of Hālau 'Ōhi'a planting kalo (*Colocasia esculenta*) in Waipi'o Valley, Hawai'i Island.

Photo by Heather McMillen, used with permission.

such a commitment enriches our experience as resource professionals, but also enhances our capacity to serve the larger family of connections while integrating the many facets of our personal and professional lives.

We believe that the process of creating a *mele komo* has instructional value but also can be transformative. It is our belief that resilience is strengthened by acknowledging, honoring, and stewarding the relationships that define the network or community of elements and beings making up a place. We witness this across our enriched professional activities and encounters. As professionals, we are more effective practitioners when our role is firmly embedded in a larger family context that provides diverse and often ancient sources of stewardship knowledge (Figures 5, 6, 7). We recommend that you, the reader, create a *mele komo* for the places that you and your community engage professionally or personally, just as Kekuhi created the *mele komo* (Figure 4) for Hālau 'Ōhi'a. Here we offer a format, but you can compose your *mele komo* in any format that you choose, written for any place or space you visit.

We suggest your *mele komo*:

1. Speaks to the broad and specific beauty of the place.

2. Speaks to a process or an overall image.

3. Uses specific names that communicate that you KNOW the space. Feel free to use early or different place names if they are available/ known, for example, Lononuiākea is an older name for Hawai‘i Island.

4. Includes a personal image that connects you to a space, allowing for chosen words to convey multiple layers of meaning.

5. Is conceived as providing limitless potential for learning from a place.

Exercise 1. *Mele Komo*.

Here we provide a simple structured approach for creating a *mele komo*, followed by an example from Tokyo. Compose your *mele komo* relying on this template. GF=geographic feature (e.g., river, falls, mountain, bay, etc.).

Line 1:

Aloha _____, _____ !
 (Name of the GF) (Describe it, and use larger geography/older name)

Line 2:

(Acknowledge 1-2 neighboring GFs and their relationship to the GF in line 1)

Line 3:

(Request entry or access) (Explain why you are there)

Line 4:

(Conclude with a humble thought for continuum)

Line 5:

A he leo wale nō!

(Pronounced *Ah heh leh-oh vah-leh noo*. It means “the voice is the offering.” This line is optional, but by using another language, we trick the brain into the novelty of it, and therefore are more willing to participate.)

Mele Komo for Tokyo Bay

Aloha Tokyo Bay, glorious Edo of Honshu!

Where the Edo and Sumida Rivers meet.

Please grant us access to your shores, so we may clean your banks,

So that WE may exist in health.

A he leo wale nō!

After you compose your *mele komo*, go to your place, engage the place with aloha as you would a beloved family member, share your *mele komo* with your place, and when you finish, pause silently, and observe. Be aware of a subtle breeze, the call of a bird, a splash, a drizzle, a sense of ease, or a shift of energy. Congratulations on creating and using your own sacred text! The power of the *mele komo* process can be enhanced when shared amongst your community, personal, and professional, from elders to children.

Sustaining and Being Sustained by our Relations

Fundamental to discussions of sustainability and resilience is engaging in the question of how we relate to all phenomena around us and to one another with all of our peculiarities. As professionals engaging in holistic (mind, body, spirit) approaches to our professions, we can consider the miracles of mirror neurons, the magic of feeling a deep sense of belonging, our connection to dark matter, the love of a parent, the procreation of sea cucumbers, neuroplasticity, or the existence of any other wonder of life—regardless of our understanding of these phenomena. In doing so, we are more effective in the work we do to protect, restore, and steward the places where we live and work. All of this is possible when we trace a direct relationship to these and other miracles.

Indigenous epistemologies posit that we are all family, where family extends beyond the human species to include all living and nonliving components of a system—what has been described as kincentric ecology (Salmón 2000). Also implied is the idea that family members are connected through sacred, reciprocal relationships that embody heart-felt responsibilities: care, sacrifice, respect, support, love, and protection. This notion of familial relationship to everything and everyone recognizes that life fully lived requires that the extended family experiences well-being to the fullest extent possible.

Recognizing we are family because we are related biogeochemically (we are all derived from the same source materials), evolutionarily (we are all part of the same family tree of life), and cosmologically (we all share elements of our creation stories) calls us to be responsible for one another. Within this framework, all members of the family have names, and so the human need to derive sustenance from the larger network of family members is treated

carefully and thoughtfully. In the process of being sustained by our relationships (when we drink water, collect from our gardens, gather protein from our reefs, or harvest wood and fiber from our forests), we are asking for a sacrifice by those family members so that we might be sustained. And so honoring in the spirit of exchange the “acquisition” of resources, the taking of a life, the gathering of plants, the removal of minerals, even the breathing of air, requires humility and gratitude grounded in our dependence on the deep aloha provided to us by our relationships with the sustaining world around us.

To highlight this notion of extended family, we ask the question: Who is your father, mother, or great grandmother? When you respond to this question, what is the feeling that comes with your answer? Is there a feeling that arises from the deep genealogical, physical, physiological, emotional, psychological, and spiritual history of relationship to that person, whether personal or learned from a story? What does it mean to answer the questions: Who is your water? and Who is your mountain? and have the answers elicit a similarly rich sense of belonging, of intimate familiarity and gratitude, of familial obligation, versus feelings associated with object ownership, use, or management? This shift is central to cultivating stewardship of the intimate, reciprocal relationships that define our place in the world and who we are as members of the larger family.

Here we offer a methodology that helps us to reimagine and attune ourselves to all of our family members and processes, human and otherwise, within those systems. To exercise this concept of environment as family, we will adapt a basic Hawai’i genealogical format from one of the cosmologies of Hawai’i. Traditionally, *mo’okū’auhau* (genealogical chant) were recited to introduce oneself to a community. *Mo’o* is the notion of continuum and the *mo’okū’auhau* conveys our interconnections over space and time. Hālau ‘Ōhi’a students have used this format to introduce themselves to Kīlauea crater on one of our field trips and to introduce themselves at our public, community sharing of what we have learned together in the class. Use the format below to create your genealogical chant including the relatives in nature that sustain you.

Exercise 2. *Mo’okū’auhau* (genealogical chant)

_____ is the _____ from _____,
(name of grandparent*) (gender **) (name of where they are from)

_____ is the _____ from _____,
(name of other grandparent*) (gender **) (name of where they are from)

born from their union was _____.

(name of parent*)

_____ is the _____ from _____,

(name of parent from above*) (gender **) (name of where they are from)

_____ is the _____ from _____.

(name of other parent)

(gender **)

(name of where they are from)

born from their union is _____.

(your name)

My beloved land is _____.

(name of the place you call home)

_____ is the name of my _____, our bodies mingle.

(name and identify a geologic feature of your home - mountain, valley, plains, etc)

_____ is the name of my _____, our blood mingles.

(name and identify a water feature of your home - ocean, river, stream, lake, spring, etc.)

_____ is the name of my _____, our energy mingles.

(name and identify a prominent landscape feature of your home - plant, animal, mineral, etc.)

_____ is the source of my water, our spirits mingle.

(name the source of your water)

Ola ka 'ohana!

(Pronounced *Oh-lah khaa oh-hah-nah*. It means "life to the family." This line is optional, but by using another language, we trick the brain into the novelty of it, and therefore are more willing to participate.)

*The ones you name can be those who raised you. They need not be biological grandparents or parents. Another option is to substitute the entire section with: "I am _____ from _____, and my beloved land is _____."

** Identify the gender as you see appropriate. In Hawaiian language, these are *kane* (male), *wahine* (female), and *māhū* (male-female, both genders, between genders).

And, born is your *mo'okū'auhau!* You can use this to introduce yourself to a place, to a community group at a meeting, or the audience at a conference before you give a talk, especially if the talk or meeting is with native or indigenous people of an area. While this represents a standard introduction protocol

for much of the world, this format is different for professionally trained managers who typically emphasize agency or organization affiliations over family and other living features of places. Broadening introductions allows community groups to know you and the places you care about and allows you to better know members of a community. This also presents an opportunity to introduce the ecological systems in an area from a more kinship based perspective. This way of contextualizing people as a part of and not apart from the landscape begins to attune ourselves to Hawaiian epistemology. Over time, or as the setting requires, you may expand your genealogy, the range of environmental family members identified in your introduction, or other features of your relationship to a place. Resilience begins with knowing yourself in relationship to those around you, and so strengthening resilience means building or enhancing the depth, intimacy, and quality of relationships, and in so doing elevating the well-being of the community.

Seeing Our Own Reflections in Our Local, Regional, and Global Communities

For our final conversation of this chapter, we introduce the possibility of our relationship to sacred texts and mythological creation stories (hereafter “stories”) as another portal to strengthen relationships, well-being, and resilience. Just as scientific theories and mathematical equations are globally recognized stories of our wonderings about the physical and biological universe, oral histories, legends, and poetry contain globally recognized stories about physical and emotional-spiritual universe. The messages, images, and characters of these stories can be so potent to our individual and collective psyche that the cultural phenomena of Christmas and Easter, Hanukah and Rosh Hashanah, Eid Al-Fitr and Eid Al-Adha, Diwali and Holi, Wesak and Hanamatsuri, etc., persist in their modern day form because their images—global, communal, and personal—still have deep relevance in our lives.

Consider stories such as Christ, the Hindu trinity, the Buddha, Great Spirit, Turtle Island, Pele’s migration, Amaterasu Omikami, and the Dream Time. These stories are rich legacies about humans and their responsiveness to their environments, their readiness in adapting to changes, and the heroics and resilience represented in the reciprocal relationships among people and their environments (a concept that is akin to feedback loops in resilience theory). These stories and many more are embedded in and so shape our awareness and subconscious about how we relate to our world. They also shape how we respond to change because their messages, images, and themes are both ancestral and acutely relevant to continually changing contemporary contexts.

This multilayered relevance plays a critical role in supporting resilience because these stories contain an immense longitudinal data set describing humanity's relationships to ourselves, our communities, and the world around us. Our universally rich heritage includes information about: the best of climates and the worst of climates; the adaptability or extinction of a species; surviving and then thriving in the face of floods, volcanic eruptions, fires, storms, earthquakes, war, pest invasion, drought, hunger, and so on; the communion between human, animals, and plants; the effect of the environment on our life ways, and everything in between. Indeed, stories teach us about the nature of being and the nature of being in relationships. They can inspire us to be expansive, and they can induce introspection. Stories can be seen as personalized lessons about people's worldviews, perspectives on the land and how people are connected to their land, why their belief systems are the way they are, and who is important in their lives and lands. With a deep engagement of stories, these universal questions can be deciphered and interpreted. Reading (or listening to) these stories therefore requires flexibility and adaptability. We see it as a valuable practice because tapping into their dynamic teachings can enhance our understanding of place, of relationships, of relationships to place—all building blocks to enhancing resilience. Thus, our final conversation here will focus on a process for accessing these stories and their multiple meanings. To do so, we focus on the sentient *ki'i*.

Ki'i literally translated means "reflection," and so *ki'i* can take the form of anything that might be reflected: an object, a person, a concept, etc. The general approach for deciphering *ki'i* centers on the question: *what do the ki'i in this story have to teach me?* In Hālau 'Ōhi'a, our learning process is structured around recognizing and learning from three categories of *ki'i*: *Ki'i Ākea* (meta- or universal images), *Ki'i Honua* (macro- or regional images), and *Ki'i 'laka* (micro or personal images). These elements help us to interpret and connect to stories at global, regional, and personal levels.

Ki'i Ākea are the archetypical or universal images found in a society's most important stories. From alpine slopes of the Himalayas to Amazonian rain forests, from Ubud to Milfordhaven, from the Salish to the Tuwharetoa, *Ki'i Ākea* capture universal themes relevant to all cultures across the ages: sacrifice, rebirth, transition, transformation, death, birth, mother earth, sky father, journey, gender roles, sibling relationships, wisdom, darkness, etc. Due to both the universality of many human experiences and the effects of large-scale migration and cultural diffusion, *ki'i* can convey the same or very similar meanings across stories, regardless of their origins (cf Cajete 1994). Associated meta-images can belong to the collective unconscious and are represented by certain characters, elements, or situations in a story. Some examples of *Ki'i Ākea* could be: moon, sun, grandfather, warrior, teacher, etc.

Ki'i Honua are the themes or images that are shared by a community, a geography or national group. The *Ki'i Honua* are in fact those images that reflect how and why Henua Enana people, Japan people, Hopi people, or Ni'ihau island people relate to the world the way they do; it is a shared worldview shaped by a shared geography. Cosmopolitan megacities also have *Ki'i Honua*. In New York City, these might include yellow cabs and the subway, Carnegie Hall and Alvin Ailey, bagels and pizza, the coastline and skyline, or Harlem and Wall Street. Individual neighborhoods within New York could even have *Ki'i Honua* that are specific to them, but also resonate with their larger community in diaspora. For example, hip hop in the Bronx or musicals in Time Square. When assessing the *Ki'i Honua*, one asks: For which community am I decoding the *Ki'i Honua*? The *Ki'i Honua* contracts the universal themes described above to engage a national, regional or even community context. *Ki'i Honua* are also useful for individuals who belong to the same occupational or religious communities. For instance the scythe and mallet is a popular image recognizable by the construction industry, while the medical/healing profession recognizes the image of the Asclepius or serpent on a rod. The *ki'i* in these cases is both the symbol, and the meaning behind the symbol. The *ki'i* or the image/theme suggests our relationship to the story at different scales. Some examples of *Ki'i Honua* images could be: ocean, tools of an occupation, seasonality, *kalo* (taro), *wa'a* (canoe), turtle, journey. We can even apply this concept to our own agencies where *ki'i* might include loyalty, team work, retirement, promotion, etc.

Ki'i 'laka are your own images, the reflections resulting in personal messages to you from the authors of a text. *Ki'i 'laka* are the most evasive because they are often neglected, and so our own capacity to engage this *ki'i* may be atrophied if our practice of self-reflection is irregular. Readers may also assume that the hero, villain, or other image in a story is simply entertaining without recognizing it is related to their personal experience. However, these micro-images include all the facets of the personal self, composed of personal themes that have grown out of our personal experiences, intuitive processes, and interpretations of the world around us; they are our most powerful allies for learning about and being in the world. *Ki'i 'laka* puts our existence into perspective, and they help us decipher our own spirits, because both text-based and oral forms of a story provide opportunities to engage and see the self in the story. The *Ki'i 'laka* can be the same images as the *Ki'i Ākea* and *Ki'i Honua*, but you relate to them on a personal level. On the other hand, the *Ki'i 'laka* can just be that one image or one theme that resonates with you because of your current life happenings.

The *Ki'i* reflection process is most useful when we begin to look at different stories around the globe, so we encourage you to share and learn the

stories from your own places, and to read and listen to stories from other places. The images in stories, songs, and legends connect people globally. Even if you are not from that place, you can still find your own connections to these places, people, and culture by finding their connections with stories of people and places you do know, and with your own genealogical connections to those places. Our resilience is heightened when we come to know the rest of the world through their great stories. As our final exercise, Exercise 3, we encourage you to choose a story and productively engage it by identifying the three levels of *ki'i* within it, focusing in on the *Ki'i 'laka* or personal images that stand out to you in that story. The story can be one that you know well or one that is new to you. Ask yourself the questions: *What does this ki'i have to teach me? What message does this story have for me? Why is this song showing up now?*

The *ki'i* (Figure 8) help us to see that our greatest challenge is to ask ourselves the right questions, the questions that will allow our spirits to interact purposefully with our immediate surroundings, our surroundings in our past or in distant areas, and perhaps most foundationally, with ourselves. If we allow them, *ki'i* can help us meet our greatest challenges with better questions because they are images created and recreated over and over by centuries of life experts and the wisdom of a billion stars, a billion births, and a billion deaths. By connecting to the stories that make up our daily lives, we are better able to engage the often complex and deep lessons in these stores to increase our ability to form and maintain sacred kinship relationships globally, regionally, and personally. Collectively, when a community engages stories in this way, we strengthen our collective ability to respond to and care for our communities and environments.

We are at the end of our message to you. If you found any of this useful, we are happy. If you are ever in Hilo, Hawai'i, during a Hālau 'Ōhi'a session, we welcome you to visit us at the Institute for Pacific Islands Forestry (contact Christian or Kainana). Our sincerest aloha to you!

Examples of Stories to Explore for Their *Ki'i*

Pele and Hi'iaka (Hawaiian)
Papa and Wākea (Hawaiian)
Turtle Island (Native North American)
Skywoman Falling (Potawatomi)
Sedna Goddess of the Sea (Inuit)
Elohim or Yahweh (Christianity and Judaism)

*These are just a few suggestions.
Please search out others.*

Figure 8: Examples of stories to explore for their *Ki'i*.

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Synergic

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Extension Disaster Education and Green Readiness, Response, and Recovery: Synergies and Partnerships

Keith G. Tidball
Cornell University
Ithaca, New York

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In the early 1990s land grant universities worked with the U.S. Department of Agriculture (USDA) to develop a disaster education program to be coordinated via collaborations among U.S. state cooperative extension systems. Given that this Extension Disaster Education Network (EDEN) is funded directly and indirectly via USDA funding, and given that the Green Readiness, Response, and Recovery idea is an outgrowth of USDA Forest Service collaborations, there are numerous possibilities for green readiness, response, and recovery resources to be collaboratively developed with land grant partners and disseminated widely across the national land grant and cooperative extension networks. This chapter will describe the national EDEN network, in the context of disaster education and best practices dissemination, drawing attention to the utility of the network to widely circulate green readiness, response, and recovery materials, but more importantly, highlighting the potential to leverage the cooperative extension system's reputation as a credible and trusted source of evidence-based information towards broader understanding among U.S. citizens of the critical importance of integrating natural resources, or green infrastructure, into all phases of disaster management.

Origins and History of Extension Disaster Education and EDEN

The Cooperative Extension Service has been involved in helping families cope with disaster since it was founded in 1914, through the Smith-Lever Act, which formalized and established USDA's partnership with land grant universities to apply research and provide education in agriculture. Congress created the extension system to address rural, agricultural issues. Over the last century, extension has adapted to changing times and landscapes and it continues to address a wide range of human, plant, and animal needs in both urban and rural areas. Today, extension works to: (1) translate science for practical application; (2) identify emerging research questions, find answers, and encourage application of science and technology to improve agricultural, economic, and social conditions; (3) prepare people to break the cycle of poverty, encourage healthful lifestyles, and prepare youth for responsible adulthood; (4) provide rapid response regarding disasters and emergencies; and (5) connect people to information and assistance available online through eXtension.org.

There are many examples of cooperative extension's historical involvement in disaster. Shortly after Cooperative Extension's inception, World War I turned it into a disaster force, with Emergency Food Agents hired to encourage more food production—crops, victory gardens, and improved milk and poultry production (Danbom 1979). Extension agents in northern Minnesota and the Upper Peninsula of Michigan were commended for their heroism

during the forest fires in the cut-over North Country between 1916 and 1920 where between 400 and 1000 people lost their lives (Simons 1958). And Extension was visibly involved in disaster preparedness, response, and recovery during the Depression-era droughts on the North American Great Plains, a time and place known as the Dust Bowl era (McLeman et al. 2014). World War II saw heavy involvement of Cooperative Extension, and Cooperative Extension has been involved in multiple disasters in every decade since (see Simons 1958 for multiple additional examples).

The Cooperative Extension Service's ability to act in all phases of the disaster cycle evolved significantly in the 1990s. The conception, development, and growth of the EDEN were a direct result of the lessons learned by the land-grant system responding to the catastrophic Mississippi and Missouri river floods of 1993. The major lessons learned were:¹

- Long-term community recovery efforts would rest with three key groups/agencies—local government, the faith community, and Extension. These three were in those communities long after the water receded and the disaster was no longer national news.
- Citizens looked to Extension for resources and expertise related to disaster recovery, mitigation, and preparedness, but the individual states lacked the capacity, research-based information, or expertise to address the multitude of issues/needs resulting from a major disaster such as this.
- The emergency management community discovered that the land-grant system could be a tremendous asset.
- Extension had a role related to emergency management, but the faculty was not technically prepared to play that role.
- There was a need for more coordination and standardization of recovery recommendations by the various emergency response agencies—Departments of Health, Extension, Red Cross, Salvation Army, Federal Emergency Management Agency, etc.
- The impacted states lacked the capacity and resources to effectively deal with the magnitude of requests for information, expertise, recommendations, technical assistance, community planning, recovery issues, etc.

1. Further description and examples of these lessons learned can be found at the following Website: <https://eden.lsu.edu/>

Based on these lessons learned, it became clear that the land-grant system would have an ongoing expectation to be involved locally and nationally in the emergency management arena.

A.J. Dye of the USDA Cooperative State Research, Education, and Extension Service (CSREES, reorganized as the National Institute for Food and Agriculture, or NIFA) asked Peter Bloome, University of Illinois; Jerry DeWitt, Iowa State University (ISU); and David Baker, University of Missouri, to develop a proposal for the use of special funds to build on the lessons learned and to position the region to more effectively prepare for and respond to future disasters.

The three leaders initially envisioned that one or more centers would be established in the North Central Region (NCR) where states could pool their technical and educational resources to more effectively respond in times of a disaster. During the 1993 disaster, the states did share some important human resources, but they thought that they could do better.

DeWitt submitted a multistate proposal for \$80,000 to CSREES. Shortly after the project was funded, DeWitt changed jobs, and it was agreed that Illinois and Missouri would move forward with the proposal. The University of Illinois subcontracted with ISU, and Peter Bloome agreed to serve as the new principal investigator.

The NCR Extension directors were asked to designate one representative per state to serve on a regional committee and to attend a fall 1995 meeting in Kansas City. The main issues that surfaced during that meeting were:

- How can we share the resources we already have that apply to disasters?
- What resources are available or missing that would be used by the North Central states in the types of disasters that we typically experience?
- How can we provide training to Extension staff members in emergency management?
- How can we promote scholarly research and efforts that would support this area if Extension were to play a role in it?
- Where can we go to find funds that might support these efforts?

At a second meeting in Kansas City in May 1996, the representatives brought more ideas for collaboration. On the last day, participants agreed that the

“disaster reduction group” needed a name. The key driving principle was development of a network or collaboration between the 12 NCR states to respond as a system/region to future disasters. Four key words emerged that described that vision—“Extension... Disaster ... Education...Network,” and from that the name and acronym of EDEN were born.

EDEN’s growth beyond the NCR is a result of two factors. First, when Extension staff from outside the NCR took part in the 1997 annual meeting in New Orleans in conjunction with the National Housing Conference, EDEN began its growth trajectory of becoming a national rather than regional network. By 2005, all 50 states and three territories had institutions as EDEN members. Second, from July 2002 to June 2004, USDA CSREES special needs funds provided grants to 17 EDEN member states to provide disaster education/emergency management training for their Extension educators.

EDEN has responded to hundreds of emergencies and disasters since its founding, many of which were weather or climate related. Reports on these responses are available on the EDEN Website at <http://eden.lsu.edu/Pages/default.aspx>.

For a number of years NIFA (formerly CSREES) has provided EDEN with funding via a cooperative agreement with Purdue University to support EDEN coordination and communications, Web development and maintenance, curriculum development, training, and resources development.

Authorities

EDEN is one of four national agricultural homeland security networks that exist to protect the food supply and agricultural production: (1) the National Animal Health Laboratory Network [NAHLN], (2) the National Plant Diagnostic Network [NPDN], (3) the Extension Disaster Education Network [EDEN], and (4) the Pest Information Platform for Education and Extension [ipmPIPE] authorized by National Agricultural Research, Extension, and Teaching Policy Act of 1977 (NARETPA), Section 1472, 7 U.S.C. 3318., 7 U.S.C 3318.

Under this authority, EDEN is charged with the following:

- Provide a central point of programmatic, budgetary, social media, graphical, and other support for extension disaster education efforts in furtherance of diverse homeland security capabilities.
- Maintain an extension disaster education World Wide Web presence that targets EDEN delegates, cooperative extension personnel, cooperators, and the general public with the latest science-based homeland security information.

- Foster inclusive county-level agrosecurity planning that brings together local government, state government, federal government, industry officials, and other key stakeholders.
- Develop mechanisms to target small and/or underserved producers with timely agrosecurity messages that are in harmony with official information from state and federal government sources.
- Foster high impact national/regional issue leadership teams.
- Develop strategic partnerships, particularly those that can better incorporate cooperative extension into state and national response frameworks.
- Plan for extension's ability to continue disaster education functions in the wake of a regionally or nationally significant catastrophic event.
- Disseminate timely information on human, animal, and plant health threats, bolstered with linkages to existing science-based education.

Recent Activities in Green Readiness, Response, and Recovery

Among the many lessons of Hurricane Katrina was that in a time of disaster, state Extension Services can serve as “local beacon(s) of recovery while working side-by-side with others in the community” (Cathey et al. 2007). As described above, roles for extension in disaster education and response had already begun to be explored as early as 1993 (Koch 1999), and within little more than a decade, a Deputy Administrator with USDA’s Cooperative State Research, Education, and Extension Service stated plainly that “extension plays a significant role in enabling families, communities, and businesses to enhance resiliency, reduce risk, and minimize loss due to impacts from critical events... the U.S. should adopt a sustainable hazards mitigation perspective... [and] extension can enhance community resiliency and significantly reduce adverse effects” (Boteler 2007). Evidence of this emerged in the aftermath of three recent hurricanes.

In about a year’s time, the state of New York experienced back-to-back tropical storm related disasters. Hurricanes Irene and Lee devastated portions of upstate New York in the early autumn of 2011 and Hurricane Sandy

caused historic damage to New York City and Long Island in the autumn of 2012. During this period, the New York State Extension Disaster Education Network (NY EDEN) was experiencing resurgence due to strategic decisions among Cornell Cooperative Extension (CCE) administrators and a change of focus, emphasis, and leadership in the NY EDEN program. It was an ideal time for NY EDEN to explore and attempt to highlight how Cooperative Extension could catalyze ways that community stewardship can help revitalize neighborhoods and restore nature, and to best prepare for, respond to, and recover from disturbances.

Hurricanes Irene and Tropical Storm Lee

In 2011, during Irene and Lee, wind and surge effects along the Atlantic coast, while significant, were generally less than expected. The high-population centers were spared. Inland rain, however, was responsible for the greatest destruction and loss of life—with the most devastating effects being felt in New Jersey, Vermont, and New York. The principal impacts of Hurricane Irene were felt miles from the coast, where torrential rains fell on already saturated soils and in the hills.

In New York, disaster declarations were in place for 28 counties. CCE, having a presence in each of the disaster declared counties, immediately set out to understand what assistance they could provide. Consistent with the mission of CCE, it was quickly understood that NY EDEN would be critically useful as a purveyor of evidence-based information for recovery. Leveraging its relationship with the State's land grant university and USDA, NY EDEN developed and disseminated a host of fact sheets addressing topics such as dealing with flooded soils and vegetables, assisting woodland owners and maple producers, and riparian/watershed response and recovery measures. These, and many, many more resources were collated on a "Hurricane Irene and Tropical Storm Irene" Website where they were made available as printable PDFs (see <http://eden.cce.cornell.edu/disasters/Pages/Irene-Lee.aspx>). As communities began to take stock of their situations, these educational resources, and the cooperative extension offices involved in disseminating them, became critical nodes of community organizing and stewardship for recovery efforts in the hard hit Adirondack and Catskill communities.

Hurricane Sandy

Unlike Hurricane Irene and Tropical Storm Lee, Hurricane Sandy unleashed an enormous amount of damage upon New York City and Long Island. Seventy-two deaths in the Northeast were directly attributed to the storm, and it was

the second costliest storm in U.S. history at more than \$50 billion (Blake et al. 2013). In late October of 2012, CCE NY EDEN initiated its standard operating procedures for major disasters several days before Hurricane Sandy made landfall in the New York City area on October 29, 2012. Outreach to state-wide extension associations and staff included phone calls and emails to association executive directors and a message to all system staff providing basic instructions on safety and preparedness. Situation reports were filed by most county associations within 2 days. Direct linkages to the National Weather Service, the New York State (NYS) Emergency Operations Center via NYS Department of Agriculture and Markets, and other state government agencies allowed for close monitoring of the hurricane's path and intensity. During this lead-up period, anticipated communications and disaster education resource needs were identified and compiled for rapid dissemination via Facebook, Twitter, email list serves, the CCE and NY EDEN Websites, and the Cornell University press office.

The emerging picture that upstate New York's agricultural sector had been largely spared was made possible early on by CCE's extensive connections in every corner of the State. The focus then quickly shifted to Long Island, the Lower Hudson, and New York City, and resources were tailored for more urban environments. A special Hurricane Sandy resource page was rapidly developed and posted on the NY EDEN Website. With the help of Cornell faculty, new resources were gathered and packaged and others were verified. Social media figured prominently in the response. A new NY EDEN Facebook page was created and achieved 319 page views on Oct 29th, which were "liked," shared, or otherwise viewed by 1,921 individuals (Facebook metric "viral"). NY EDEN also utilized Twitter and sent out 288 "tweets," with many followers receiving "tweets" and "re-tweeting."

The CCE NY EDEN listserv was used to send out more than 50 emails containing important updates, talking points, and fact sheets, as well as instructions for associations on how to rapidly add Hurricane Sandy content to their Websites and links back to NY EDEN for their stakeholders.

News media outputs by NY EDEN staff both before and after the hurricane included NBC News (blog), USA Today, Huffington Post, Morning Ag Clips, NY Farm Bureau, Food & Farm Show/Foodstuffs Web radio, multiple local radio and newspapers outlets, The Cornell Chronicle, and others.

NY EDEN transitioned into a period of regular contact with CCE associations in counties most impacted by Hurricane Sandy. Educational and informational resource needs of constituents of those counties were assessed, and current recovery issues and future needs were discussed and coordinated with neighboring states and the national EDEN organization.

In surge-impacted areas, public community spaces such as community

gardens played a role in supporting the recovery of residents and the neighboring communities after Hurricane Sandy (Chan et al. 2015). In the end, much of the NY CCE EDEN response revolved around the issues faced by those involved in community greening, community gardening, and stewardship of urban forests. Fact sheets generated by Cornell faculty and disseminated by extension educators via NY CCE EDEN included topics such as crop damage assessment (garden scale and large scale), how to deal with flooded vegetables, reclaiming flooded soils, and tree response/chainsaw safety.

At the conclusion of response activities, as transition into recovery got underway, CCE EDEN was recognized by the New York State Commissioner of Agriculture and by staff at the New York State Emergency Operations Center. CCE EDEN is now integrated into the disaster response capability of the state's multi-agency disaster response framework, serving as a liaison to the State's land grant university and the expertise therein. CCE EDEN is most often and most heavily involved when agriculture, wildlife, forestry, or other natural resources interests are under threat.

It should be noted that the above procedures are not unique to New York or Cornell Cooperative Extension. In fact, there are similar sorts of arrangements in other state cooperative extension systems, and where such systems do not exist, our hope and intent is that these systems are "off-the-shelf" ready to be adapted and replicated as appropriate in other states and territories.

Conclusions

Given that (1) this book has as its genesis the work of the urban forestry professionals of the USDA's Forest Service, and (2) the National Extension Disaster Education Network is overseen in part by staff at a sister agency within the USDA, the National Institute for Food and Agriculture (NIFA), and (3) both the USDA Forest Service and USDA NIFA have a long history of collaboration with land grant universities, it seems natural that there be existing collaboration upon which to build. But unfortunately, this is not yet the case; an opportunity exists to build the capacity of all partners via this book.

As noted in an earlier chapter, at the time when the Forest Service was established, 80 percent of U.S. residents lived in rural areas—areas potentially affected by degraded landscapes. Now, 83 percent of the U.S. population lives in urban areas, where conservation and restoration is also greatly needed. As stated in the Background chapter (Hines et al. 2019), "The mission statement of the Forest Service remains unchanged, but as demographic shifts occur, the Forest Service understands that 'caring for the land and serving people' must also occur where the majority of those people live. Just as the Forest Service restored the degraded landscapes and watersheds of a century ago,

so it also seeks to enable restoration and stewardship in urban areas.” As such, this volume makes the case that natural resource stewardship takes on special meaning in the urban environment, made more urgent by the implications of climate change.

Thus, this chapter points to an existing, yet underdeveloped and under-leveraged network that could potentially further the efforts of agencies such as the USDA Forest Service and the communities they support when natural disasters and other hazards threaten landscapes, especially those found and/or cultivated in urban contexts. A partnership among the state and national EDENs with the Forest Service, especially their efforts in urban contexts threatened by climate change, could lead to targeted educational products and programs, as well as a nimble and responsive communication system with which to disseminate them. Hopefully, one outcome among many from the publication of this volume is a formalized relationship between these entities with the USDA that furthers efforts to document the role that green design and community engagement and empowerment can play in helping communities prepare for, respond to, and recover from hazards and other disturbances.

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Disaster Recovery Steps to Maintain and Improve Urban Forest Resilience

Dudley R. Hartel
USDA Forest Service
Baton Rouge, Louisiana

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Considerable research demonstrates the broad range of ecosystem services (i.e., benefits) attributed to urban trees either individually or in groups as part of parks, natural areas, riparian buffers, in green stormwater infrastructure, along streets, and in other urban public landscapes. Environmental services contributed by urban trees include stormwater management, carbon sequestration, and impacts on human health that include air quality and lower urban temperatures (urban heat island mitigation).

Communities that adopt arboricultural standards and practices and implement comprehensive urban forest management can provide the long-term outlook needed to manage and maintain these environmental services. One component of this management is disaster response and recovery and this chapter will look specifically at a disaster response/recovery protocol that helps communities maintain viable and valuable urban tree canopy following destructive storm events.

The objective of this chapter is to introduce disaster planning, preparedness, response, and recovery utilizing professional arborists and urban foresters as a component of a comprehensively managed urban forest (i.e., community stewardship). It is intended to provide community groups, non-governmental organizations, civic leaders, and state and federal land and program managers with background on the Urban Forest Strike Team (UFST) disaster response and recovery program.

Community Preparedness, Vulnerability, and Typical Tree Damage

Many communities have implemented tree management and monitoring programs, and adopted ordinances promoting urban tree protection and management. Important components of management programs include urban forest management plans that identify professional standards, adoption of best practices, detailed tree planting plans, and comprehensive urban forest risk management plans and practices. Monitoring efforts might include public tree inventories, public and private tree inventory sampling like i-Tree Eco or Urban Forest Inventory and Analysis (UFIA), and community-wide urban tree canopy (UTC) mapping and analysis. Urban forest management programs that promote healthy, diverse tree populations are integral to disaster preparedness.

Regardless of the level of urban forest management in a community, trees remain vulnerable to damage and loss from natural disasters that include high winds and ice storms. The resulting storm damage increases the immediate risk to residents and visitors in the community and in the long-term adversely affects production of environmental services. The purpose of urban forest management as a disaster planning tool is to improve overall

urban forest health, identify tree defects, assess risk, and prioritize mitigation that reduces storm impacts on the trees in the urban forest.

Extreme wind and ice events result in tree damage that is immediate and that requires mitigation to reduce risk to the public and begin the recovery of affected communities. It has been estimated that 80 percent of tree damage during natural disasters is associated with a preexisting defect (e.g., trunk decay and/or cavity, codominant stems, limb structure, damaged roots). Consequently, wind and ice events result in broken branches and limbs, split trunks, and toppled trees. UFST assessments for these types of disasters and damage can be made quickly and reliably and can be accomplished within the current Federal Emergency Management Agency (FEMA) timeline for public assistance.

While damage by flooding may include scoured trunks and toppled trees (particularly when accompanied by high winds), most damage will not become apparent for months after the flood event when trees begin to die or fail to leaf out from extended saturated soils. UFST assessments for these disasters are most effective in later stages of recovery and can still provide risk-based assessment of damaged and failing trees regardless of the status of FEMA public assistance.

Communities that maintain healthy trees, reduce tree defects and their associated risk with appropriate mitigation (i.e., pruning or removal), and have a protocol in place to respond and recover from disasters or extreme storm events will reduce short-term risk and be able to maintain a higher level of environmental services over the long-term by keeping damaged but viable trees. Communities are encouraged to include the urban tree resource and its professional management in local disaster plans.

Urban Forest Strike Teams, Urban Tree Canopy, and Post-Disaster Objectives

Urban forest strike teams (UFSTs) are a disaster response and recovery project that is supported by the Southern Group of State Foresters and the Northeast-Midwest State Foresters Alliance and their respective state urban and community forestry (UCF) programs. The urban forestry program of the USDA Forest Service provides technical assistance and organizational support for UFSTs from Athens, GA, and Durham, NH (Figure 1). UFSTs are composed of state forestry agency certified arborists and urban foresters, municipal arborists, extension foresters, and tree wardens trained to make urban tree risk and damage assessments following natural disasters (i.e., wind events, ice storms). UFSTs have not been implemented in the western United States primarily because typical storm events and natural disasters (i.e., fire, floods, landslides) more often result in tree loss rather than damage. However, the

Urban Forest Strike Team

As part of the Hurricane Gustav disaster response, experienced professional arborists from throughout the South are assessing storm-damaged trees along the public right-of-way to facilitate your local recovery.

They are working in cooperation with the Louisiana Department of Agriculture & Forestry, the City of Baton Rouge, BREC, and USDA Forest Service.

Figure 1: Urban forest strike teams vehicle signage.

UFST rapid assessment protocol could possibly be adopted for management and response to other disturbances of urban trees. The primary objectives of UFSTs include:

- Assistance to communities that do not have the professional capacity to manage the trees affected by the disaster
- Immediate and short-term risk management
- Retention of viable tree canopy and associated environmental services
- Compliance with FEMA criteria for reimbursement under public assistance

UFSTs provide rapid tree risk assessments to identify the risk that storm-damaged trees pose to people and property on publicly managed land (e.g., parks, streets and other rights-of-way, and around public buildings), support FEMA public assistance and are the basis for professional recommendations for short-term risk mitigation.

UFSTs provide professional response and recovery services to communities following ice storms, hurricanes, and other natural disasters. Resource deployment is commensurate with the scale and intensity of the event and therefore may occur at the local, state, or regional level.

Deployment for risk assessment and debris classification typically occurs in the late stages of disaster response or early stages of disaster recovery before debris removal operations have been completed. In later stages of disaster recovery, UFSTs may assist by identifying appropriate planting sites and species to restore environmental services destroyed by the disaster.



Figure 2: UFST crew discusses tree damage along city street.

Photo by Dudley Hartel, USDA Forest Service.

UFST deployment is merely one component of a comprehensive urban forest management strategy that ideally includes urban forest risk management and inclusion of urban trees and professional management of those trees in local disaster plans.

Urban Forest Strike Team Overview

The UFST initiative involves recruiting, training, and deploying professional urban foresters and arborists (required to have basic incident command system [ICS] training, and arboricultural certification or experience) to assess tree damage using FEMA criteria and tree risk management standards. Strike team members attend a multi-day training workshop and obtain continuing education via webinar, e-learning, and/or state sponsored disaster training scenarios (i.e., disaster exercises).

As UFST personnel (i.e., task specialists) gain disaster experience they are eligible for advanced training and promotion to team leader status. A typical deployed “team” includes two team leaders and 10 task specialists (i.e., five crews) with geographic information system (GIS) and communications support.

UFSTs evaluate individual trees, street by street, along trails, and in parks within a defined disaster area to assess storm damaged trees on public property and rights-of-ways to identify risk and recommend removal or pruning mitigation, and qualification for FEMA debris reimbursement under their public assistance program. Maps and data sheets are provided to the community to help them document debris for FEMA, plan the work needed, effectively contract for debris cleanup, document the cost of the damage,

schedule additional post-disaster risk assessment, and prepare for additional restoration and mitigation pruning during long-term recovery (Figure 2).

The teams may also provide technical assistance with debris estimation during the initial response phase of a disaster, and support for longer term risk assessment and tree planting recovery efforts.

Protocols and services provided by UFSTs follow national disaster policy, FEMA guidelines, and current arboricultural standards:

- Tree risk assessment (Tree Care Industry Association 2011)
- Best management practices (Smiley et al. 2012)
- FEMA public assistance program and policy guide (FEMA, various dates)

The Deployment Framework for Urban Forest Strike Teams

Municipalities typically request UFST assistance with disaster response and/or recovery through their local (municipality or county) emergency manager, state UCF coordinator, or state forester. Assisted by the state UCF coordinator, the municipalities are responsible for identifying and prioritizing areas for debris estimation and public property tree risk assessments (Figure 3). The state UCF coordinator is responsible for coordinating disaster recovery resources throughout the state when natural disasters are geographically extensive (i.e., significant impact in multiple communities). This community or state-based (i.e., bottom up) approach to disaster response is in keeping with FEMA's overall objectives for disaster planning at the local and state level.

A good fit for the process and UFST response might be a community situation where:

1. There is **significant damage** to public trees in a community.
2. The damage is such that the **community finds it challenging** to decide which storm-damaged trees meet FEMA debris standards or represent a significant risk to the public.
3. The footprint of the **damage area is concise** enough that a team could work efficiently.
4. The **community may not have staff with technical tree expertise**,

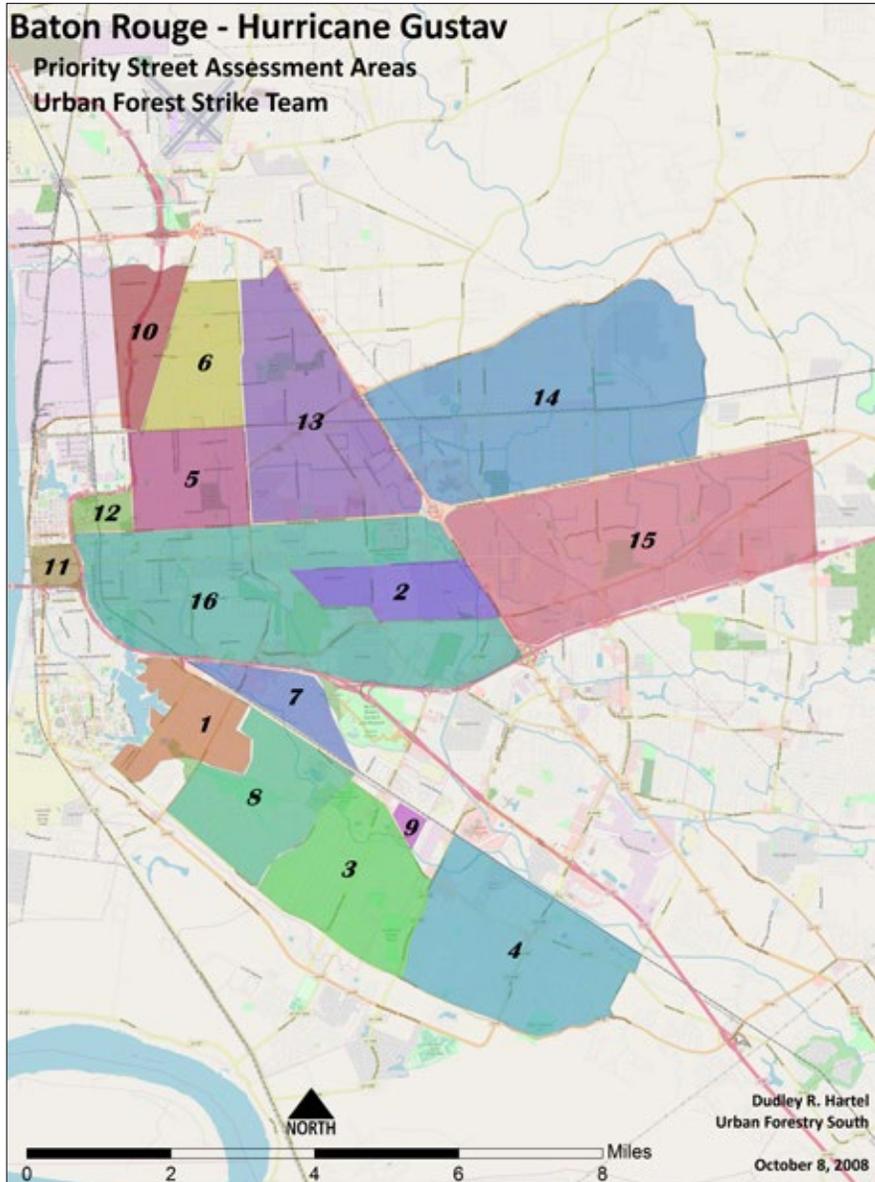


Figure 3: Baton Rouge (LA) storm damage prioritization map for UFST deployment.

Photo by Dudley Hartel, USDA Forest Service.

or their staff may not have the time to do tree assessments because of the scale of the disaster or other disaster-related assignments.

5. The **community has the capacity** to use and follow up on recommendations.

a. Information compiled by the teams can be used immediately for FEMA documentation and in contracting for debris removal.

b. Information can be used during long-term recovery for follow-up mitigation, restoration pruning, and tree health and risk assessments.

UFST have successfully worked with communities, State emergency management personnel, FEMA debris managers, and disaster management consultants to meet requirements of the response and recovery process during the past 10 years of operation.

UFST currently uses ArcGIS Online (AGOL; Esri, Redlands, CA) with real-time reporting (assuming cell coverage is available) which enables the city arborist, local emergency management, and UFST team leaders to monitor progress and storm damaged areas worked. Most state and local emergency management agencies have adopted ArcGIS Online as their geographic information system for managing disasters.

Urban Forest Strike Team Activities

UFST has responded to more than 21 disasters in 14 states in the eastern United States since its inception. Local communities, FEMA regional debris managers, and disaster management consultants have directly benefited from UFST assessments, data collection, and risk/damage reports developed for their use within FEMA public assistance. Deployments have ranged from multiple teams to single UFST crews. UFST currently has more than 250 task specialists and 30 team leaders trained (eastern U.S.).

UFST training workshops have been held every year across the eastern United States. This training also includes disaster exercises to maintain UFST readiness, improve the assessment protocol, and further develop the data collection and reporting system.

State forestry agencies in the southeastern United States have developed workable interstate deployment with the publication of mission ready packages. When regional support is needed, states and communities are

being encouraged to use the national mutual aid agreement and partnership Emergency Management Assistance Compact (EMAC) to support interstate deployments with the necessary legal and financial support to UFST resources. EMAC's strength lies in the relationships among federal organizations, states, counties, territories, and regions; and the ability to move just about any resource, including UFST, from one state to another.

The UFST program and protocols have undergone improvement throughout the 10-year history but continue to use the incident command system (ICS) model including prerequisites and training standards, and an operational mode at the state level (initiated by the state UCF coordinator and state forester). Also during that time, protocols and equipment have been continuously updated based on after action reviews, availability of new technology, and modified professional standards. UFST uses a risk-based approach based on the current arboricultural standards and best management practices (BMP). UFST was initially developed to provide resources at a regional level but the program has evolved to place emphasis at the local, county, and state levels which can be less expensive, more responsive, adaptable to a wider range of storms and damage, and to a wide range of community needs.

Urban Forest Strike Teams Support Communities

UFST provides an unbiased, third-party assessment of damage to trees from natural disasters with the primary objective of retaining as much viable and productive tree canopy as possible within the criteria used by FEMA's public assistance program and compatible with community goals, objectives, and management strategies. UFST can take community species (e.g., live oak, bald cypress, magnolia) and spatial priorities (e.g. maintain trees in specified neighborhoods or parks) into consideration to override allowable FEMA assistance. The results can include the following data and reports:

- FEMA tree removal list—can be prioritized by risk rating
- FEMA tree limb removal list—can be prioritized by risk rating
- FEMA stump list
- Mitigation that identifies local community priorities
 - Trees with residual defect—for post-recovery management.During later stages of recovery and outside of the FEMA reimbursement process, UFST may assist with evaluations to support additional stewardship activities:

- Follow-up tree risk assessments (Level 1)—12-18 months following the event
- Tree species selection based on prior disaster response (i.e., data analysis)
- Planting site evaluations to support long-term viability and productivity

Conclusions—What We've Learned

UFSTs can deploy quickly during late response and early recovery following natural disasters to help communities manage debris and maintain important, viable trees in their urban forest. The UFST role is to supplement and complement local resources that may be limited depending on the scale and intensity of the storm event. UFSTs are professional foresters and arborists grounded in incident management, tree risk assessment, and FEMA guidelines who operate independently from the community and the debris management process which makes for acceptance across the disaster management spectrum (i.e., community, city managers, disaster consultants, debris contractors, FEMA). UFSTs are an important component of an urban forest and disaster management programs.

Regardless of the level of urban forest management or the degree of disaster preparedness, urban trees will be damaged during storm events. Prestorm mitigation (i.e., pruning and removing trees with defect that represent unacceptable risk) can take place within the community's urban forestry or their disaster planning and preparedness programs. Addressing and identifying this mitigation in both, as collaborative or supporting plans, may help a community see the connection between their urban forest management and their preparation for disasters.

Regardless of the source of the mitigation, we know that a defective tree removed or a defective limb pruned cannot fail during any successive storm event. Anecdotally and with less certainty, we also observe that healthy, structurally sound trees of appropriate species growing on suitable sites will typically withstand greater storm impacts with lower levels of tree damage. These healthy, structurally sound trees of appropriate species growing on suitable sites are often the result of adoption and use of arboricultural standards and best practices, at some minimal level, that are used throughout the tree's life-cycle within a directed urban forest management program.

Case Study

Baton Rouge, Louisiana¹

Hurricane Gustav, a Category 2 major hurricane, made landfall at Cocodrie, LA, with wind speeds at 105 miles per hour on September 1, 2008. While the hurricane quickly weakened to a tropical storm as it crossed southern and western Louisiana (wind speeds at 60 mph), it caused major wind damage to trees in Baton Rouge. Heavy rains preceded the hurricane and the winds caused significant wind-thrown trees in addition to more common broken limbs and branches from direct wind impact.

This case study illustrates the collaborative nature of the state forestry agencies, municipalities, and USDA Forest Service in mobilizing UFST commensurate with the scale of the disaster and the needs of the community. Specifically it illustrates the use of an UFST and the deployment of successive teams to provide tree risk assessment and FEMA public assistance support.

Request for Assistance

The Baton Rouge city arborist, Steve Shurtz, describing this as “worst storm to have hit Baton Rouge in 100 years” made initial contact with the Louisiana Department of Agriculture and Forestry (Mahlon Doucet, UCF Coordinator and Wade Dubea, State Forester) to make a formal request for assistance.

Leslie Moorman (North Carolina), Paul Revell (Virginia), and Barbara White (Virginia)

1. Excerpted from USFT Hurricane Gustav daily blog. See Literature Cited.

began preparations for the deployment of UFST (two teams) to assist with street tree risk assessment in Baton Rouge (Louisiana) and other communities in that area that were hit by Hurricane Gustav. In Louisiana, Mahlon Doucet and Tom Campbell (UCF Partnership Coordinator) contacted other nearby communities that were active with the state UCF program to determine if additional UFST support was needed.

The plan called for the first team to arrive during the week of September 21; the second team was to arrive on September 30 and work through October 11th. Urban Forestry South (USDA Forest Service, Athens, GA) provided technical assistance.

UFST Deployment

The first team (four crews) deployed on September 22 and included task specialists from Arkansas, Georgia, North Carolina, and Virginia. Paul Revell, Virginia Department of Forestry (VDOF) was team leader and assisted by Urban Forestry South. The Louisiana Department of Agriculture and Forestry (LDAF) provided an incident response office at their offices in central Baton Rouge, and GIS and communications specialists to assist UFST during the deployment.

A neighborhood near the incident office was selected for a quick refresher training for the crews, equipment checks, review of disaster specific safety issues, and community context

discussion (i.e., keep “all” live oaks), led by the city arborist, Steve Shurtz. During that first day, UFST also made contact with Baton Rouge Recreation (BREC) and determined that they also needed immediate assistance in major city parks.

The second team (arriving October 1) included five crews from Georgia, North Carolina, and Virginia, and were led by David Stone (VDOF) and Doug White (NC Forest Service). Urban Forestry South continued to provide technical assistance.

Operating under ICS protocol, Paul Revell and the UFST “first team” crews briefed the incoming team leaders and crews on tree damage, crew safety, and community issues.

Working in the Community

The UFST team leader and LDAF worked with the city arborist on reconnaissance of the known storm damaged area to develop a prioritization map (See Figure 3). BREC parks were also included in this area prioritization process. The prioritization was reassessed when the second team arrived in Baton Rouge.

UFST crews carried identification and signage (See Figure 1) that introduced them to the community as they worked along city streets and in parks. LDAF communications handled news media contacts and arranged for UFST interviews as needed with local print and television outlets.

Support to Community and Debris Contractors

After review, raw data collected during the UFST deployment was turned over to the city and BREC daily and detailed street maps were produced about every 5 days to assist debris contractors with pruning and tree removal mitigation. A final tabulation of data was prepared for the city to support documentation for FEMA public assistance.

Final Statistics

Street miles: 500

Street trees assessed: 5,498

Park trees: 1,882

Stumps: 208

Recommendations to Communities

Local communities working with their state forestry agency's urban and community forestry (UCF) program can participate in the UFST initiative at various levels. At the highest level, communities can develop in-house capacity in the UFST protocol by participating in training that is conducted annually throughout the eastern United States. This approach provides an increased understanding of disaster deployment and the assessment protocol to support mitigation, and can be further supported by local adoption of BMPs for urban tree risk management which may include the tree risk assessment qualification available through the International Society of Arboriculture. At the lowest level, communities can develop a closer working relationship with the state UCF Coordinator and participate in programs to expand local urban forest management to include an understanding of the UFST disaster deployment objectives and mechanism.

As a member of a local community group, nongovernmental organizations, or in your role as a civic leader, what steps might be taken to incorporate the UFST protocol into local planning, response, and recovery for disasters?

Consider:

- Becoming more knowledgeable of your state's urban and community forestry program
 - The state forestry agency's program and staff
 - Your regional or statewide urban forest council

- Becoming more knowledgeable of and involved with your community's urban forestry program
 - Staff
 - Plans, standards, and practices
 - Urban tree/forest risk management
 - Funding
 - Local tree board
 - Other partnerships

- Request your state forestry agency participation in UFST
 - As trained UFST members
 - To recruit municipal and consulting arborists into the program

- When talking to elected officials, explain the value of urban forests and disaster planning

- Participating in local disaster planning

- Present professional urban forestry within context of natural disasters
- Participating in local comprehensive planning efforts
 - For urban forest management
 - For disaster planning that includes urban forestry and response/recovery activities of UFST

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Coordinated Disaster Recovery: The National Disaster Recovery Framework in Action

Jonathan Halfon and Shannon McLachlan
Federal Emergency Management Agency
New York, New York

Halfon, Jonathan; McLachlan, Shannon. 2019. Coordinated disaster recovery: The National Disaster Recovery Framework in action. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 234-241. <https://doi.org/10.2737/NRS-GTR-P-185-paper16>.

Building Resilient Urban Sectors

Urban areas are complex, multilayered systems that must carefully balance social and economic interests with built infrastructure, resource flows (energy, water, food, etc.), nonprofit and industry networks, and various levels of government. Each system is part of an overarching sector, which are interconnected and interdependent. Some may be in direct competition due to limited resources (municipal agency budgets), others may have competing goals (property developers versus preservationists) (Meerow 2016). It is the push and pull between diverse sectors that make cities incubators of innovation and progress during “blue sky” periods. This can also be the source of potentially cascading problems following a catastrophic event like a hurricane or other natural disaster. When urban centers achieve dynamic equilibrium between competing sectors, they thrive (Mehmood 2015). However, this natural instability makes returning to a previous state of equilibrium post-disaster unlikely, if not impossible, because each sector will need to redefine their priorities in light of the disruption (Meerow 2016).

Resilience, therefore, cannot be understood simply as returning to the state of predisaster (Mehmood 2015). Resilience is the ability for all urban sectors to respond to and rapidly recover from a disturbance, and to adapt all their systems to better handle future disturbances. A truly disaster-resilient community, broadly speaking, is not simply looking to rebuild homes, roads, and schools. It is looking to find a new dynamic equilibrium between all of its sectors, even those not directly impacted by the event. The relationship between public policy and these unstable interests is at the heart of recovery and resilience planning. Each sector, not just emergency management, has a hand in disaster recovery.

The National Disaster Recovery Framework

The Federal Emergency Management Agency (FEMA) espouses an “all-hazards” strategy, which establishes the four phases of emergency management—preparedness, mitigation, response, and recovery—and is based on the assumption that all nationally significant disasters, be they natural or human-made, require similar response and recovery processes. Each demands coordination between many federal, state, and local agencies with varying specialties, as well as clear and consistent public messaging. Because of this, FEMA has not focused entirely on mitigating specific threats, like hurricanes, but rather on developing tools, protocols, and agreements that can be called upon across the diverse array of threats that communities face (FEMA 2010). Two of the most notable tools are the National Incident Management System (NIMS) and Incident Command Structure (ICS). Both mechanisms provide an

adaptable framework for how the federal government and first responders interface during large and small disasters. NIMS and ICS are tools that help manage a disaster in the short term; they can be employed to help stabilize an incident in the immediate days and weeks after it occurs. It is only within the last decade that a framework was developed to address what comes after this response-and-stabilization phase: long-term recovery.

In 2011, former President Barack Obama released Presidential Policy Directive-8, which called for the development of five new interconnected national planning frameworks. The frameworks—prevention, protection (preparedness), mitigation, response, and recovery—line up closely with the traditional disaster phases employed in emergency management. The recovery framework brought a new set of tools to address post-disaster needs that go beyond “safeguarding life and property” in the short term, the traditional response goals (Box 1).

Box 1. National Disaster Recovery Framework Recovery Support Functions and Lead Agencies

Recovery Support Function (RSF)

Community Planning and Capacity Building
Economic
Health and Social Services
Housing
Infrastructure Systems
Natural and Cultural Resources

Lead Agency

Federal Emergency Management Agency
Dept. of Commerce
Dept. of Health and Human Services
Dept. of Housing and Urban Development
U.S. Army Corps of Engineers
Dept. of the Interior

Fema 2011

To institute a flexible structure that could support many different scenarios, the National Disaster Recovery Framework (NDRF) established six recovery support functions (RSFs) organized around familiar urban policy sectors:

1. Housing
2. Economic
3. Infrastructure Systems
4. Health and social services
5. Natural and cultural resources
6. Community planning and capacity building.

Each RSF is led by a federal agency that has both the resources and expertise to advise on recovery and resilience in their designated sector. Each RSF is also active at all times, not just in the immediate aftermath of a disaster. This is an acknowledgment that resilience is not a finite, teleological state, but rather a capacity that can be increased over time through the accumulation of

small actions. It is also an acknowledgement that in order for a community to become truly resilient, it must plan for disasters before they occur.

The NDRF recommends a reorientation of the federal approach to disaster recovery. While professional disaster recovery workers have long known it to be true, the NDRF makes explicit that disaster recovery is always local. The success and speed of recovery depends on how well local organizations and communities can pull together, working in unity for a shared set of goals.

Practically, the NDRF and the national preparedness goal call on communities to develop predisaster recovery plans so they are better prepared to meet the community's needs after a disruption. After a disaster—when there is pressure to act quickly, and many interdependent activities and decisions to be managed—confusion and conflicts can be greatly reduced if a community has already thought about, and outlined, their approach to rebuilding. A good predisaster recovery plan must work in tandem with a community's comprehensive, mitigation, and emergency management plans, outlining priorities, roles, and processes so opportunities are not lost, and decisions are consistent with a community's overall vision for the future.

Hurricane Sandy National Disaster Recovery Support

Making landfall close to the New York City metropolitan area, Hurricane Sandy exposed regional vulnerabilities associated with inadequate shoreline protection, a shortage of affordable housing for displaced persons, and poor protection of vital energy and transportation infrastructure. Nearly all sectors and systems were impacted in both large and small ways.

The NDRF was published only a few months before Sandy hit, allowing federal agencies to put the new framework into action immediately. The work of the Presidential Hurricane Sandy Rebuilding Taskforce, chaired by Shaun Donovan, then Secretary of the Department of Housing and Urban Development (HUD), supported the NDRF. The taskforce produced a recovery strategy that was the engine for a great deal of Sandy recovery work. In the field, the RSFs authorized by the NDRF developed a Recovery Support Strategy to consolidate and unify the activities of many supporting organizations and professionals. Both the recovery support strategy and the taskforce rebuilding strategy offer concrete examples of a change from a top-down, vertical organization to a more horizontal structure based on partnering with local communities. This structure empowers the whole community to take ownership in all aspects of recovery.

Communities recovering from disasters often turn to existing local entities or community-based organizations as rallying points before more

traditional forms of government assistance can be dispatched. In the aftermath of Sandy, community groups such as Occupy Sandy and LES Ready sprung up organically, and more established groups such as the Red Hook Initiative pivoted their missions to provide aid.

The NDRF structure has the flexibility to commit resources to support these community initiatives. The arts and culture community have substantial constituencies that can be engaged to assist communities before, during, and after a disaster to support recovery and rebuilding, both of the physical infrastructure and to assist in restoring the cultural bonds that might have been broken. Recognizing this, the NCR RSF and the New York City Department of Cultural Affairs convened a small group of stakeholders in the fall of 2013, nearly a year after Sandy made landfall, to explore how “art responders” could be activated to support long-term recovery and resilience. Over the course of 11 working sessions, 14 prominent New York City-based organizations developed CultureAID. The organizations come together and reorient their regular programming to support their constituencies with post-disaster needs and to help them avoid redundancy in the resources (financial and nonfinancial) they are committing to the recovery effort. CultureAID also offers procedures for assessing post-disaster impacts to arts and cultural organization and provides post-disaster communication tools.

Advanced planning and preparedness is the best way to position a community to recover more quickly from a disaster. Accordingly, one of few explicit recommendations made in the NDRF is the call for communities to develop a predisaster recovery plan (Box 2).

Predisaster recovery planning identifies practices and policies that can expedite recovery after a disaster. By engaging in a robust predisaster recovery planning process, communities are able to take advantage of post-disaster rebuilding funds, and to establish goals that will reduce vulnerability and lead to greater sustainability. Establishing procedures, decision-making structures, and recovery priorities and goals, a community can reduce confusion and accelerate their recovery.

While a community as a whole will be in better shape if they develop such a plan, individual groups or organizations can also prepare themselves. This can be as simple as an organization envisioning how its mission or research could be applied in a post-disaster setting. For example, a workforce development organization could add training on post-disaster construction, a skill that is always in high demand after a disaster. An environmental stewardship group could conduct surveys on what natural resources are most valued by their community, which they could use to lobby for better protections, or to ensure that priority resources are not sacrificed in post-disaster redevelopment.

Box 2. Predisaster Recovery Planning, Key Activities*

1. Define recovery planning team and scope of planning activities
2. Develop and implement a stakeholder and partner engagement strategy
3. Determine the community's risks, impacts, and consequences
4. Assess community's capacity and identify capability targets
5. Determine leadership positions and define operations necessary for post-disaster recovery planning and management efforts
6. Establish processes for post-disaster decision making and policy setting
7. Write the local predisaster recovery plan
8. Approve the predisaster recovery plan and associated regulations
9. Identify and undertake recovery readiness activities

*from FEMA 2017

Communities can use a disaster as an opportunity to influence the design of recovery projects to support predisaster community objectives. After most disasters, communities will rebuild impacted infrastructure. After a large disaster, there may be additional funding available to implement more ambitious plans.

The NDRF also encourages a local recovery planning process. Ideally this would work as a compliment to the predisaster recovery plan and consider the unique impacts of the disaster event. Following Sandy, New York State invested heavily in this idea and funded over 100 local recovery plans using a HUD Community Development Block Grant disaster recovery allocation. The New York Rising Community Reconstruction Zone initiative was supported by the community planning/capacity building RSF, which coordinated data and guidance to New York State and advised local jurisdictions throughout the planning process. In an effort to better connect state and local recovery priorities to future funding and resources at the federal level, each recovery plan took the NDRF sector-based approach to organizing projects. This allowed for a project database to be developed and shared with the federal coordinating agencies, easily communicating local recovery project priorities to federal and state counterparts.

Once that process was underway, FEMA was also able to provide additional support to impacted communities, namely coastal communities of Long Island. These activities demonstrate how a temporary recovery resource (such as FEMA's community planning/capacity building RSF) can work with, or leverage, existing structures to deliver support. During major disasters FEMA has the ability to enter into mission assignments and interagency agreements with other federal agencies to fund long-term recovery efforts out of the Disaster Relief Fund. This gives FEMA the ability to work with other federal agencies to

modify their existing grant programs and technical assistance to provide support tailored specifically to impacted communities. The CPCB RSF was able to use this mechanism in a variety of ways after Sandy including working with the Environmental Protection Agency to fund direct technical assistance and develop trainings and tools around coastal zoning and land use concerns that communities could put to use in their recovery efforts.

By establishing this sector-based approach to recovery and providing tools for identifying and supporting long-term recovery projects, the National Disaster Recovery Framework is encouraging meaningful interdisciplinary coordination between urban sectors. This localized approach to federal recovery bolstered a host of community projects following Sandy and continues to evolve with each new disaster, providing a valuable new model for putting local communities first.

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Leveraging Partnerships for Long-Term Recovery and Smart Growth Resiliency

Leslie Tomic¹ and Rabi Kieber²

1. Federal Emergency Management Agency, Washington, D.C.

2. Environmental Protection Agency, New York, New York

Tomic, Leslie; Kieber, Rabi. 2019. Leveraging partnerships for long-term recovery and smart growth resiliency. In: Campbell, Lindsay K.; Svendsen, Erika; Sonti, Nancy Falxa; Hines, Sarah J.; Maddox, David, eds. Green readiness, response, and recovery: A collaborative synthesis. Gen. Tech. Rep. NRS-P-185. Newtown Square, PA: U.S. Department of Agriculture, Forest Service: 242-253. <https://doi.org/10.2737/NRS-GTR-P-185-paper17>.

On October 29, 2012, Hurricane Sandy made landfall and caused extraordinary devastation across the northeastern United States (Figure 1). It was the second costliest disaster in the United States at the time and damaged some of the most densely populated areas of the country. The impacted area spanned county, regional, and state boundaries, encompassed entities that did not normally collaborate, and brought issues to light that were typically addressed independently by a variety of government authorities.

With the complexity of the disaster and extent of damage, individuals that were involved in the response and recovery efforts inherently knew that long-term recovery would extend out many years, even decades, into the future and would require an immense amount of coordination and resources. The Federal Emergency Management Agency's (FEMA) New York Joint Field Office (JFO), located in Queens, NY, was the headquarters for disaster coordination for New York during the initial phase of recovery. With the influx of partners and resources, the JFO became a hub of opportunity and fostered the creation of organic partnerships around potential recovery projects. Although it was a very chaotic time, pressure from both the public and the administration to achieve results enabled federal staff at the JFO to cut through red tape and expedite projects that normally took months, and even years, to get off the ground.

On Long Island, there were many challenges associated with the cross-jurisdictional impacts from the hurricane such as flooding, impaired water quality, and a devastated transportation system. These challenges, however, did not keep Long Island communities from immediately starting on the long road to recovery. They defined their new post-disaster "normal" and the help that they would need to rebuild from the destruction that was left behind (e.g., economic analysis, resiliency,³ information and funding, etc.).



Figure 1: A view of Hurricane Sandy as it approached the northeastern United States. Image from NOAA.

The Long Island Smart Growth Resiliency Workgroup (Workgroup), an unprecedented collaboration among staff from the U.S. Environmental Protection Agency (EPA), Federal Emergency Management Agency (FEMA), New York State Department of State (NYS DOS), and Suffolk and Nassau Counties of Long Island, NY, emerged as part of the recovery process. Staff from these agencies did not normally work together on disaster recovery even though they had worked together for years, trusted one another, and knew how to work together to get results. Hurricane Sandy provided the opportunity for this ad-hoc group to create a formal structure and convergence of segregated goals and partnerships into one with a focused mission of helping Long Island communities go beyond merely rebuilding by incorporating the principles of resilience, smart growth, and equitable development into their long-term planning and recovery efforts. Each member of the Workgroup acted as a liaison to her or his respective organization to gain additional leverage and support for the mission.

The Workgroup made several decisions that were key to its success: 1) building on already developed plans and projects; 2) keeping the core group small and composed of people who already had well established relationships; and 3) hiring a facilitator to assist with engagement and planning. As the effort grew, each partner leveraged additional relationships for broader local and state support to help identify unmet needs within the impacted communities. The Workgroup knew that they wanted to build on the strengths of each organization and member, in order to provide coordinated, long-term assistance to Long Island communities. The successes and lessons learned throughout this process, and described in this paper, can be a case study for communities impacted by future disasters.

Pre-Hurricane Sandy Coordination

FEMA and EPA began working together on recovery issues after the 2008 flooding in Iowa. It was during this work that the two agencies discovered natural synergies between EPA's sustainable development and FEMA's mitigation programs. Both agencies realized that incorporating key concepts underlying sustainability and mitigation into the delivery of assistance to local governments after a disaster would strengthen the community support of these two

federal agencies. A Memorandum of Agreement (MOA), signed in 2010, documented the success of this partnership and enabled the agencies to maximize coordination pre- and post-disaster by outlining areas where their programs were complementary or symbiotic (FEMA 2010). Work between the agencies continued throughout the country and grew with each recovery opportunity.

3. Resilience is our ability to prevent a short-term hazard event from turning into a long-term community-wide disaster. While most communities effectively prepare themselves to respond to emergency situations, many are not adequately prepared to recover in the aftermath. (NOAA 2017).

EPA and FEMA Region 2 used the MOA to expand coordination and partnership to geographic areas with recent disaster impacts, a high density of vulnerable populations, and a low capacity to plan at the local level. One example of this coordination took place in Paterson, NJ, which experienced severe flooding from Hurricane Irene and Tropical Storm Lee in 2011. EPA facilitated the convening of five federal agencies and the local government to discuss how to incorporate sustainability and mitigation measures to increase their resiliency to future events. The discussion focused on how each agency could use existing programs to help the community reach their recovery goals. Some agencies had grants that were providing direct funding to the community; others explored the potential to repurpose existing programs or technical assistance that could be applied to assist the community. While some projects that enhance resilience have been completed, the integration of these concepts into long-term recovery for Paterson continues today.

In addition to the federal partnership identified above, EPA Region 2 and the NYS DOS worked together after Hurricane Irene on strategies for supporting growing New York communities. The goal of this work was to help communities develop in ways that preserve natural lands and critical environmental areas, protect water and air quality, and reuse already-developed land. NYS DOS had also previously committed funding from the State Smart Growth Planning Grant program to the Governor's Long Term Community Recovery initiative, which provided small awards to communities to help them incorporate the principles of smart growth while developing recovery plans. EPA was doing similar work under national Memorandums of Agreement with FEMA and the National Oceanic and Atmospheric Administration (NOAA) (U.S. EPA 2011).

EPA Region 2 and the NYS DOS began working with Suffolk County to support their county-wide development goals, and their work in specific communities such as Wyandanch. In fact, Wyandanch was selected as one of the first communities on which the regional HUD-DOT-EPA Partnership for Sustainable Communities⁴ would focus and was also one of the landmark NYS Brownfield Opportunity Areas. Additionally, EPA worked with NYS DOS on a pilot program where EPA provided technical assistance to modify their Clean Water State Revolving Fund program to ensure their state water infrastructure investments are used to promote location-efficient investments. The culmination of these efforts led to strong relationships across the governmental spectrum and became crucial to how partnerships would develop after Hurricane Sandy.

4. The Partnership for Sustainable Communities works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution. Partnership for Sustainable Communities is comprised of three federal agencies: Office of Economic Resilience (HUD agency), Office of Transportation Policy (DOT agency), and Office of Sustainable Communities (U.S. EPA). For more information, see <https://www.sustainablecommunities.gov/>.

On September 23, 2011, FEMA expanded its ability to coordinate with other federal partners by establishing the National Disaster Recovery Framework (NDRF; FEMA 2017b). The NDRF mandated that federal agencies work collaboratively to support disaster-impacted States, Tribes, territories, and local jurisdictions in their recovery process. The NDRF outlines six recovery support functions (RSFs) and identifies federal agencies to lead each functional area (more details in Halfon and McLachlan 2018, this report). These six RSFs were developed to help communities address specific areas of concern during the recovery process. The NDRF not only enabled greater federal coordination, but it also shifted the conversation from response to long-term recovery. Given the history that FEMA and EPA shared on previous events, EPA became a prominent partner in the Community Planning and Capacity Building RSF, the only FEMA-led functional area.

Post-Hurricane Sandy Coordination

Hurricane Sandy made landfall within a year of the National Disaster Recovery Framework being published, and it became the first incident where the structure was fully activated. Because of their past working relationship in Paterson, NJ, FEMA, and EPA Region 2 staff quickly integrated recovery efforts under the Community Planning and Capacity Building RSF and were able to communicate more directly and understand potential programmatic overlap from the start because they already understood each other's protocols and program restrictions. The initial work shifted from introductory discussions regarding agency-specific acronyms and programs to the creation of a common goal and application of programmatic assistance. In fact, EPA and FEMA staff had to work together to assist with the integration and education of the new federal, state and local partners who did not have disaster experience.

Partnering with State and Local Governments after the Event

Simultaneously, NYS DOS and EPA Region 2 were trying to organize an inter-governmental/interstate dialogue around salient and timely smart growth topics (e.g., home rule in NYS and Connecticut). When Hurricane Sandy made landfall, EPA and NYS DOS decided that the topic of mutual interest would be the confluence of smart growth, sustainability, and resiliency on Long Island resulting in the current bottom-up, capacity-building effort encompassed in the Workgroup. Given that all recovery efforts are locally driven, the federal and state partners knew that the integration of the local government was essential. Since Long Island faces many unique challenges (e.g., a single-source aquifer for drinking water), it was imperative to get cooperation

from both Nassau and Suffolk County.

The inclusion of Suffolk County was expedited because of the previous partnership and work that had been completed with EPA Region 2 and NYS DOS. However, none of the partners had preexisting relationships with Nassau County. In addition, the initial Workgroup was trying to balance developing a strategy with Suffolk County and the Federal Recovery Support Strategy, which FEMA and EPA were required to complete under the NRDF, so additional time and resources for outreach were limited. In mid-2013, due to the nature of high staff turnover during a disaster, staffing changes brought in a new lead FEMA Community Planner under the Community Planning and Capacity Building RSF. The planner had previously spent 4 years as an urban planner in the Comprehensive Planning Division of the Nassau County Planning Commission and helped the partnership identify the most appropriate Nassau County staff to invite into the Workgroup. This past relationship proved critical because it engendered trust and credibility between the Workgroup and Nassau County. These established relationships are key when discussing partnerships associated with disasters. Often, partners will cycle in and out of an event quickly, making it difficult to build trust between individuals and gain access to their network. With the addition of Nassau County, the Workgroup was ready to proceed more effectively with specific planning and project initiatives.

The Work

The first step for the Workgroup was to define the roles, responsibilities, and expectations of the group and to capture the collective recovery challenges that needed to be resolved. The Workgroup agreed that the membership should remain small and limited to the key individuals that had been identified. Discussions around expanding the group led to the identification of additional potential challenges. For instance, if more agencies and staff were involved, there would be more competing priorities that would have to be considered, and it would be harder to focus and get things done in a timely fashion. Therefore, the five core members of the Workgroup established the main recovery issues that encompassed all agency perspectives and points of view.

A facilitator was brought in to assist the Workgroup with understanding and overcoming issues around competing priorities, equity in recovery, the availability and management of the influx of resources, the complexity of the problems, the constraints of the federal agencies, and how the shift in group dynamic with new partners (and personalities) impacted their ability to develop and implement a central mission. After many conversations about the disaster impacts and recovery challenges, the Workgroup developed a set

of regional goals to incorporate smart growth, environmental justice, resiliency and hazard mitigation concepts, health indicators, and the inclusion of science and data into the recovery process in the Long Island counties of Suffolk and Nassau. In addition, the Workgroup needed to build on existing local efforts, align with existing New York State policies and programs, and establish strong intergovernmental coordination.

The group created three white papers (topics: environmental justice,⁵ brownfields,⁶ and smart growth) with an understanding of existing regional priorities, an analysis of the storm's immediate impacts and anticipated future needs based on best available data. The white papers were key in gaining support from leadership and leveraging available resources that would make this partnership a success.

The initial focus was to encourage economically, environmentally, and socially sustainable development in low risk areas away from flood zones and along transit corridors in Nassau and Suffolk Counties. At the urging of the Suffolk County Executive, the Workgroup shifted its focus to include water quality so that Long Island's sole-source aquifer and coastal aquatic ecosystems are enhanced and protected. This change took effect after months of facilitated discussions between both Suffolk and Nassau counties; the partners wanted to make sure that both counties agreed to the change.

To garner broader community support, the Workgroup organized a conference, "Accepting the Tide: A Roundtable on Integrating Resilience and Smart Growth on a Post-Sandy Long Island," which took place in May 2014 and brought together a variety of stakeholders (Figure 2) including two especially crucial stakeholders: Jamie Rubin, Director of the Governor's Office of Storm Recovery, and Steve Bellone, Suffolk County Executive. Both were leaders and agents of change for the recovery process at their respective level of government. More than 90 local elected officials, municipal employees, nonprofit workers, and people affiliated with the designated New York Rising Community Reconstruction⁷ areas, attended the conference. Through the conference, the team was able to identify community needs and stakeholder resources that would expedite the recovery process. This led to additional partnerships with academics and local nonprofits.

As an outgrowth of this conference, the Workgroup began focusing on projects that would address issues raised by participants: 1) a health impact assessment, 2)

5. Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. (<https://www.epa.gov/environmentaljustice>)

6. A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. (<https://www.epa.gov/brownfields/overview-brownfields-program>)

7. The NY Rising Community Reconstruction Program is a recovery and resiliency initiative established to provide assistance to communities impacted by Hurricane Sandy, Hurricane Irene, and Tropical Storm Lee (<https://stormrecovery.ny.gov/community-reconstruction-program>).



Figure 2: Following Hurricane Sandy, the Suffolk County Department of Economic Development and Planning and Nassau County Department of Public Works have been collaborating with FEMA, EPA, the New York State Department of State to examine recovery options that will help Long Island recover smarter, stronger, and more resilient. Suffolk County Executive Steve Bellone (2nd from left) greets Antonius Agelink of GoDutch consortium.

Photo by Kenneth Wilsey, used with permission.

CommunityViz training, 3) an ecosystem services assessment, and 4) technical assistance provision.

The health impact assessment provided information to local governments to highlight the positive and negative impacts on public health from a particular project, plan, or policy. An assessment for Suffolk County is currently being finalized on a local ordinance change that would impact on-site sewage systems and nearby wetlands. Understanding the health impacts associated with flooding of these septic systems is crucial in planning for resilience in these communities. EPA's commitment of resources (full-time employees and contractor hours), along with funding from FEMA, made the assessment possible. The assessment team launched the project in December 2014 and held stakeholder meetings in March 2015.

Second, in January 2015, the Workgroup hosted a week-long workshop for community planners and geographic information systems (GIS) staff on CommunityViz, a GIS-based, participatory scenario-planning tool for planning and decisionmaking. FEMA recovery funds and EPA's mission contract made the workshop possible, with the latter expediting access to recovery funds. The training integrated data from NOAA's sea-level rise tool, EPA's EJScreen Screening and Mapping tool, FEMA's Hazus,⁸ the U.S. Census Bureau, and local land-use data. Participants quickly realized the power of this tool to support their work (Figure 3). In fact, one planner proclaimed



Figure 3: FEMA held a week-long training session using CommunityViz, a tool for evaluating the cumulative effects of community development decisions using a geographically-based analytic platform. The program can help governments or organizations conduct a comprehensive recovery planning process that engages local stakeholders.

Photo by Kenneth Wilsey, used with permission.

that CommunityViz can help them do work in a few days that would normally take a few weeks.

The third project is an ecosystem services assessment, identifying the value Long Island communities derive from the goods and services provided by nature, which will help guide them as they make recovery and redevelopment decisions and implement projects identified through the New York Rising Community Reconstruction plans. Ecosystem services valuation is a very useful tool because it can help communities better understand the economic benefits of restoring wetlands to prevent impacts from future storms, for example. It should be noted that the Workgroup expanded its members to include Stony Brook University and The Nature Conservancy for this project.

Lastly, the Workgroup is providing technical assistance to two NY Rising communities—Long Beach and Mastic Beach—to integrate smart growth practices into their community resilience efforts. The Workgroup will help the

communities assess their existing land-use and building laws/codes; identify gaps that prevent resiliency efforts; and identify concrete strategies to address the gaps (e.g., options for existing law/code updates, land use study, etc.). More specifically, Long Beach received technical assistance from Global Green, which was funded through a grant from EPA's Building Blocks Sustainable

8. A nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses GIS technology to estimate physical, economic, and social impacts of disasters (FEMA 2017a).

Communities program. The Workgroup also helped to secure law students from Tuoro's Land Use and Sustainability Institute to assist Long Beach in implementing some of the recommendations from both the Global Green technical assistance and a New York University study on green infrastructure and stormwater management.

Unifying Themes and Lessons Learned

The combination of formal and informal coordination mechanisms and relationships are what made this partnership unique and successful, and the process of developing this Workgroup helped capture how the integration of program areas can drive a community to become more resilient. The implication of these effective partnerships became apparent, and as a result, the Workgroup is providing a structure and process of engagement to recovery experts at all levels of government to help inform future recovery efforts.

Some of the unifying themes that helped drive the Workgroup forward are as follows:

- **Building off of existing projects or partnerships creates leverage and momentum for opportunities after a disaster.**
- **Federal interagency coordination in the field facilitates effective engagement with state and local partners. A symposium or development of "thought pieces," such as white papers, can bring stakeholders together around broad concepts before diving into specific solutions where existing equities may be on the line.**
- **Using a facilitator can help to streamline the ability to organize a group of new partners with varying and/or competing interests.**
- **State and local governments are key partners in any recovery effort as are local universities, community-based organizations and nonprofits. Without their assistance, recovery goals can be detached from local efforts and create tension around resources.**
- **Federal agencies have distinct assets and can be of far more assistance when they partner to share those assets with communities. A new Memorandum of Agreement, led by the U.S. Office of Management and Budget and signed by 16 federal agencies, is ready to be implemented for this purpose.**

- Outcomes are most readily achieved when each entity is willing to allow others to take credit for the collective work needs dictate. This enables each partner to play to their strengths and gain additional support in a more strategic manner.
- Understanding and respecting each organization's priorities is critical.
- Recovery and mitigation planning is a cycle; what is done in recovery planning should feed into the mitigation plan and vice versa. Planners and emergency managers can be most effective when they are partners from the outset; planning requires whole community participation.
- Science and data are key components to a recovery process that is looking toward resiliency and sustainability.
- Bringing science based, data driven, digital tools to the community and teaching stakeholders how to use the tools is an efficient way to build capacity and generate buy-in for best-practice solutions.
- Relationships outside of the work are just as important as in the office because it helps to build trust and respect that is needed to work through challenges.

The successes and lessons learned that were part of this process were analyzed and used to update several formal documents that were the foundation of this partnership. EPA and FEMA integrated the data and subject matter experts into the revision of the Memorandum of Agreement⁹ and the National Disaster Recovery Framework in 2016. As a result, EPA now has Sustainability Advisors that will be deployed during a disaster and help recovery personnel at all levels to navigate EPA programs and tools that can help inform the recovery process. Dialogue between FEMA and the EPA has also enabled FEMA to incorporate sustainable development and resilience as part of mitigation and recovery planning processes. Using this example to inform national disaster recovery policies will help to enhance the recovery efforts in the future.

9. The FEMA and EPA MOA was expanded to promote additional coordination opportunities and to provide a collaborative framework for policy work related to both hazard mitigation planning and sustainable development (U.S. EPA 2016).

Furthermore, the lessons learned and successes of this experience can inform the next disaster, which could result in an expedited recovery process for communities nationwide. Without documenting and communicating

what was learned, it is likely that future efforts will encounter the same issues and a delayed recovery process.

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Helping Communities Build Climate Resilience with a Toolkit of Scientific and Local Knowledge

Lauren L. Marshall,¹ David D. Herring,²
Nancy Beller-Simms,³ and Jesse M. Keenan³

1. USDA Forest Service, Washington, D.C.

2. National Oceanic and Atmospheric Association (NOAA),
Silver Spring, Maryland

3. Harvard University, Cambridge, Massachusetts

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The last 4 years have been the warmest years on Earth, since reliable record-keeping began in 1880 (NASA 2018, NOAA 2018). Climate scientists project Earth will continue warming at an increasing rate through the 21st century due to the increasing abundance of human-produced heat-trapping gases, such as carbon dioxide and methane. Both long-term global climate change and short-term natural variability patterns (e.g., El Niño-Southern Oscillation) are causing extreme regional weather and climate events with increasing frequency and severity. An extreme event can be any phenomenon that falls within the highest or lowest 10 percent of a probability distribution of observed or anticipated events, such as high or low temperatures, rainfall amounts, water levels, and even socioeconomic phenomenon.

People and the natural and built environments are vulnerable to many types of extreme events. As built environments encroach on sensitive geographies and ecosystems, resilience becomes increasingly relevant for reducing vulnerability. In 2017, the United States experienced 16 extreme weather and climate events, each exceeding \$1 billion in damages, for a record-setting combined total of more than \$300 billion (NOAA 2018). These losses stemmed from damages caused by severe storms that caused wind damage and produced historical floods (Figure 1), as well as exceptional drought conditions that challenged farmers and water resource managers and exacerbated conditions for damaging wildfires. Since 1980, the United States has sustained 219 weather and climate disasters that cost \$1 billion or more, with a cumulative inflation adjusted cost totaling \$1.5 trillion.

Every day, communities and businesses across the United States and around the world face challenges stemming from extreme events and changing climate conditions. The impacts of extreme events are felt particularly acutely in cities and towns (Figure 2). In an effort to reduce uncertainty, decisionmakers are increasingly seeking science-based information and tools to help them understand where, how, and why these changes have occurred, and are likely to occur in the future. While climate science has historically been limited in its ability to downscale climate model projections to the operations of a city, the advancement of various science-based software and web applications represent tremendous opportunities for data-informed decisionmaking.

To help meet the public's growing demand for authoritative science information and to help promote resilience of communities and businesses, an interagency partnership of scientists and subject matter experts developed the U.S. Climate Resilience Toolkit (hereafter referred to as the "Toolkit") (U.S. Govt. 2014) managed by NOAA under the auspices of the U.S. Global Change Research Program. The Toolkit is a free and open-source resource that makes it easy for the public to access and understand a broad range

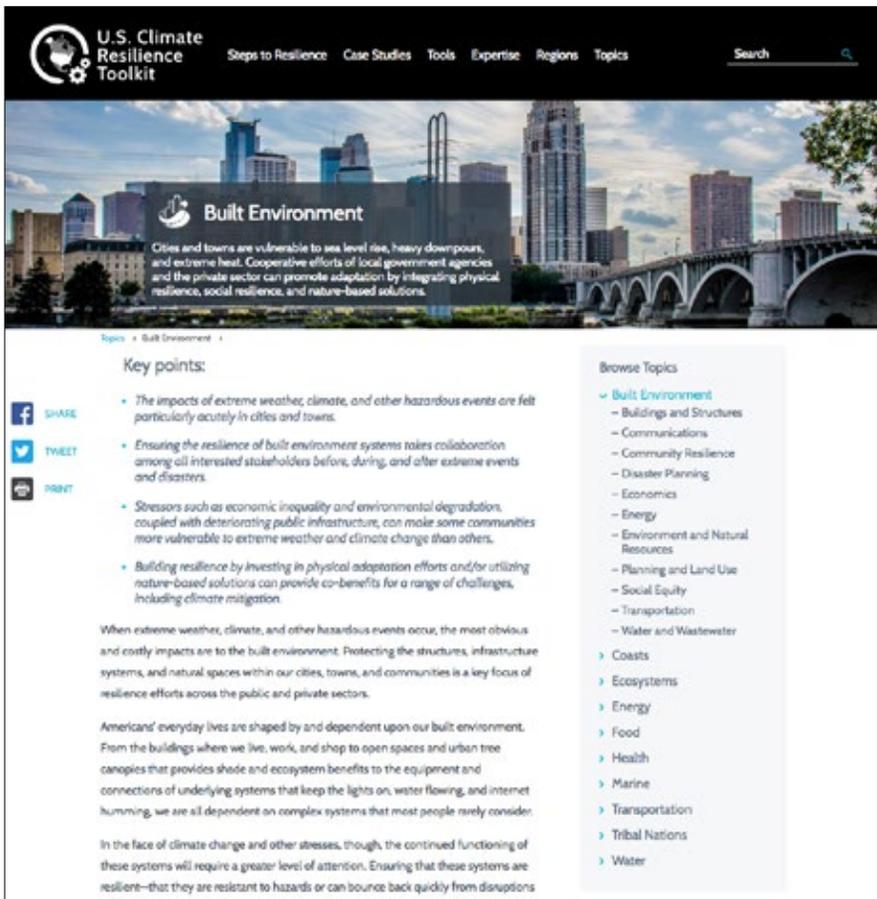


Figure 1: The Toolkit provides narratives authored by subject matter experts on ten different topics, including one titled “Build Environment,” that explain and illustrate how climate change impacts different U.S. sectors.

Image from NOAA.



Figure 2: Local first responders use an airboat to transport people to safety during flooding in August 2007 in Oklahoma.

Photo by Patricia Brach, FEMA, via Wikimedia Commons.



Figure 3: Hurricane Sandy knocked out power to New York City, causing a blackout below 34th Street. Some areas lost power for more than 3 days.

Photo by Michael Tapp, via Flickr.

of science-based tools, data products, and information services offered by the federal government that are relevant to resilience planning and capacity building. Its primary target audience is applied professionals—such as city planners, resource managers, policy leaders, etc.—who oversee development of climate adaptation plans. The Toolkit is a Web-based framework that aggregates and contextualizes information and tools for three main purposes: to help people 1) make and implement resilience plans; 2) explore how climate conditions are changing in their location and how sectors are being impacted; and, 3) learn what others are doing to address climate-related challenges similar to the ones they face. There is also a curated “Funding Opportunities” page, kept up to date by the Toolkit’s core editorial team, on the Website listing federal and nonfederal funding sources to help communities and businesses obtain funds to recover from a disaster and/or mitigate future risks.

Recognizing that 80 percent of Americans live in urban and peri-urban settings (U.S. Census Bureau 2012), we led an interdisciplinary team of subject matter experts in developing the Toolkit’s “Built Environment” section. This section of the Toolkit supports the development of resilience at the intersection of the built and natural environments, which requires collaboration among all interested stakeholders before, during, and after extreme events and disasters (Figure 3). Additionally, economic inequality and environmental degradation coupled with deteriorating public infrastructure can further stress our built environments, making some communities more vulnerable to extreme events than others. Building resilience by investing in physical

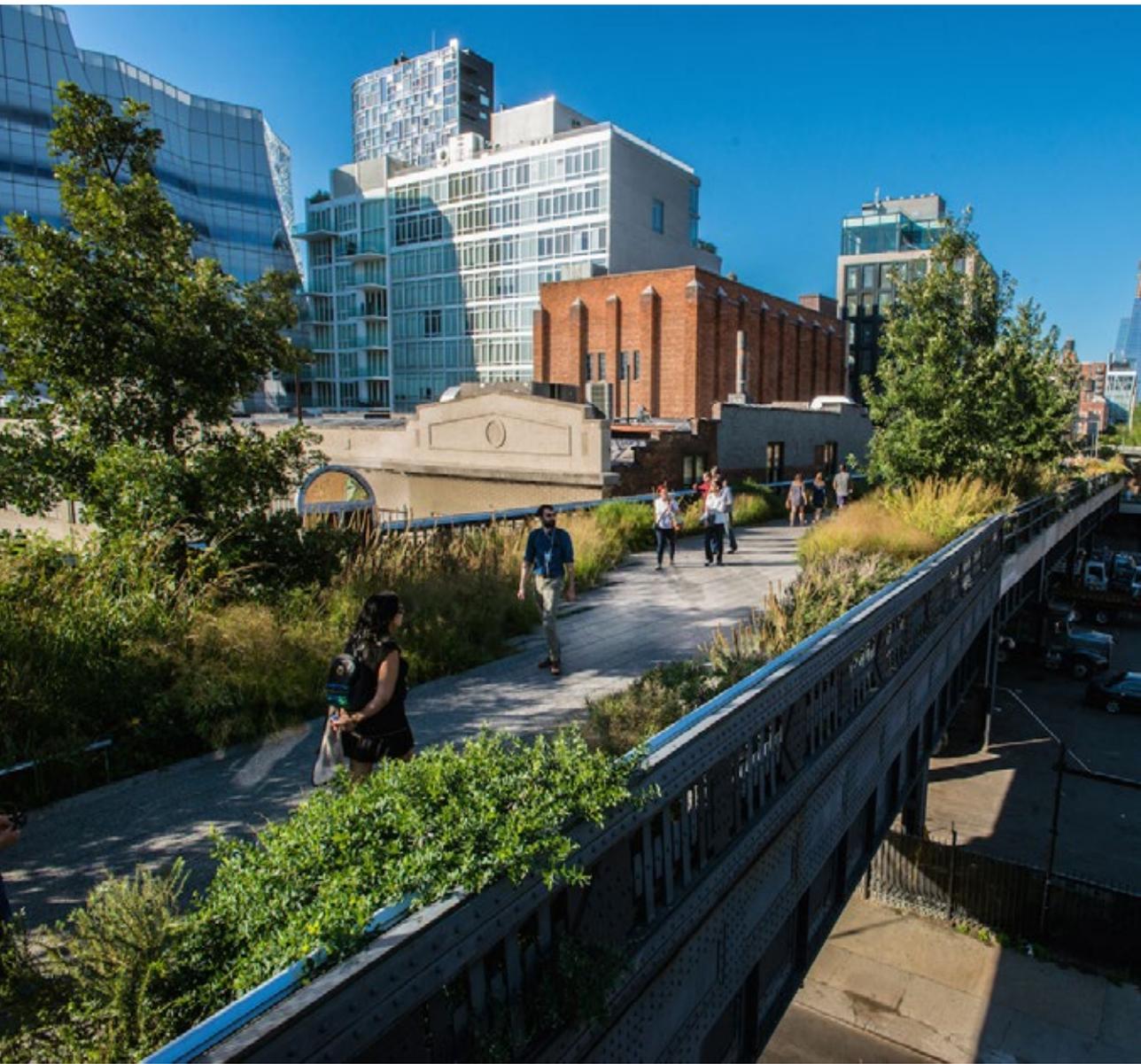


Figure 4: Green infrastructure in built environments can provide win-win climate adaptation strategies for local residents. New York City's "High Line" is an elevated railway line that was converted into a 1.45-mile-long public park, featuring a wide public walkway and attractive use of vegetation to help mitigate the local urban heat island effect.

Photo by Lance Chueng, used with permission.

adaptation efforts and/or using nature-based solutions can provide co-benefits for a range of challenges, including mitigation of climate-related impacts.

The Built Environment section contains narratives—often excerpted from authoritative peer-reviewed literature—summarizing ways in which U.S. cities and towns are vulnerable to, and have been impacted by, climate and nonclimate stressors. These narratives are cross-linked with real-world case studies from across the United States, highlighting people in communities and businesses who have successfully taken action to manage their climate risks (Figure 4). Additionally, the topical narratives and case studies are cross-linked with science-based decision-support tools, in order to illustrate how people have used those tools to plan and build resilience.

Helping people build resilience is the Website’s main purpose. Toward this end, the Toolkit offers a five-step planning framework, called “Steps to Resilience,” that integrates a range of different content types into topical, geographical, and purposeful frames of reference. This framework guides users through a deliberative process whereby they can access, explore, discuss, coproduce, and integrate information together for the purpose of building shared mental models as they address these fundamental questions:

- Do climate-related hazards threaten assets we value?
- If so, what is the risk, and are we willing to tolerate that level of risk?
- If the risk is intolerable, what options exist to reduce or eliminate the risk?
- Which options are viable and affordable, and in what priority order might we pursue them?
- How will we plan and implement particular actions?
- How will we define and measure success, and how will we monitor progress and take corrective actions where needed?

Defining and Measuring Success

The team that built the Toolkit (managed by the second author of this article) thought that, to be successful, it must be useful, user-friendly, and actually used (Mitchell et al. 2016). The team’s first task was to aggregate scientific information that the audiences would find relevant and potentially useful for decisionmaking. The second task was to integrate, contextualize, and design

the information in ways that would make it easy for the audience to find and use. The third task—by far the most ambitious of the three—was to engage directly with people in communities and businesses around the country to help them use the Website in their resilience planning and capacity building efforts.

There are many ways to measure success, and no single measure is entirely instructive of how well the Toolkit is performing in these three areas. As such, a multi-pronged approach is used to evaluate the Toolkit Website (Mergel 2013). The first monitors visitor statistics, including number of return visitors, as one indicator of the reach of the site and whether people consider the Toolkit to be useful. If people find the Website to be useful, the Toolkit's program manager hypothesized that they will visit the Website on more than one occasion and they will encourage friends and colleagues to visit it. The observed total number of Website visits has been increasing at an accelerating rate (Janssen et al. 2016). The Toolkit received 889,961 visits through the first three-quarters of the federal government 2017 fiscal year, which is a 76 percent increase over the previous year's visit rate. The annual target growth rate for the Website is 10 percent. Moreover, approximately 34 percent of those visits were by return visitors, a 1 percent increase over the previous year.

Surveys and listening sessions are utilized to assess whether, and to what extent, audiences perceive the Toolkit to be user-friendly and whether and how they use it. Surveys and listening sessions have been conducted both by external evaluation teams and the Toolkit's core editorial team to maintain a steady flow of user feedback throughout the Website's development. More recently, the core team deployed a new Website survey, created to help measure the audience's perceptions in five key dimensions: 1) awareness of the site's existence and purpose; 2) trust of the Website's contents; 3) satisfaction with the site's scope; 4) usability of the site's information and functions; and, 5) control mutuality, or the degree of symmetry of communications between the Website's users and editors. As two-way communication is essential for building relationships, the Website's editors respond to all incoming emails in a timely manner—most within 24 hours, all within 1 week.

Through user feedback and engagements with user communities, we have heard and observed members of our target audience expressing value for the site's usefulness and user-friendliness, and that they *use* the site to help them in their work. For example, after the newly-elected Trump administration began removing references to climate change from government Websites in early 2017 (Davenport 2018), we received a flurry of emails from stakeholders (including architectural designers and city planners) urging us not to take the Toolkit offline because they said they use the site in their work. And, 3 months into our online user survey, the results (based on 142 respondents) showed high user ratings—significantly higher than government-wide

averages of user ratings (on a scale of 10-100). Specifically, in the category of user satisfaction, users rated the Toolkit a 79 (government average = 73); users rated the relevance and usefulness of the Toolkit's content an 85 (government average = 78); users rated the Toolkit's design an 84 (government average = 74); users' likelihood of recommending the Toolkit to a friend or colleague rated an 89 (government average = 76); and users' likelihood of returning to the Toolkit rated an 89 (government average = 82) (Petras et al. 2017). While it's still too early to declare the Toolkit a success, and there are opportunities for improvements based on user feedback, there is good evidence to date that suggests it is being well-received and used by our target audience.

Case Studies

To successfully help people and communities build resilience, the Toolkit's core editorial team believes that it is critical to facilitate engagement with subject matter experts, and it is also important to help people learn from others like them. Case studies can serve as inspirational templates that others can learn from and emulate. To promote this peer-to-peer learning, the Toolkit includes case studies, which predated the Toolkit, to highlight how communities are already incorporating resilience into their planning and stewardship activities. The tools, processes, and resources showcased in these case studies guide communities in identifying valued assets and threats, as well as in assessing their exposure to vulnerability and risk as a means to focus and prioritize their work. Each case study includes direct links to relevant tools in the Toolkit's compendium of more than 350 decision-support tools and other resources designed to aid communities, businesses, and resource managers in adapting and replicating the highlighted work. The following case studies in urban forestry, stormwater management, and coastal dune restoration represent exemplar cases for highlighting the value of the Toolkit and the myriad tools that are accessible through it. For each of the following cases, the associated tools and resources referenced in the narrative may be directly accessed on each case's landing page on the Website.

Case Study

Fortifying Chicago's Urban Forests⁴

Chicago is at the center of one of the most populous metropolitan areas in the United States. Approximately 10 million people live in the region, in neighborhoods that range from high-density urban settings to suburbs with yards and open space between single-family homes. Trees in yards and parks across the region provide some shade when temperatures rise, but the region's tree canopy—the percentage of the ground covered by tree branches and leaves—is lower than in many other cities in the Midwest. The loss of 13 million ash trees to an invasive insect, the emerald ash borer, has further reduced the canopy in many areas. The cost of removing and replacing ash trees has exhausted many municipal budgets in the region, leaving little money to care for the remaining trees or time to plan ahead.

Faced with the decline of urban trees, concerned stakeholders joined together in partnership with Leslie Brandt, a climate change specialist with the USDA Forest Service's Northern Institute of Applied Climate Science, to form the Chicago Region Trees Initiative. The goals were to improve management skills and knowledge; to increase the region's tree canopy; and, to incorporate species that are resistant to pests and climate-related impacts. The partners used habitat suitability modeling, projected changes in heat and hardiness zones, and an assessment of tree species' adaptive capacity to assess the vulnerability of more than 150

tree species that are currently growing or recommended for planting in the region. The assessment showed that some of the least vulnerable trees in the region are nonnative invasive species. Conversely, results indicated that many of the species native to the area are vulnerable to changing conditions.

Representatives from counties, municipalities, and park districts worked with experts in a series of workshops on urban forest vulnerability and adaptation. Using a structured process, they evaluated which impacts and adaptive capacity factors had the largest effects on vulnerability. Finally, they implemented a five-step adaptation project to incorporate climate change considerations into real-world projects and planning efforts, which included planting resilient trees. The Chicago Region Trees Initiative is integrating climate-change-related goals into a regional tree master plan and updating its recommended planting list to encourage climate-adapted species. Communities across the Chicago region are working to incorporate vulnerability information and adaptation strategies in their work. Looking to the future, the initiative is seeking grant funding they will use to create real-world demonstrations of adaptation that resulted from the workshops.

4. Adapted and excerpted from <https://toolkit.climate.gov/case-studies/fortifying-chicagos-urban-forest>

Case Study

Improving Water Quality by Dealing with the First Inch of Rain⁵

Just outside the northeastern boundary of Washington, D.C., the suburban city of Mount Rainier, MD, features affordably priced homes, pedestrian-friendly streets with sidewalks, and a handful of historic buildings. Mount Rainier lies within the watershed of the Anacostia River, which flows into the Potomac River. In turn, the Potomac flows into the ecologically productive Chesapeake Bay. Unfortunately, the Anacostia—sometimes referred to as Washington’s “forgotten river”—is severely polluted with toxic sediments, agricultural nutrients, and trash. In keeping with its “green” values, Mount Rainier city staff recognized that controlling urban runoff could reduce the influx of pollutants into the river.

Acknowledging the potential to improve water quality in the region, the city established an Urban Green Infrastructure Plan to develop guidelines to improve the city’s stormwater management. Mount Rainier’s Green Team Committee—a group dedicated to increasing sustainable practices in the community—worked with the City Council, city staff, and the nonprofit Low Impact Development Center to ensure the plan would meet Mount Rainier’s goals. The Plan set a goal for the city to limit polluted runoff into streams by becoming stormwater neutral—state defined as the ability of an area to capture, infiltrate, retain, or

evapotranspire the first inch of rainwater that falls in any storm event. Capturing and slowing just 1 inch of rain can deliver larger-than-expected benefits for water quality because the first inch of stormwater runoff—sometimes called the “first flush”—contains the highest abundance of pollutants from the land. Additionally, capturing the first inch of rainfall reduces the speed at which runoff reaches nearby streams, reducing the likelihood of problematic flooding and erosion farther downstream.

The Plan includes recommendations to reduce stormwater runoff in a variety of situations. Examples include installing adequately sized gutter downspouts and draining rain barrel overflows to landscape areas or rain gardens; capturing stormwater from driveways and patios using slot drains along the downslope edge of the paved area; and planting trees to increase evapotranspiration, reduce erosion, and provide shade for urban areas. In order to document any reduction in stormwater runoff, the plan needed a reliable method to calculate before-and-after runoff rates and to evaluate the effectiveness of various strategies. The city chose to use the U.S. Environmental Protection Agency’s “Stormwater Calculator”, featured in the Toolkit’s “Tools”

5. Adapted and excerpted from <https://toolkit.climate.gov/case-studies/improving-water-quality-dealing-first-inch-rain>

compendium, which utilizes data on local soil conditions, topography, and rainfall records to estimate annual rainfall and runoff from sites. Once these calculations are complete, the tool estimates the effectiveness of various practices and combinations of practices to help users select appropriate strategies for their stormwater-reduction design. The process of using the Stormwater Calculator helps users analyze a real-world problem to find solutions that work.

Since the plan was established in 2013, Mount Rainier has been implementing a vigorous tree-planting effort; began using pavers to create permeable parking lots and alleys; and, has converted one of the city's main

roads, Buchanan Street, into a "green street." Additionally, many residents have planted rain gardens in their yards. Mount Rainier's Thomas Stone Elementary School and the Mount Rainier Nature Center have also planted rain gardens. In 2015, Mount Rainier was certified by Sustainable Maryland as a "Sustainability Champion." As a participating community in Sustainable Maryland, the town has access to grants, incentives, and technical support to further promote sustainable and resilient practices. This case highlights a valuable example of co-benefits that serve the advancement of environmental quality at the intersection of sustainability and flood resilience.

Case Study

Restoring Natural Dunes to Enhance Coastal Protection⁶

Barrier islands in New Jersey are like a ribbon of sand along the coast. The linear islands originally formed as ocean waves and currents pushed sediments from the ocean floor into beaches and dunes after the last ice age. Over the centuries, undisturbed dunes migrated back and forth across their beaches, moving inland as prevailing winds removed sand from one side of the dune and deposited it on the other. As homes and businesses crowded New Jersey's shore in the early- to mid-20th century, development encroached on the inland side of natural dune systems, narrowing the width of beaches and reducing the area that could supply sand to either side of the dunes. Roads and other structures effectively pinned down the formerly dynamic system. Over the years, the height and protective abilities of the dunes diminished. As glaciers melt and warming seawater expands, rising sea levels increase the risk of flooding along all coasts, especially during storms.

When Hurricane Sandy hit New Jersey's beaches in October 2012, neighborhoods that sit inland of developed beaches received the full brunt of the storm's waves and storm surge. In other areas, where natural beach dunes were still in place, damage was less pervasive. Increasingly, shore communities like Seaside Heights, NJ, are recognizing the benefits of preserving

or enhancing the natural infrastructure that dune systems offer.

Instead of pursuing costly engineering solutions or beach replenishment programs to address their vulnerability, some towns "work with nature" to rebuild dunes. For instance, planting beach grasses and installing and maintaining sand fences can help hold sand in place. Sand fencing helps capture wind-blown sand and also controls pedestrian traffic to protect fragile dune vegetation. Modifying paths to the beach so they are angled rather than perpendicular to the beach is another dune-enhancing strategy; this change reduces the opportunity for either wind or waves to move sand from the dune directly inland. These projects offer multiple advantages including cost-effectiveness; a capacity to continue adapting to changing conditions; and, improving habitat for fish and wildlife. An example of this type of project can be seen in Seaside Heights, which is famous for its oceanfront boardwalk, amusement rides, and arcades. Here, the city chose to rebuild after Hurricane Sandy in part by recreating sand dunes at the end of the boardwalk in order to serve as protection from future storms.

As coastal communities begin to explore their vulnerability, the "Climate

6. Adapted and excerpted from <https://toolkit.climate.gov/case-studies/restoring-natural-dunes-enhance-coastal-protection>

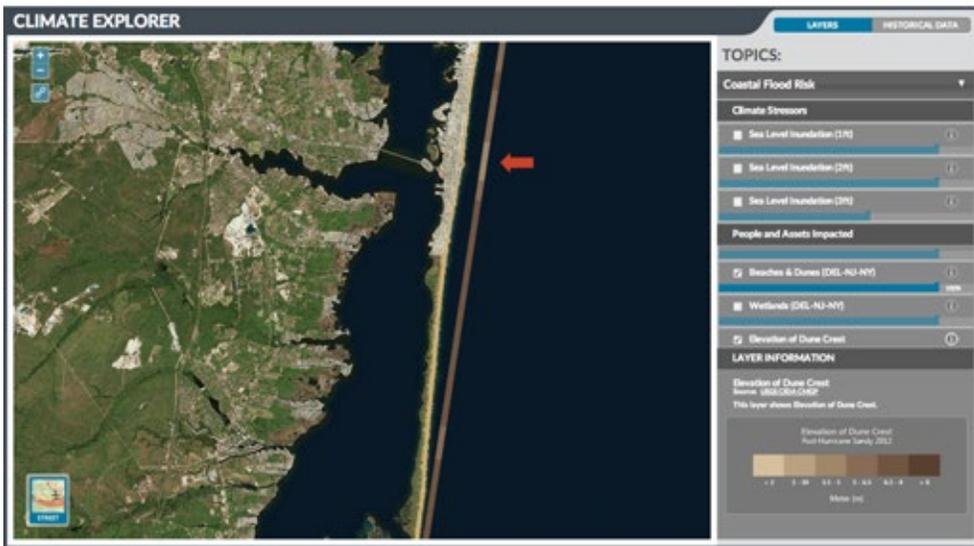


Figure 5: The Toolkit’s “Climate Explorer” is a Web-based mapping and graphing tool that enables users to explore decision-relevant climate variables from observed history and model projections out to 2100. This screenshot shows a U.S. map of the projected number of days in 2090 in which temperature will exceed 95 °F in two possible future scenarios. The “lower emissions” side of the map (left) shows a future in which humans emit enough heat-trapping gas to drive up radiative forcing at Earth’s surface to 4.5 watts per square meter. The “higher emissions” side (right) shows a radiative forcing of 8.5 watts per square meter, which is the course humans are currently on. Dark red shows areas where as many as 225 days per year are projected to exceed 95°F, pale yellow represents 25 days per year, and white represents 0 days. Source: <https://toolkit.climate.gov/climate-explorer2/> (2017)

Image from NOAA.

Explorer” feature of the Toolkit can help users assess whether and where their valued assets are exposed to environmental hazards. The Climate Explorer provides interactive graphs and maps of climate projections and observations (Figure 5). For instance, it can display historical temperature and precipitation observations for hundreds of climate stations and offer map layers of valued assets and climate threats. In the case of coastal dunes, the Climate Explorer allows communities to visually compare beach width and dune height. Users are able to visualize a

variety of different geographic scales, as demonstrated in Figure 1, which shows the narrow barrier islands and beaches along New Jersey’s shore. The strip of tan and brown colors along the shoreline indicate the elevation of the dunes along the coast (e.g., the darker the color, the higher the dunes). By using the Climate Explorer, community stewards—including scientists, planners, and policymakers—can identify areas where the beach width and dune height have shrunk as a result of development and craft targeted policies and projects to restore dunes and enhance resilience to flooding.

Conclusions

The manifestations and implications of extreme events and climate change are increasingly well understood in the built environment. While interdisciplinary datasets, analytical models, and tools are informing decisionmaking, the relative immaturity of the field of climate adaptation science dictates that much of the most impactful exchange of knowledge is based on qualitative case studies that identify best practices and trial-and-error experiences. The Toolkit not only collects and curates these case studies, submitted by each section's team of subject matter experts, it also provides corresponding references to relevant datasets and tools. To this end, the Toolkit connects on-the-ground practitioners with a broader community of practice. As such, the Toolkit is more than an aggregation of data and tools. It is an innovative platform that seeks to connect different actors who may vary in their motivation, expertise, agency, and level of technical facility. In the future, the challenge is to disseminate knowledge across scales, as well as to define, validate, and diffuse best practices that represent aspects of innovation in the name of resilience and adaptation. From a broader perspective, the Toolkit bridges the knowledge gap between scientific data, decision-support tools, and emerging best practices that are central to the adaptive capacity of the public, private, and civic sectors in the United States.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Meaningful Nature Places: Experiencing Sacred in the Everyday

Kathleen L. Wolf¹ and Mary Wyatt²

1. University of Washington, Seattle, Washington

2. TKF Foundation, Annapolis, Maryland

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In the Beginning

Kitty and Tom Stoner traveled to London some years ago, but arrived too early to check into their hotel. Deciding to take a walk, they discovered a small park. The modest but beautiful garden was nestled within a ring of buildings near the city center, similar to spaces found in cities throughout the world.

The Stoners were enthralled by this simple place and chance encounter, and made follow-up visits. The space offered a comforting enclosure, and distinct entryways marked transition from a hectic streetscape to a quiet enclave. Informal paths encouraged movement throughout the space, while benches were comfortable places for visitors to rest and reflect. Bench plaques shared stories about generations of users, and how this place of safety and stillness was a destination across historic times of stress and destruction.

The epiphany may have had its origin in the altered state of jet lag, but the garden experience tapped deeper reckonings. The Stoner family has enjoyed a variety of nature outings and experiences, even seeking out wilderness in times of personal challenge. Meanwhile Tom, from his career in mass communications, had observed the emergence of new information technologies that make lives busier and people more isolated.

Philanthropic organizations hold a unique position in civic society. As start-ups they can address a perceived need, often preceding public awareness of an issue, and step out to define the concern and act. That remarkable green space in London prompted long discussions about nature, what is sacred and vital in life, and the need for contemplative spaces that are in everyday settings, and accessible to all.

Thus began a plan of action and founding of the TKF Foundation. After consulting with people representing many disciplines and communities, the Foundation's mission was articulated: to provide the opportunity for a deeper human experience by supporting and inspiring the creation of public green spaces that offer a temporary place of sanctuary, encourage reflection, provide solace, and engender peace.

"A quiet place! My soul grows still. This is indeed a balm for the weary, a shelter for the beaten. I am so grateful for this quiet place. I am now renewed."

—Western Correctional Institution, Cumberland, MD³

Nature and Sacred

The family-based philanthropy supports mostly smaller, community-based outdoor spaces that offer solace to people experiencing a wide range of challenges and stressors (Figure 1). Described as Open Spaces Sacred

3. Quote taken from a garden visitors' journal. See page 274 for source description.



Figure 1: One of more than 130 Open Spaces Sacred Spaces, created to offer a space of respite and contemplation.

Photo by Len Spoden, used with permission.

Spaces (OSSPs), they are designed and built to involve local people and respond to local needs. “Open” means publicly accessible and without restrictions, so the gardens might benefit all in a community. The Foundation’s programs align with belief in the human need for respite in nature, sometimes overlooked in the broader schemes of urban planning and city design.

“This place is a midday antidote to phones and hard drives [and] flickering fluorescent light. I love the way the stems and branches lean out of their confined spaces, reaching every way at once. I love the way a flowering bush becomes a bouquet of butterflies and bees. I love how the boundary between earth and sky is not a straight line, marked instead by the individual curves of trees and leaves. I keep coming back for more.”

—Mount Washington Arboretum, Baltimore, MD⁴

A sense of the sacred within nearby nature experiences is fundamental. Public organizations often shape the spaces and character of communities, but discussions about the notion of the sacred are not common. Yet few other words

aptly describe the qualities that make certain gardens and green spaces memorable and particularly satisfying. Sacred spaces are alluring, have a quality that

4. Quote taken from a garden visitors’ journal. See page 274 for source description.



Figure 2: Each of the gardens contains a bench, and a journal welcomes visitors to share their reflections.

Photo by Len Spoden, used with permission.

inspires thoughtful introspection, and provide respite from the stresses of daily life.

“People travel around the world looking for a place like this. I’m happy that I only have to travel around the block!”

—Mount Washington Arboretum, Baltimore, MD

Across more than 20 years, the Foundation has partnered to create more than 130 OSSPs, mostly located within cities of the U.S. mid-Atlantic corridor (Stoner and Rapp 2008). They are at schools, hospitals, places of worship, prisons, office buildings, and within neighbourhoods. Many are proximate to places that harbor people who hurt, such as those grieving for loved ones, reconstructing life following trauma, or restarting after a major loss.

The spaces have been designed and constructed using participatory processes involving community members, design professionals, and foundation staff. Eligibility for funding is dependent on the commitment of a “Firesoul,” an individual who is passionate about the garden’s creation and facilitates all the moving parts. Every site includes a bench, providing a comfortable place to sit and relax (Figure 2). Tucked under the bench seat is a journal where visitors are invited to record their thoughts. The handwritten entries are periodically scanned and sent to the foundation’s offices. This chapter includes a selection of these reflections, just a sample from thousands.

“So much having to let go, let go. Hope I’ll not have to let go of this sacred space too. True, all space is sacred, if we only knew, but we need spaces of retreat and special beauty like this to help us awaken to the sacred everywhere.”

—Whitman-Walker Clinic, Washington, D.C.

The Experience Flow

Across the years and gardens, the Foundation began to recognize patterns of experiences. The staff read bench journal entries as they arrived, and books about the topics of spirituality and sacredness. They also reached out and interviewed civic leaders across the United States who have observed how people react when spending time in public gardens, and how the sacred can be expressed in everyday nature.

What was learned? It seems there is a progression of experiences; immediate reactions are followed by feelings that linger even after leaving the site. Details of these discoveries are found in “The Sacred & Nearby Nature in Cities” (Wolf and Housley 2016b), and are highlighted here:

Design and Space

Certain physical traits and characteristics elicit a sense of heightened awareness and inner reflection. The terms used to describe physical space capture spatial perceptions that differ from most urban spaces (Table 1). An important aspect is a feeling of comfort or security, making it possible for one to let down one's guard, being mindful of the surroundings and loved ones, and nurturing one's thoughts.

Sensory Encounters

These are perhaps the most direct and memorable experiences, the rare opportunity to be in the moment and enjoy the simplest pleasures that nature provides. Some reactions are physical, such as the sun's warmth, bird sounds, the change of seasons, or simply quiet. Other terms describe personal reactions, such as calm and peaceful. Others are about engagement, about being drawn into the character of the space, such as fascination and stimulating.

"Gentle, peaceful breeze blows the cares away. Isn't it profound how nature can calm the spirit and refresh you? It is no wonder God created nature."

—Mount Washington Arboretum, Baltimore, MD

"The cool breezes blow against my tear-shed face, and my eyes will soon close. I shall let the sounds of the waterfall fill my soul, the bright colors of spring blooms chase away my blues for just a little while."

—Garden of Little Angels, Franklin Square Hospital Center, Baltimore County, MD

Experiences Within

Accompanying the appreciation of built form and associated sensations is a conscious awareness of a different frame of mind or mood from when one first entered the space. The visitor's experience morphs from a reaction to physical place to a broader mindfulness and introspection. Meditation, reflection, and contemplation are often part of the evolution within a sacred encounter.

"Always a quiet and restful place, no matter what is happening around and inside me. Peace is in the air here. I breathe it in when I am here, and I can smell it in the wood of the bench."

—St. Anthony of Padua Church, Falls Church, VA

"This is a reservoir of peace in a busy world. It gives one the possibility to hear the spirit within."

—Kids on the Hill Sculpture Park, Baltimore, MD

Initial Restorative Affects

A shift to a contemplative mood is accompanied by a realization of benefit to mind and body. Many studies about nature and restorative experiences show that fairly brief encounters with outdoor spaces (just minutes actually) can reset a sense of satisfaction and boost mental function. While in the nature space, the visitor experiences a cleansing of mental clutter and body tenseness. One transitions to more calm, less stressed mental and physical states.

“This is the most healing place I know...I listen to the trees say “shhhhhhh” and I trust the quietness. I feel my hair brush my face, and I realize how affected I am by things I can’t even see, things greater than me.”

—Chesapeake Bay Foundation, Annapolis, MD

Enduring Change

The restorative mood often continues after one leaves the space and re-enters the busyness of life. The effects of the sacred space experience are portable, and continue for some time beyond the direct encounter. Some people will “self-dose” with intentional experiences, seeking to set up a continuous flow of positive outcomes across multiple visits. While having the occasional, or a single sacred space in a community may be beneficial, having a system of such spaces is a valuable community asset (Wolf and Brinkley 2016).

“I leave feeling more peaceful, refreshed, better than when I arrived. How thankful I am.”

—Thanksgiving Place, Washington, D.C.

“I am going to believe in myself today and make something happen. It’s time.”

—Garden at Cedar Hill, Washington, D.C.

Community and Culture

Most sacred spaces also have a social dimension. This is expressed in two ways. First, sharing the experience with loved ones (friends, family, and appreciated neighbors) is important. Journal entries often express appreciation for the closest personal relationships. On another level, being part of a community of people (be they neighbors, or members of an organization) that work together to steward a site enhances the experience. Shared land care, celebrations, and recognitions are all joint experiences of place that promote greater social cohesion, and may facilitate interactions of people who may not normally engage with each other.

Table 1. A Civic Sacred Vocabulary

<p>refuge compatible comfort safety & refuge sense of place sanctuary</p>	<p>quiet, intimate sun shining (brightness & warmth) sounds (wind, birds) water coolness & sound nature episodes (spring bloom, bird return, fall color) alive</p>	<p>peaceful, calm stillness meditation reflection immersed (re)connect sense of guidance ponder deep breathing safe mourning playground for the soul</p>	<p>serenity calming revitalized cleansing mindful deeper awareness mind and body “reset” restorative creative beginnings short retreat reconciliation reverence respite</p>	<p>self-discovery de-stress healing, health affirmation of cycles of life & death renewal, hope memories refreshes creativity feel cleansed connect to something bigger than self universal</p>	<p>celebration familiar inclusive cherished commitment stories friendship memorial sharing differences respect legacy monument cultural cues ceremony</p>
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“We saw a bird that we tried to catch. A fun place to dig with sticks, looking for worms. We came here to see other people in the neighborhood.”

—Kids on the Hill Sculpture Park, Baltimore, MD

A Civic Sacred Vocabulary

The Foundation’s explorations revealed words and phrases that embrace the notion of the civic sacred (Table 1), and are some of the most thoughtful and symbolic in the English language. As would be expected, some of the words align with more traditional interpretations of spirituality or religion. But many expand understanding of how people encounter and experience sacred space in an everyday way, and thus are appropriate in secular settings.

“...with my work colleagues I’ll say something, and they hook into it or they don’t. That lets me know where to take the idea, or just drop it. Usually I don’t use the word ‘sacred’, but use beauty, serenity, relaxation. They can connect to these words and then we can talk more directly.”

—Environmental planner in public agency

Design Recommendations

While in the London garden Tom and Kitty Stoner immediately recognized that character of space affects mood and emotion. That experience sparked an exploration of the physical forms that can contribute to contemplative, mindful nature settings. In the early years, the Foundation founders and staff read the writings of garden, landscape, and urban design professionals. In the first garden-funding cycles of the 1990s, the foundation also observed that spatial patterns were emerging across the gardens, the result of interactions between design professionals and community members who participated in the design process. In time, the foundation crafted design recommendations for new projects. These design elements foster the flow of experience, and are found in cherished urban green spaces all around the world.

Portal: An archway, gate, stand of trees or other marker indicates a clear transition (Figure 3). One moves from urban bustle to a calmer, reflective space.

Path: Whether linear, or more meandering, a path allows one to focus attention and achieve mindfulness within the surroundings (Figure 4). Labyrinths promote contemplative walking, and can be installed in fairly small places to expand the use of a modest site.

"I experience the labyrinth...it honors a need for introspection and stillness. It is a place to acknowledge illness and healing, death and birth and pain, a place to face fear, listen to an inner voice, seek hope or faith or perhaps take a breath."

—Amazing Port Street Sacred Commons, East Baltimore, MD

Destination: An appealing focus or end point draws a person into the welcoming space. Carefully crafted features can encourage quiet, fascination, joy, and spiritual connections. This might be a distinctive planting, a water feature, or art (Figure 5).

Surround: Materials, such as plantings, fencing, or trees, help create a sense of boundary and enclosure (Figure 6). Portal, path, and destination invite one to experience a space; the sense of surround promotes a sense of being away.

These elements are not meant to be a design formula. Unique interpretations are seen across the completed OSSP gardens. There is a sense of variety within unity, that is, there are infinite possibilities of design and nature expression. For instance, participatory design has revealed meaningful details that recall unique characteristics or remembrances of a community, or the symbols and important messages of different cultural groups. Or there can be a linked set



Figure 3: A portal marks entry into a meaningful nature space.

Photo by Len Spoden, used with permission.



Figure 4: A path encourages one to focus attention and movement.

Photo by Dave Harp, used with permission.



Figure 5: An appealing feature or object draws a person into the welcoming space.

Photo by Len Spoden , used with permission.



Figure 6: A sense of boundary and enclosure can promote a sense of being away.

Photo by Dave Harp, used with permission.

of civic sacred spaces within a community, all connected in concept, but each having somewhat different features, characteristics, or user groups.

The Foundation provides a bench for each of its sponsored gardens. The seating invites visitors to pause, sit, breathe, and to be present in the moment and space. The benches are built by inmates in a job skills program at the Maryland Western Correctional Institution and are made from reclaimed wood. A notebook, tucked in a shelf under the bench seat, encourages visitors to write about their experience. Thousands of journal entries have been transcribed. The anonymous writings share reflections that attest to the values of having a place to connect with loved ones, to be able to take time to reflect on emotions and needs, and to be in nature.

“No signs, no fences, no restrictions. Just a lovely place to sit.”

—Garden at Cedar Hill, Washington, DC

Turning to Research

The Foundation has provided fiscal support, but is equally committed to being an active partner in the planning and construction of the gardens, including design consultation, interactions with Firesouls, participation in design charrettes, and attendance at garden dedications and celebrations.

It became abundantly clear from these experiences, and from the journals, that spiritual, mental, and physical well-being, and community cohesion benefits emerge when people have access to nearby nature. Visitors confirmed that even the smallest urban green space can provide respite from the daily stresses of life, as well as offering the space to cope with more significant challenges. Further, the benefits of nature can be realized across all socioeconomic demographics.

The Foundation eventually became interested in the empirical studies that might align with their observations. They wanted to know: “What can science tell us about the Nature Sacred experience?”

“I may not be cured when I leave here, but time in this garden has healed me.”

—University of Maryland Baltimore Washington Medical Center, Glen Burnie, MD

Research Briefings

The first step was to scan across completed studies that relate to the health benefits of small-scale nature experiences and publish a series of research briefings. The reports sort findings by topics that correspond to garden and user observations (Figure 7).



Figure 7: A collection of topical research briefings for urban professionals and thought leaders.
Photo by TKF Foundation, used with permission.

Feeling Stressed?: Demonstrates how frequent, short-term experiences of nearby nature can help reduce both mental and physical stress (Wolf and Housley 2013).

Reflect and Restore: Describes how brief encounters with nearby nature can improve our short and longer-term mental capacities, including greater mindfulness, reduced depression, and improved cognitive performance (Wolf and Housley 2014b).

Older Adults Benefits: Reviews current knowledge about older adults' health and lifestyles, nature access, and community design (Wolf and Housley 2016a).

Environmental Equality: Encourages communities to commit to equal access to nearby nature for all residents to assure better health and wellness (Wolf and Housley 2014a).

National Program of Integrated Design and Research

After decades of philanthropic work, the family Foundation faced critical decisions about its future. In 2010 the board of directors made the decision to sunset the organization and use remaining funds to launch a set of projects that would integrate design and research, and gain attention of thought leaders and urban policymakers. A national announcement for planning grants resulted in 12 awards selected from 167 applications. A later call for full project proposals generated more than 40 applications, and six projects were selected. The



Figure 8: This healing garden serves patients and staff at a Legacy Health hospital in Portland, Oregon.

Photo by Legacy Health, Portland, Oregon.



Figure 9: A walkway floats above a historic cemetery, restored to a native meadow in Brooklyn, New York.

Photo by Menelik Puryear, used with permission.



Figure 10: Space frames in a Joplin, Missouri, memory garden symbolize tornado-destroyed homes.

Photo by Giles Ashford, used with permission.



Figure 11: Military patients and loved ones have access to a wooded ravine during treatment at the Walter Reed National Military Medical Center in Maryland.

Photo by Lisa Helfert, used with permission.

national Nature Sacred program was launched!

Designers have worked with user communities to create new gardens, and each has an associated team of researchers that are studying social and therapeutic effects. Some of the sites are intended to be a place of respite for people who encounter challenges in everyday life, while others are places that are built in direct response to a destructive event. At this time (mid 2018) the gardens have been built and dedicated, and the associated research is underway. Here are highlights of the portfolio:

Green Healing—Legacy Emanuel Medical Center

Legacy Health is a nonprofit health system with six hospitals serving the Portland, OR, community and emphasizes patient, family, and employee centered care. A new four-season terrace garden serves multiple patient groups (Figure 8). Research questions focus on hospital staff health, patient healing, and how users engage with the space.

Metro Biodiversity—Brooklyn Naval Cemetery Landscape

The historic Brooklyn Naval Cemetery is located at the intersection of the Brooklyn Greenway and the Brooklyn, NY, Naval Yard redevelopment project. High school students and residents of a nonprofit supportive housing center are collaborating in the restoration of the 1.7-acre site, introducing a native plant meadow (Figure 9). Research questions focus on student learning and life skills, as well as changes in nearby community services clients.

City Resilience—Joplin, Missouri

In May 2011 an EF5 multiple-vortex tornado struck Joplin, MO, devastating wide swaths of the city. Cunningham Park commemorates the energetic and innovative reconstruction of the community (Figure 10). Social scientists are exploring how a nature place aids people who have experienced an acute (that is, rapid and dramatic) crisis in their community.

PTSD & Recovery— The Green Road at Walter Reed National Military Medical Center

Many of the men and women who served in Iraq and Afghanistan are suffering from severe physical injuries, as well as traumatic brain injuries and stress, including post-traumatic stress disorder (PTSD). More holistic treatments and therapies are emerging that incorporate patient-centered care, healing buildings, nature, art, and spirituality (Figure 11). Physical, mental, and social measures are being used to determine outcomes as military patients access a wooded ravine and immerse in nature.

Figure 12: Public housing residents and volunteers restore a cherished community garden in Queens, New York.

Photo by Giles Ashford, used with permission.





Hurricane Recovery—Queens, New York

Hurricane Sandy ripped through New York City in October 2012. A beloved community garden has been reconstructed by New York public housing residents in Rockaway, Queens (Figure 12). Similar to the Joplin garden, research is exploring how nature, using a user-based participatory design and construction process, can contribute to community resilience and support individual recovery from crisis.

Urban Distress— Exploring Cognitive and Immune System Outcomes

No garden is being built for this project. The team is using imagery from existing OSSPs to conduct several studies that explore the underlying patterns of how the human brain reacts to nature settings. Using cognitive and neuroscience methods, research is exploring why human health improves with nature experiences and how to optimize those outcomes.

What Has Been Learned?

Tom and Kitty Stoner, in their initial garden experiences, sensed the importance of contemplative green spaces for individuals and communities. The Foundation's purpose and activities have evolved. Here are some key discoveries, and these apply to many communities:

Health and the Sacred

While acknowledged intuitively for centuries, details of the healthful influences of nature are now confirmed by extensive scientific evidence (University of Washington 2016). In the specific context of OSSPs, time spent in nature can ease the stress of modern lifestyles, particularly in cities, and support mental health and wellness. Yet, there can be so much more to these encounters, as the “thick experiences” of particular nature settings move one to another dimension, including feelings of the sacred. While some people may acknowledge the sacredness of wild spaces beyond the city (Lindland et al. 2015) or religious centers, the TKF Foundation has actively explored and supported how small gardens and nature within community can nurture the civic sacred in everyday life.

“No matter where we go in the world, no matter how much ‘progress’ our society achieves, we will always need open places filled with nature that let us recharge our soul and see the world in a fresh light.”

—Amazing Port Street Sacred Commons, East Baltimore, MD

Diversity of Life Challenges

The enthusiastic response to the Nature Sacred call for integrated design, and research revealed the scope of challenges that people experience in modern life. In addition to the awards, proposals included projects that addressed the needs of underserved communities, patients in medical care and treatment, refugees attempting to integrate in a community, rehabilitation centers, and schools serving both traditional and high-needs students. Across these situations people face life challenges that are both short-term and persistent. It is likely that millions of people are attempting to cope with similar circumstances. The experience of nature, even if brief, can introduce a state of mindfulness that helps one to sort through ideas or challenges, and prepare for what needs to be done.

“Just for today I am grateful for being alive. I am blessed to be able to think clearly without the use of a drug regulating my mind. Thank you, God, for your many blessings and for your strength to make it through this day.”

—Amazing Port Street Sacred Commons, Baltimore, MD

“I am a survivor of traumatic brain injury. My life was changed 2 ½ years ago by a careless driver. It is not over; it is just different. I am still becoming acquainted with the new me and trying to discover where I should be and what I should do.”

—Kernan Rehabilitation Hospital, Baltimore, MD

Design for Meaning

Each of the gardens supported by the TKF Foundation is a unique physical form that has emerged from a complex and engaging process. Some gardens have been launched by deep hurt within a community, while others are offered as a gesture of care by a local organization. Firesouls are the people who mobilize resources and people and act as the interface between community interests and foundation programs. The design elements of portal, path, destination, and surround are a starting point for design, and have been the attributes of ageless sacred spaces. Given recent interest in nature and health, cities may introduce parks, trails, and gardens to provide options for physical activity or food growing. Observations from more than 100 OSSPs suggests that there is also a need for places that generate deeper meaning and restorative potential.

“A place for thought. A place for bliss. A place to reflect on the past. A place to contemplate the future.”

—Western Correctional Institution, Cumberland, Maryland, MD

Need for Greater Investment

The initial garden projects and Nature Sacred research (while still underway) indicate that it is important for people to have access to nature spaces that are within close proximity to homes and accessible from other everyday places of urban life. Small green spaces are not just pretty; they are essential places that can help people cope with adversity and can support social resilience. And from an economic standpoint, it is likely that OSSPs are a modest expense for the degree of public benefit they provide. The Foundation has several visions for the application of its work. More health organizations may come to recognize the importance of small, intentionally designed parks as social determinants of health and be more open to funding outcomes research. Policymakers may be compelled to include OSSPs in planning and investment for public services, incorporating gardens into city systems (such as transit or schools) so that small parks are readily available throughout a city (Wolf and Brinkley 2016).

“Today I begin a new chapter in my life—a chapter of healing, not from pains, sickness or wounds, but from my internal world. The garden represents peace and comfort. I come here to...find purpose in life, and the garden helped.”

—Whitman-Walker Clinic, Washington, D.C.

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Beyond Trees: Growing International Stewards in Nontraditional Ways

Adrina C. Bardekjian¹ and Liza Paqueo²

1. Tree Canada and Faculty of Forestry, University of British Columbia, Montreal, Quebec
2. USDA Forest Service, Washington, D.C.

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Us, growing stewards
Urban forests: beyond trees
Hope for the future.

More than half of the world's population lives in urban areas. By 2050, that number is expected to increase to at least 70 percent—and the densest of these areas will be concentrated in Asia and Africa. Cities around the world are feeling the strain of increasing population density. Unplanned urban growth has placed heavy pressures on resources and infrastructure. This intensification has led to land use and tenure issues, rising poverty and unemployment, an increasing gap in wealth distribution, and further marginalization of disinvested populations.

Approximately 1 billion urban (and peri-urban) dwellers live in informal settlements or slums (Ooi and Phua 2007) with no access to basic services, green spaces, food security, and safety. In addition, many of these communities have become more vulnerable to destructive natural and climate-related disasters, diseases, and other ecological and social stresses.

Natural resource managers are also facing a widening set of challenges. For example, cities account for 70 percent of global energy use; energy costs are skyrocketing (United Nations University, n.d.). Many cities are encroaching into surrounding wildlands, threatening biodiversity (UNEP 2005). Conversely, wildland fires are destroying nearby communities (USDA Forest Service, n.d.). There is also a growing disconnect between natural resources and communities, particularly the current and next generations of young people. Nearly 2 billion of the world's youth live in developing countries, and most of that age group live in cities (United Nations 2016). By 2030, 60 percent of urban residents will be under the age of 18 (Grant 2012). Lack of accessible green spaces in many cities around the world have led to unmanaged recreation, violence and health challenges such as asthma among young people. In addition, this block of young people is often excluded from many civic engagement and participatory processes. As a result, there is an opportunity to grow leaders and stewards in communities.

Hope to mitigate these challenges may lie in urban natural resources and their sound and sustainable management. The public and private sectors are shifting gears. Many cities in the global north (e.g., Chicago, Louisville, San Francisco, Portland, Dallas, Toronto, Montreal, Winnipeg, and Vancouver), are harnessing the power of *green*: green thinking, green education, green infrastructure, and green livelihoods. The idea growing in cities worldwide is that by developing urban natural resource programs, one can hope to mitigate or decelerate many of the effects of rapid urban intensification and population growth. Natural resource managers, nongovernment organizations, and

community-based organizations realize (or are beginning to understand) the importance of improving lives in cities by harnessing ecosystem services—including their economic, socio-ecological, and health benefits—derived from trees, wetlands, parks, and other green spaces.

Green infrastructure is one dimension in a basket of solutions needed to address the pressures associated with urban population growth. The dominant narrative in urban forestry focuses on trees and technical applied practice. To build democracy, neighborhood pride and unity, ecological literacy, and market innovation, we need better, more transdisciplinary engagement among professionals who can collaborate across multiple scales—in other words—beyond trees! Engaging communities through stewardship, partnership building, and conservation education are methods employed to do this.

Additionally, nontraditional thinking and partnership building can help buttress any urban related programs. It can leverage more resources to maintain these programs over a long period of time and create needed social investments to carry the new green ethos into the future. Collaborating with faith-based organizations, community activists, populations with special needs and disabilities, first responders, disaster relief managers, and other nonenvironmental based groups are some examples of nontraditional partnerships at the local level. At the global scale, creating a worldwide network of practitioners is another way.

The USDA Forest Service International Programs and its partners understand the power of building networks and working collaboratively across landscapes and borders. The United States, Canada, and Mexico have worked together for almost 60 years on advancing sustainable forest management through the North American Forest Commission (NAFC), one of six regional forestry commissions of the United Nations Food and Agriculture Organization. The three countries carry out this work via several technical and topical working groups, including the recently implemented Urban Forest Programs Working Group. Through NAFC, the forest management agencies are able to share tools, information, and best practices for urban settings across the continent and learn from other forestry commissions.

Additionally, International Programs has, for nearly 20 years, brought together natural resource professionals from around the world to participate in intensive and interactive seminars, each of which focuses on a specific topic. The idea is less about highlighting what the United States is doing, but more on building a growing network of practitioners.

Currently, there are 10 annual seminars. The topics covered are: urban forestry, landscape restoration, watershed management, livestock grazing, climate change, protected areas, sustainable tourism, disaster management, and mining. A 2016 meeting of the Urban Forest Programs Working Group of

NAFC led to the development of the International Seminar on Urban Forestry³ a year later (USDA Forest Service 2017). This pilot seminar, titled “Beyond Trees,” took place in Chicago, IL, and New York City, NY. Nineteen participants from 16 different countries (Armenia, Canada, Mexico, Georgia, West Bank, Jordan, Morocco, Uganda, Philippines, Bhutan, Ethiopia, Jamaica, Colombia, Malawi, Tanzania, and Dominican Republic) spent 2 weeks examining various methodologies, tools, and partnerships (Bardekjian, 2017, 2018; Photos and videos 2017; Video introductions 2017). While the agenda included exploration of urban forestry practices and tools as such i-Tree and the Stewardship Mapping and Assessment Project (STEW-MAP), it focused mainly on how nontraditional partnerships and efforts can be effective in improving lives in urban communities.

Takeaways from the USDA Forest Service International Programs

As past participants agree, there are many lessons that can be learned from the various seminars offered by the Forest Service. From the 2017 urban forestry testimonials, the main takeaways included: 1) engaging communities where they live to foster youth development and community stewardship; 2) facilitating access to food, education, and community greenspaces; and 3) collaborating locally and globally to achieve common goals.

Engaging Communities Where They Live to Foster Youth Development and Community Stewardship

As a cornerstone for overall programming, engaging communities where they live highlighted the need for better environmental awareness and integrated education programs at the local level. Environmental programs that considered the social needs of local youth were particularly represented during the Urban Forestry Seminar. These narratives are rarely woven together in dominant urban forestry and urban ecology discourses. Young people form a majority of the demographics in many cities around the world. One way to ensure the long-term sustainability of urban natural resources is by growing stewards through youth and community engagement. Seminar participants observed the different types of youth related efforts.

Nontraditional ways of engaging youth can be successful gateways into growing future stewards. One of International Programs’ partners, Rocking the Boat, a nonprofit organization located in the South Bronx, was originally founded to encourage youth in one of New York City’s most under-resourced communities to build boats and eventually row them on the

3. Now called International Seminar on Urban Forestry and Community Engagement.



Figure 1: A group at Rocking the Boat, in South Bronx, with thank you sign.

Photo by Pamela Foster, used with permission.

Bronx River (Figure 1). The organization mentors the students to be self-confident, to problem-solve, and to become aware of the ecosystem around them. As a result, the unintended consequence of this group has been to develop not just robust environmental activities, but also environmental students and leaders. Seminar participants had an opportunity to have young people who have gone through the programs at Rocking the Boat be the docents for a day out rowing on the river.

International Programs also helps raise awareness among students and teachers in Chicago's underserved areas. At Seward Elementary Communication Arts Academy, seminar participants saw first hand how bringing wildlife icons, such as raptors, directly to the school gymnasium provided an inspiring opportunity to launch a lively discussion about habitat, behavior and sustainable environments—the physical proximity left an impression on the young students growing up in a community prone to gang violence.

Additionally, engaging the broader community is imperative to maintain the connection to land and people—and hope. The fortitude of community stewardship was best exemplified in Gary, IN. Participants experienced the destitute aftermath of a once industrialized city and how it negatively impacts the social succession of a community once industry departs. Participants learned how the City of Gary is stabilizing neighborhoods through community green infrastructure plans, accessible waterfronts, and historical preservation and nature tours. The long-term commitment and passion of some of the



Figure 2: A visit to the Grange rooftop garden in New York City.

Photo by Pamela Foster, used with permission.

volunteers focused on maintaining housing and beautifying neighborhoods through creative methods such as painting boarded-up homes.

Facilitating Access to Food, Education, and Community Greenspaces

Many people live in food deserts where access to fresh food is scarce. As the relationship between public health and urban greenspaces becomes more accepted and understood, urban residents need access to resources. Urban agriculture plays an important role in connecting communities to nature and getting people to think about where their food is grown. At Brooklyn Grange Rooftop Farm in New York City, participants discussed the necessity of educating inner city youth about their physical health and nutrition that can impact mental health as well (Figure 2). SWALE, New York City's floating food forest, is an excellent model for education projects about permaculture (Figure 3). Built on a repurposed barge, the SWALE garden serves as an outdoor mobile classroom to raise awareness about food security.

Access to education is too often a privilege that some communities do not have. Stewardship begins with awareness and a kindling of interest. In New York City, seminar participants learned about providing access to youth across all income strata. Ten years ago, International Programs began a partnership with the Cell Motion Biobus, which brings science to the five boroughs of New York City. Children who would otherwise have little access



Figure 3: Built on a repurposed barge, SWALE floating food forest serves as an outdoor mobile classroom to raise awareness about food security.

Photo by Adrina C. Bardekjian, used with permission.

to laboratory tools and enriched scientific engagement are encouraged to explore and learn within the safe, hands-on confines of the bus. As a result of this partnership, the Biobus and International Programs worked with the Princess Basma Youth Resource Center in the Hashemite Kingdom of Jordan to create a similar mobile science laboratory that would focus on environmental awareness. Led by two female scientists, one of who shared her experiences at the Urban Forestry Seminar, the bus, baptized *Eureka!*, provides conservation science curricula and experiential learning to students across the Kingdom. To date, this bus has reached tens of thousands of youth, nearly half of which have been displaced from their homes in Syria and Iraq.

Education for underserved communities is integral for public well-being. This includes engaging those whose voices are often overlooked in environmental science discourses. Being able to reach people in ways that resonate is key for sustainable healthy communities. Creative pathways can be employed to include everyone in the process of conservation. In Chicago, for example, the Forest Service works with El Valor—a local Mexican-American community organization with programs focused on engaging adults and children with cognitive and physical disabilities—to raise environmental awareness. Integrating symbols that tie cultural connections to land stewardship is a cornerstone of the El Valor programming for underserved and challenged communities. For decades, the International Programs office

has highlighted the life cycle of the monarch butterfly and encouraged the community to raise this charismatic species. The monarch butterfly is used as a cultural metaphor depicting migration and the long journey home. As a result, thousands of families are now valuing the importance of small pollinator patches of green and becoming more aware of the nature in their own backyards.

Access to greenspace facilitates community ties, awareness, and stewardship, and as such, community gardens play an important role in a healthy social ecology. In New York City, participants were introduced to Gardens Rising, a community garden coalition dedicated to building green infrastructure to reduce stormwater flooding on the Lower East Side. Community gardens offer a haven for shared assembly, a place of learning and access to environmental health benefits. Participants had the opportunity to discuss with the coalition the variety of challenges that have arisen, including threats of increased development by the City, distribution of water resources, and maintenance and litigation measures due to competing interests.

Collaborating Locally and Globally to Achieve Common Goals

Across the United States, there are over 130 million acres (53 million ha) of urban forests. As more people migrate into cities, the need to conserve urban and peri-urban green spaces for the benefits they confer also grows. Worldwide, the Forest Service works with local government, private and non-governmental organizations, community groups, educational institutions, and nontraditional partners to manage and care for urban forests for their intrinsic environmental services—such as water, air, habitat—but also for their social and economic values. Specific challenges to natural resource management and urban communities identified by participants included:

- Engaging governments and communities in urban forest stewardship and education within cities that have competing priorities such as poverty and political unrest.
- Being inclusive with respect to diverse cultures, ethnicities, religions, and economic backgrounds.
- Engaging people that have limited access to education.
- Moving away from science as an elitist activity or concept and making it accessible and fun.

- Understanding the similarities and differences among departments at various levels of government and learning from one another to bridge gaps.

To overcome these challenges and to move toward a healthy (global) society, both socially and environmentally, communicating locally and internationally to share knowledge will require multiscale network building.

Fostering nontraditional partnerships is an effective method to create stewards for land, water, food, and environmental sustainability. In addition to collaborating with social service agencies like El Valor, seminar participants were introduced to the notion of engaging faith-based organizations like Faith in Place and Sacred Keepers, to deliver environmental conservation programs by reaching diverse people of all faiths, ethnicities, and sexual orientations. At the root of Faith in Place is the belief that storytelling and the power of narrative connects people to people and people to nature. The underlying take-away being that societal leaders need to be more attentive to the priorities of diverse communities and racial equity, and explore multiple avenues of entry into environmental conservation dialogues.

Another aspect of multiscale network building is to understand resiliency and adaptation in the pursuit of civic engagement. Communities are faced with multiple and diverse environmental and economic challenges and building social and ecological resiliency and preparedness helps mitigate fear in the face of adversity. In south Chicago, seminar participants were introduced to Jardincito—a community garden project fostering with environmental stewardship and resiliency against challenges of poverty and gang violence. One recurring question for participants here was, given that some communities have systemic challenges (e.g., poverty, violence, social unrest), what are the motivations for engaging neighborhoods in urban forest stewardship and education? Multiscale partnerships are one way to begin unpacking these concerns. In New York City, participants learned that land-use management is a three-way partnership between the USDA Forest Service, The Natural Areas Conservancy, and the NYC Parks Department. The success of numerous programs can be attributed to how public-private partnerships are developed to leverage resources and offer an equitable balance for both green and gray infrastructure.

Lastly, understanding civic capacity to build strategies for community development at the local level is imperative for effective engagement with natural resource managers, funders, policymakers, educators, stewardship groups, and the public. People can be positive agents of change through social, spatial, and temporal interactions that underlie community connectivity. Capturing these connections and motivations is a good place to start.

In New York City, participants learned about the STEW-MAP project, that captures stewardship information and indicators of social resilience such as place attachment, collective identity, social cohesion, social networks, and knowledge exchange. Mapping provides legitimacy to stewardship groups, without whom landscapes may not be sustained.

Discussion

To respond and be resilient to the pressures of urbanization, population growth, and globalization, countries would benefit from developing programs that are tailored toward cities, their residents, and natural resources. It is also important to integrate green infrastructure, green thinking, and green learning into urban planning, management, and education. One way to move forward on this avenue is through partnerships across all sectors (local, state, and national). Another way is through the dynamic exchange of ideas with organizations in other cities around the world.

For nearly 20 years, the Forest Service International Programs and its partners have built networks of professionals from all parts of the globe through its international seminars. The cornerstone of the International Seminar on Urban Forestry is transdisciplinary learning through international collaboration. Participants have the opportunity to meet people from around the world and become exposed to social issues, environmental challenges, and opportunities to which they would normally not have access. They are also given various seeds of thinking and tools that can help develop a rich urban forest program—from tools that can quantify the ecosystem benefits of urban trees, to ways to engage future stewards of the urban environment.

Collective challenges to urban natural resource management that were identified by participants, included the lack of awareness and urban forestry education programs in their respective countries; disconnect between research initiatives and applied practice; lack of policies incorporating urban greening in infrastructure; increased residential and commercial development; absence of strategic approaches at federal and regional levels; lack of knowledge exchange between communities, across professions and among lawmakers; and lack of human and fiscal resources.

Like other workshops, the Urban Forestry Seminar has proven to be forward thinking and innovative with the hope that an international cadre of stewards deepens their own learning and continues to reach out to teach to others what they have learned. Participants range from early to mid-career decisionmakers, in positions able to reflect the changes needed for sustainable futures (government officials, community leaders, natural resource professionals, NGO managers, and practitioners). All participants

stated that they endeavor to share takeaways with community leaders and colleagues in their respective organizations and through professional social networks.

The implications of this can be seen in the action plans being undertaken and executed in the represented countries once participants return to their respective home. Examples of action from participation in the Urban Forestry Seminar are seen in Mexico, the Middle East, Philippines, and Canada.

Over the past 30 years, Mexico's population has nearly doubled, with urbanized areas increasing sixfold. Mexico City, the capital, is currently the fifth largest city in the world by population. In an effort to promote smarter, green development, improve planning, and connect urbanized populations to nature, the USDA Forest Service, in collaboration with the Davey Institute, has helped to develop i-Tree Eco for Mexico. This open-access tool provides local data that allows urban planners, land managers, and citizen scientists with the ability to quantify pollution reduction from trees, estimate their economic value, calculate stormwater absorption and cooling costs, and much more. After returning home from the seminar, the Mexican participant secured funding from the Mexico City government to conduct a pilot study using i-Tree Eco in reforested areas around the city. Other cities and municipalities throughout the country also hope to use the tool to promote science-based urban planning as well as engage communities.

The Palestinian Child Arts Center (PCAC) is one of the Forest Service's long-standing partners in the West Bank area of the Israeli-Occupied Territories. Through year-long engagements with youth, summer camps, and leadership opportunities, this organization works to utilize environmental education to increase youth awareness of the environment in Palestine, and to encourage positive and future-oriented thinking. Comprehensive exploration of environmental impact on people's livelihoods, and vice versa, led to unique and innovative solutions to complex multifaceted problems. A chief takeaway for this participant was the attention that government and community organizations placed on the environment. This indicated that the environment was not just for one entity to own, manage, or enjoy, rather it took a collective effort from the smallest local community, to the federal government to care for, protect, and preserve natural resources. This participant also appreciated the use of repurposed and reconstructed structures such as green roofs, urban garden plots, and vegetated old railroads, to transform often degraded parts of cities into enjoyable, livable landscapes. The hope is to create community gardens as a means to provide alternative recreation and enhance local livelihoods.

In the Philippines, the City of Puerto Princesa, the capital of the island of Palawan, is rapidly growing. Moreover, it has significant forestry resources and

a strong environmental ethic. Working with the U.S. Agency for International Development's urban program, Strengthening Urban Resilience for Growth with Equity (SURGE), the USDA Forest Service International Programs continues to work with the city on sustainable and inclusive economic growth. Specifically, it is supporting the local government in applying i-Tree tools. The local government official who represented the city at the seminar inspired more interest and commitment to urban forestry issues and to exploring the use of some of the models and tools learned at the seminar to encourage community engagement.

In Canada, leadership on urban forest stewardship is community driven through actions of nongovernmental organizations. Tree Canada, a national NGO dedicated to urban forestry, is the Secretariat for the Canadian Urban Forest Network (CUFN) and Strategy (CUFS).³ The CUFS provides a guide for urban forestry activities in Canada through its five working groups: National Infrastructure, Communications, Research, Techniques and Technologies, Professional Development. In the iteration of the guide prepared for the 2019–2024 term, the strategy has been revised to be more socially inclusive based on the experiences of the Canadian participant at the seminar. These include advocating for alternative modes of education and creative communications, incorporating more inclusive community engagement strategies for long-term volunteer commitment, actively broadening the multidisciplinary Canadian Urban Forest Network to reach audiences that are currently under-represented, and encouraging the Canadian Forest Service to develop urban forest policies and mandates.

Despite the successful seminar model of bringing people together to foster an international learning commons, the main questions that pervade include: How do we move forward into the next decade to ensure that cities are becoming more resilient? What can we do to not to be outpaced by urbanization trends? We need to consider the importance of integrated cultural connections to nature and the diversity of ecological and social histories and legacies that have impacted land succession. The impact of these changes are embedded in the social consciousness of communities. This raises question about equity and power and how these issues underlie land use, ownership, and governance. As such, there is a need to embrace transdisciplinarity in how we live, work, and play.

The Forest Service International Programs offers participants an opportunity to learn about diverse points of view in environmental discourses—in this case urban forestry and stewardship. A key takeaway from the seminars is that such transdisciplinarity can lead to unexpected outcomes, and perhaps better than that which was originally intended.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

How Arts and Cultural Strategies Can Accelerate Environmental Progress

Jamie Hand¹ and Alexis Frasz²

1. ArtPlace America, New York, New York

2. Helicon, New York, New York

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ArtPlace America (ArtPlace) is a 10-year consortium of a number of foundations, federal agencies, and financial institutions that works to position arts and culture as a core sector of comprehensive community planning and development. We do this work to help strengthen the social, physical, and economic fabric of communities. ArtPlace's efforts are largely focused around "creative placemaking," which describes projects in which art plays an intentional and integrated role in place-based community planning and development. This brings artists, arts organizations, and artistic activity into the suite of placemaking strategies pioneered by Jane Jacobs and her colleagues, who believed that community development must be locally informed, human-centric, and holistic (Jacobs 1961). In practice, this means having arts and culture represented alongside sectors like housing, transportation, public safety, and others—with each sector recognized as part of any healthy community; as requiring planning and investment from its community; and as having a responsibility to contribute to its community's overall future.

In 2016 and 2017, ArtPlace worked with research and strategy agency Helicon Collaborative (New York and California) to conduct research into the energy and environment sector. The research goal was to better understand and articulate how arts and culture can help provide solutions to the climate change and natural resource challenges that we—as individuals, as communities, as a nation, and as a planet—face today. The full report, "Farther, Faster, Together: How Arts and Culture Can Accelerate Environmental Progress," is now available at <https://www.artplaceamerica.org/blog/5-things-arts-can-do-environment> (accessed Feb. 16, 2018).

Since 2011, ArtPlace has had the honor to provide grant support to projects in communities of all sizes and contexts across the country, many of which show the ways that arts and culture can contribute to community resilience—whether by revealing where rising sea levels will appear in a neighborhood, or building social networks to better connect neighbors and resources after a hurricane. From this vantage point, we see clearly how arts and culture can spark community stewardship that revitalizes neighborhoods; restores nature; and helps prepare for, respond to, and recover from disturbances.

It is not only a natural disaster that requires resilience in its wake, however. Rapid economic shifts, policy changes, and legacies of disinvestment in infrastructure may not get the immediate headlines or offers of celebrity help, but they are all issues that can have dramatic or traumatic impacts on the people living in a place—particularly in low-income communities of color. As with natural disasters, these issues continue to challenge the current sets of circumstances and tools under which urban planning and development professionals are operating. We need communities that can withstand change, and arts and culture have repeatedly offered creative strategies to do exactly that.

Forthcoming research with Helicon seeks to document these approaches and disseminate them broadly within the environmental sector; excerpts of the results are shared here. Helicon's methodology involved a literature review of 522 academic and non-academic sources; identification and analysis of 103 art and culture projects across the United States that are addressing environmental issues in a community development context; 37 in-depth interviews with environmental and cultural leaders; and a working group of 26 people, convened in partnership with Grist and the Sierra Club, to review and refine the findings and identify concrete next steps to move this work forward. Quotes are from interviews unless otherwise noted.

Based on literature and input from environmental sector leaders, Helicon identified five critical leverage points for environmental progress and corresponding arts and cultural strategies that are helping to drive change in those areas. In this chapter, we preview three of these five areas and share a "bright spot" creative placemaking project to show how it can work on the ground in a community. Project summaries are based on interviews and consultation with the artists and partners involved, as well as secondary research where available.

Spark Public Demand for Change

Public demand shapes social norms and drives business and political actions, and the lack of strong public demand for change is one of the most significant barriers to environmental progress. Surveys show that climate change is typically viewed as non-urgent by the public relative to other concerns, such as health care and taxes (Pew 2014). Public pressure, when it does exist, has contributed to environmental wins such as the ban on fracking in New York State in 2014 (Graves 2016) and Florida voters' rejection of restrictions on rooftop solar in 2016 (Smith 2016). In California, strong grassroots mobilization drove the state's strict carbon pollution standards (Global Warming Solutions Act 2016).

Overall, however, the environmental sector has struggled to activate public demand for sustainability. Cognitive scientists show that people are motivated by things that feel emotionally resonant and personally salient (van der Linden et al. 2015), but environmental issues like energy or water policy often seem abstract and distant to everyday life (especially when they are presented in technical or advocacy language). In addition, when problems seem too big or seem hopeless, like climate change, people can become paralyzed and avoidant, which worsens the problem.

The environmental sector is looking for ways to make issues feel immediate, relevant, and personal. Part of this involves making people aware of sustainable alternatives, so that change feels possible and they can see their

agency in making it happen (Paramaguru 2013). Jodie Van Horn, Director of the Sierra Club's Ready for 100 campaign, explains, "The biggest challenge in building support for 100 percent renewable energy is that people don't know what it looks like. We need to create a cultural conversation about clean energy, not just a scientific one. We know that sweeping policy change will only follow an on-the-ground shift in public expectations. We can't just *tell* people wind and solar are better, and do economic impact studies about how they create jobs. People cannot imagine it unless it is visible. People need to see and feel it—how does my daily life change? How does my street feel different without cars?"

Creative Placemaking Can Spark Public Demand for Change

Through stories, metaphor, imagery, and physical experiences, arts and culture can evoke emotions and make abstract issues—such as climate change—become real and personal. For example, Ashland, MA, is the site of the Nyanza Chemical and Dye Co. plant, which was shut down in the 1970s and later designated a U.S. Environmental Protection Agency (U.S. EPA) Superfund site. Although the site was supposedly remediated to safe levels, residents continue to suffer from unusually high rates of rare cancers. In 2014, local artist Dan Borelli studied U.S. EPA data and then changed the colors of the town's streetlights to reflect the colors and concentrations of dye still present in the groundwater in various parts of town. He guided group walks around the town so that residents could see exactly where the dye was still present in their water. This brought the issue out of the shadows, helping people see themselves as united in a shared struggle. As a result of this experience, a group of residents is now fighting for further cleanup and safe siting of housing. Borelli says, "Information alone won't move people. Data on a Website is easy to ignore, but when people experience something viscerally in their built environment it changes them."

Social science agrees. Anthony Leiserowitz, Director of the Yale Project on Climate Change Communication at the Yale School of Forestry and Environmental Studies, advocates for using the arts for climate communications because they are "particularly great at connecting with the deeper parts of ourselves and [are] one of the most effective ways of engaging us emotionally" (Frasz 2016). Behavioral science confirms that engaging people experientially and emotionally is the precursor to changing perspectives and motivating action. Policy papers and data have their place in environmental communication, but they do not reach and influence people's emotions in the way that stories, images, and experiences can.

Art can also help visualize and prototype what a sustainable future could look and feel like, so that people believe change is possible and want to

Featured Project

Water Bar & Public Studio

Minnesota is the location of the headwaters of the Mississippi River watershed, which draws from 31 states. This means that the need for smart and fair water management is key for the state’s own communities, in addition to many others. There are long-standing tensions among different stakeholders in the state—like urban drinking water districts and rural agricultural producers—which are intensified by climate change, population growth, and ideological differences. State government and environmental groups are struggling to increase public awareness of and commitment to responsible water stewardship, let alone

bridge these deeper divides.

Water Bar was started by artists Colin Kloecker and Shanai Matteson as a way to engage people with water issues across geographical, social, and political divides. Matteson lives in Minneapolis but grew up in a small, conservative town at the headwaters, and knows firsthand that trying to “educate” people about environmental issues using data and admonitions (the common languages of science, policy, and advocacy) does not work. Matteson says, “Especially in this politically contentious time, you have to meet people where they are, around what matters most to them” (Figure 1).

Instead, Water Bar is a free bar that invites people in with a sign out that says “water is all we have.” “Water Tenders,” made up of a rotating cast of public officials, ecologists, activists, artists, and community members, serve water from various sites around the State. The casual, playful atmosphere attracts



Figure 1: Water Bar collaborates with Dakhóta lápi Okhódakičhiye and Healing Place Collaborative to teach about Dakota language and relationships to water and place at Owámni Falling Water Festival.

Photo by Water Bar, used with permission.



Figure 2: Water Bar reader, with essays by artists and information from local water utilities and nonprofit organizations.

Photo by Water Bar, used with permission.



Figure 3: Greensboro Water Resources and Guilford College collaborate to create and staff a mobile Water Bar for Elsewhere’s South Elm Projects.

Photo by Elsewhere, used with permission.

a range of people, from the curious passer-by to the committed activist, and engenders conversations between people that would not normally interact. Topics range depending on who is in the room—from water pollution to usage rights to climate-change related issues—but the artistic construct and welcoming space creates a context for truly human connections, regardless of sector, geography, or views. Matteson says, “As artists we can be ambiguous in a way that is fundamentally different from a government agency or an environmental group that has a specific agenda. It isn’t that we don’t have views, but we are not telling people what to think. It is ok if you have questions, or don’t know where you stand on something, or don’t agree.” In addition, because it is “play,” water tenders and patrons can break out of their official roles, often leading to new ideas or collaborations.

Cognitive scientists now confirm

Matteson’s intuition that getting people to connect with issues and each other on a personal and emotional level is how opinions and behavior are really shaped and changed. Water Bar, like many art experiences, meets people on the level of identity, values, vulnerabilities, and emotions.

Water Bar is now a sought-after resource and creative partner for civic and governmental organizations including the State Governor’s office, the City of Minneapolis Office of Sustainability, environmental organizations, watershed districts, and others statewide as they look to raise public awareness and solve complex water challenges by working across sectors (Figure 2). Water Bar has also become a community hub for artists and community activists looking to form collaborations and to develop new opportunities to work within broader water systems (Figure 3).

move toward it. Artists can also stimulate the curiosity of people who do not self-define as “environmentalists” by broadening the range of ways that the future can be imagined and created. Kate Wolford, president of the McKnight Foundation, notes: “Sometimes there is not a lot of trust in ‘environmental’ messengers in rural areas and post-industrial cities. Artists can be powerful influencers because art can cross boundaries and ideological barriers.”

Build Community Capacity and Agency

Low-income communities and communities of color are impacted more severely by all kinds of environmental issues—from being sites of toxic industries to being more vulnerable to the effects of climate change (Fairchild 2015). Lower-income people may depend on the land for their livelihood; lack resources to protect themselves from extreme weather events and rebuild; live in environments with fragile infrastructure; or be unable to cover the rising costs of food, transportation, and housing. Frequently, they face a combination of many factors. Miya Yoshitani, Executive Director of the Asian Pacific Environmental Network (APEN), says, “Climate change is a threat multiplier for inequality—increasing prices in housing, food, and transportation impact our communities first and worst. We cannot allow the solutions to climate change to be developed without input from the communities that are most impacted by it.... We need people in those communities to help design the equitable solutions for climate change now.”

Many in the environmental sector recognize the need to address these disproportionate environmental impacts (and the systemic forces that enable them to persist) and to ensure that these same communities directly benefit from sustainability solutions.³ Advocates for environmental equity argue that it is not enough to consider the needs of frontline communities within traditional planning processes—which in the environmental sector have historically been top-down and expert-driven, controlled by scientists, policymakers, or city planners—but that communities must be leaders in generating solutions and making decisions about their own futures.

Community planners, developers, and political leaders are becoming more interested in community-centered planning processes not only because these processes are more equitable, but because they also generate better solutions than top-down, expert driven processes (Movement Strategy Center 2015, Sherman 2016). Community members have first-hand knowl-

edge that can inform solutions, and fostering community leadership builds the capacity to both implement plans for change and the resilience to face unanticipated challenges in the future. Community-based planning

3. This has always been the focus of the environmental justice (EJ) segment of the sector, but it is now beginning to enter the more mainstream parts of the sector.

and design is outside of the realm of expertise or comfort of most policymakers and planners, so artists and creative community organizers can provide essential skills and knowledge.

Creative Placemaking Builds Community Capacity and Agency

It is common for creative placemaking projects to use cultural practices as a way to engage communities in planning, problem solving, and action around environmental issues. Incorporating storytelling, music, visual art, movement, and other creative methods into community processes can help shift the power dynamics between professional “experts” and community members, and encourage local residents to share more openly what they know and what they need. This can ensure solutions incorporate community-based knowledge and are culturally appropriate, making them more likely to be embraced and implemented.

The Gulf Future Coalition (GFC), a regional organizing network, and Mondo Bizarro, an artist collective, worked together to help Louisiana Gulf Coast residents decide how to allocate the settlement money from the 2015 British Petroleum oil spill. The planning process included local food, music, and storytelling, and incorporated creative planning techniques. According to participating artist Nick Slie, this “create[d] conditions for people to be authentically and genuinely involved in the dialogue, like we [were] talking with our own families.” The success of this process in engaging the community has had multiple ripple effects, and the Coastal Louisiana Protection Authority is now exploring ways of using art-based methods in planning on an ongoing basis (Slie et al. 2015).

Art can also develop communities’ capacity and power by putting people in touch with their own creative potential and reinforcing a community’s shared cultural identity. It is for this reason that many environmental justice groups include it as a part of their work. Frances Lucerna from El Puente, an environmental justice (EJ) group in Williamsburg, Brooklyn, that integrates the arts into its programs, explains: “Art helps people see themselves positively and tap into their own potential for creation. The arts help people realize ‘I can’—they are an antidote for disempowerment.” This sense of personal capacity to influence outcomes can be transformative for people that have been historically disenfranchised or disempowered.

Yoshitani says, “Culture is essential to environmental justice work because it is through food, music, art that you reach people’s hearts. We’re not an arts and culture organization, but it is embedded in all of the work we do. We must find ways to reach people that are meaningful, that inspire them.

Featured Project

Duwamish Revealed

The Duwamish River is Seattle's only river. In 2001 it was designated a U.S. EPA Superfund site, a result of decades of pollution from sewage overflows and industrial chemicals (Duwamish River Cleanup Coalition, n.d.). The communities surrounding the river are diverse—including communities of immigrants from Central and South America, Southeast Asia, and Africa—and largely low-income. Three Native tribes have ties to the river, including the Duwamish Tribe for whom the river is named. The river's toxicity is well known, and it has numerous health and environmental impacts on the surrounding area. The official Superfund

cleanup plan is massive and will continue over decades, yet, in the opinion of many local environmentalists, it does not go far enough.

Tenacious community residents and area environmental justice (EJ) groups have been working for years to educate people about the river's toxicity and advocate for cleanup. However, all but the most committed environmental activists saw the river as a lost cause, and many Seattleites avoided it or remained unaware of its existence.

In 2015, Seattle artists Sarah Kavage and Nicole Kistler realized that people's fear of and alienation from the river were hindering the ability of environmental



Figure 4: In a celebration of the Duwamish River's First Peoples, Raven, Willapa, and Haynisisoos canoe families from around the region paddled in to the Revealing Coast Salish Cultures Festival at the Duwamish Longhouse.

Photo by Robert Zverina, used with permission.



Figure 5: Aerialist Tanya Brno performs suspended by a crane above the Duwamish River in an illuminated moon created by sculptor Yuri Kinoshita. The performance was accompanied by Coast Salish flutist and storyteller Paul Che Oke Ten Wagner (Saanich Tribe).

Photo by Tom Reese, used with permission.

groups to generate public pressure for change. As Kavage says, “You can’t ask people to fight for something that they don’t care about.” Paradoxically, the communication methods used by EJ groups—highly technical information and warnings—actually perpetuated this sense of alienation and the widespread view that the river was “dead.”

Over the course of a year, the artists worked with a local EJ group Environmental Coalition of South Seattle (ECOSS) to design a creative celebration about and along the river. The intention was to help change perceptions of the river, through creating a context for the nearby residents and others from around the region to experience it in an alternative and more positive way (Figure 4). They hoped this might help build a broader constituency of people

motivated and inspired to fight for it to be cleaned up.

The summer-long celebration included artists from the communities that border the river and others in the city. It featured site specific sculpture, performance, participatory events, aerial performances, food, rituals honoring and blessing the river, traditional dancing, and expressions of specific cultures, such as Mexican lucha libre wrestling (Figure 5). Many immigrant groups living near the river created events to honor and share the particular ways that their cultures relate to rivers (Figure 6).

The festival and the organizing that took place to make it happen helped to shift and deepen people’s connections to the river, and vastly expanded what people could imagine for it. It activated people who do not self-identify as “environmentalists,” and it changed the way that environmental activists thought about community engagement. Kistler says, “It helped folks to see that there are other ways to engage people in caring for the river, besides picking up trash and cutting blackberry bushes.”



Figure 6: Traditional Khmer lantern lighting ceremony at the Duwamish Revealed Water Festival.

Photo by Vansica Sun, used with permission.

We would not have participation from our members without art.”

In addition, cultural spaces and activities provide contexts for building the “social infrastructure” that enables communities to respond effectively to environmental challenges as they occur and change as needed. Eric Klinenberg, Director of the Institute for Public Knowledge at New York University, argues that community cohesion is essential for resilience in difficult times: “Increasingly, governments and disaster planners are recognizing the importance of social infrastructure: the people, places, and institutions that foster cohesion and support” (Klinenberg 2013).

Enrich and Activate the Built Environment

Massive investments are needed to create new sustainable infrastructure—smart-grids; building weatherization; coastal wetland restoration; climate resilient infrastructure; stormwater, clean water, and food and waste distribution systems and more (American Society of Civil Engineers 2016). Over the next 20 years, it will cost at least \$1 trillion to fix the water system (Doyle et al. 2014) and \$12.1 trillion to build the renewable energy infrastructure we need (Ceres 2016).

Infrastructure solutions that provide co-benefits (Hansen and Pauleit 2014), or serve “two needs with one deed,” can make resources go farther and attract a broader coalition of supporters (Mazur 2015). This can prevent having to choose between many legitimate needs, and provide more possibilities for accessing public or philanthropic funds available for a particular purpose, such as resilience or water quality. Research has found that infrastructure that provides economic and social benefits is better at motivating “public, private and financial actions to address climate change” even “across ideological divides” than pitches for investments on an environmental basis alone (Bain et al. 2016). The U.S. Green Building Council, for example, has found that the cost savings and job creation possibilities of LEED-certified buildings attract bipartisan support (Long 2015). Especially appealing are co-benefits that tangibly and immediately improve the quality of place—such as walkable and beautiful neighborhoods, access to fresh food, green space for recreation—at the same time as they address environmental issues like stormwater runoff or energy efficiency.

Movements like Smart Growth and Sustainable Urbanism are helping to provide conceptual frameworks for approaching development in this more holistic way. Entities like Eco-Districts, initiatives such as the EPA’s Greening America’s Communities program, and tools like community benefit agreements, are helping to operationalize co-benefits on the ground. All of these stakeholders are seeking ways to make necessary sustainable infrastructure

investments more efficient and more appealing to a wider range of investors by making them accomplish a wider range of public purposes.

Creative Placemaking Enriches and Activates the Built Environment

Creative placemaking often intervenes in the built environment, whether by beautifying or animating existing infrastructure, or building new physical fabric. Art and culture can help infrastructure meet a wide range of human needs through welcoming, activated and beautiful public spaces and buildings, while solving the technical aspects of environmental problems. The Land Art Generator Initiative (LAGI), for example, holds competitions for renewable energy generators that are also public sculptures. This shows people that renewable energy can be beautiful and useful, thus combatting a common perception that renewable energy structures are eyesores or unsuited for urban environments. Their work is in increasingly high demand from communities around the world.

In addition, because artistic and culturally activated infrastructure is more appealing and visible, it can attract positive attention and additional resources. Artist Emmanuel Pratt credits the arts elements of Perry Avenue Commons' multiblock aquaponic farming operation in Chicago with generating buy-in from local community members, city officials and investors. Pratt says, "The second we activated the garden through art and culture, not only did vandalism completely disappear, we became an international tourist destination point." As a result of this positive attention to a previously neglected part of the city, city officials have permitted kinds of activities that are not covered by existing zoning regulations, further spurring Perry Avenue's growth and impact, and making the city more willing to embrace community-driven economic development.

Creative placemaking infrastructure is usually relatively small scale, but some environmental sector leaders consider small-scale solutions to be essential components of sustainable infrastructure plans going forward. Reasons include: small-scale infrastructure can more easily be owned and controlled by local communities; can be more responsive to local conditions; costs less to build; and makes the system more resilient to shocks. In the area of energy, for example, small-scale distributed systems can generate affordable power for communities and even contribute back to the grid. Small-scale green infrastructure can conserve and replenish water, provide open space for recreation, reduce the risk of flooding, and provide wildlife habitats throughout a city. Because they can be built relatively quickly, small-scale solutions can demonstrate what is possible and generate appetite for larger-scale change. Moreover, if replicated, small-scale solutions can address problems at scale.

Featured Project

The Fargo Project



Figure 7: The Listening Garden is at the center of World Garden Commons, where visitors can enjoy both concerts and the natural sounds of the grasses moving in the wind, the insects, the birds, and the water.

Photo by Fargo Project, City of Fargo, used with permission.

The flooding of the Red River has long been an issue for the City of Fargo, ND, and is getting worse with climate change (U.S. EPA 2016). Over the past several decades the city has built an extensive network of stormwater detention basins to protect the community from water overflows. However, this has created wide swaths of barren, ugly, and unusable spaces that have physically separated neighborhoods and marred the city's landscape.

In 2009, the city began working with artist Jackie Brookner to see if there was a way that these basins might be made more functional from a social and aesthetic perspective. A pilot site was selected, an existing 18-acre basin that the team named World Garden Commons, as a place to test ideas and

build community capacity for engaging in the transformation. Brookner pulled together a team of local artists who used sandboxes, visualization techniques, poetry, storytelling, food sharing, and physical movement to engage residents in a multiyear process of re-imagining how the spaces could be used. These creative techniques “bring a different kind of imagination in,” says Brookner, and allow “more room for surprise and tapping into the whole person” (Gross 2011).

Together, the residents—including Native Americans, Scandinavian-Americans, and refugees from Africa and other countries—began to imagine new possibilities for these spaces. In partnership with the city's planners and engineers, they designed a series

of amenities that included sculptural features, a natural amphitheater, community gardens and festival public spaces (Figure 7). These vibrant public spaces will provide social and cultural spaces for the surrounding community, and create new opportunities for interactions among groups that have been physically isolated from each other. The process also helped the community reconnect to water as something that can be life-giving and life-enhancing, not simply terrifying (Figure 8). Integrating stormwater management with living community spaces celebrates water as an essential part of Fargo's identity and culture.



Figure 8: Stream Restoration by Amu Production as part of The Fargo Project: World Garden Commons. Photo by Fargo Project, City of Fargo, used with permission.

The creative approach to the site has turned out to have some environmental and economic benefits as well. For example, the artists convinced the city to experiment with not mowing the fields in order to see what grew there. Not only was the natural landscape of native grasses aesthetically beautiful, but it turned out that this landscape naturally and efficiently managed invasive species, saving the city money



Figure 9: A recurring theme among Fargo community members was the desire for more vegetation. The World Common Gardens includes community gardens, wildflower patches, native plantings, orchards, and wetlands that are integrated effectively and meaningfully into the storm water basin.

Photo by Fargo Project, City of Fargo, used with permission.

and energy (Figure 9). The project also built knowledge on green infrastructure unique to North Dakota, as Brookner engaged with North Dakota State University and City Engineering to try new approaches.

Fargo City Planner Nicole Crutchfield reflects that "By working with artists and using a creative problem-solving lens, we were able to find solutions that functioned on multiple levels—ecological, spiritual, infrastructural, and aesthetic. We picked up on nuances about what the community needed and what worked that we would have missed if we had approached it using our conventional planning methods." Working this way was so successful that the city of Fargo has begun to use artist-led, community-based processes for other infrastructure projects as well. It believes so strongly in this approach that it has created a workbook to help other communities understand why working with artists can generate better solutions and how to do it effectively (Asleson et al. 2015).

Conclusion

As discussed in the examples above, artists and arts organizations are actively partnering to solve some of the most pressing environmental challenges of our time, and contributing actively to community resilience efforts in the following ways:

- Sparking public demand by making environmental issues personal, emotional and salient; and inspiring people with positive visions of a sustainable future.
- Building community capacity and agency by using art to help build community power and identity; and creating inclusive processes for dialogue and community decisionmaking.
- Enriching and activating the built environment by creating infrastructure that meets a broad range of people’s social, aesthetic, and spiritual needs.

While different stakeholders in the environmental sector prioritize different approaches, our research suggests that these efforts could have profound environmental impacts in both the near and long term. A number of ArtPlace’s philanthropic and federal partners, too, see the promise that creative placemaking holds for communities across the country. In his article “Putting the Arts to Work for City Resilience: Creative Placemaking,” former National Endowment for the Arts Design Director Jason Schupbach writes:

Successful use of creative placemaking requires making the people part of the resilience equation work. To do this, cities must treat creatives with the same gravity afforded other community development assets and colleagues. We have seen that cities that pay more attention to creative placemaking find their interventions have a more balanced, holistic approach that brings the projects to the very stakeholders they seek to benefit, truly promoting city resilience (Schupbach 2015).

For more ways that artists are supporting community resilience—as well as environmental goals more broadly—see Helicon Collaborative’s full research findings, “Farther, Faster, Together: How Arts and Culture Can Accelerate Environmental Progress” (<https://www.artplaceamerica.org/blog/5-things-arts-can-do-environment>).

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A Proposed Multi-Agency Program for Stewardship Science

Christian P. Giardina,¹ Bruce Evan Goldstein,²
Morgan Grove,³ Lindsay K. Campbell,⁴
Erika Svendsen,⁴ and Heather McMillen⁵

1. USDA Forest Service, Hilo, Hawaii

2. University of Colorado, Boulder, Colorado

3. USDA Forest Service, Baltimore, Maryland

4. USDA Forest Service, New York, New York

5. Hawaii Department of Land and Natural Resources,
Honolulu, Hawaii

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Poorly planned development, resource over-exploitation to feed expanding per capita consumption, and climate change interact to diminish native biodiversity, degrade natural resources, and compromise human well-being in urban and urbanizing environments. Because urban dwellers are expected to represent 60 percent of people on Earth by 2030 (UNFP 2007), these impacts are extensive. Innovative approaches to reducing impacts of urban living are being sought across the United States, providing compelling counter-examples of how communities are creatively meeting challenges by enhancing stewardship linkages between people and place. These complex exchanges have important implications for the resilience of coupled natural and human systems, especially regarding response to disturbances and disasters. To date, however, the science available for stewarding coupled urban systems lacks a national framework and coordinated operating environment.

Elected and appointed leadership, urban planners, and sustainability officers all require current and accessible information about the stewardship actions of nonprofits, civic and religious groups, and neighborhood associations. Unfortunately, this information is hard to secure in a timely way and information from other cities is often not available or accessible. Given that stewardship linkages often enhance resilience of coupled systems to global change, disturbances, and disasters, efficient and inclusive institutional structures are needed at multiple scales to support knowledge co-production and exchange across research, practice, and policy in an urban context. Although highly creative and potentially transformative approaches are being taken globally to understand stewardship (Campbell et al. 2016, Fisher et al. 2015, Grove et al. 2015, Kealiikanakaoleohailani and Giardina 2016, Munoz-Erickson 2014, Svendsen et al. 2016), funding for such efforts is limited, national-scale syntheses are rare, and the means for productive interaction among researchers, resource stewards, and policy entities are lacking (McMillen et al. 2016).

To address these gaps, we propose the establishment of a joint stewardship science program (JSSP), to which USDA Forest Service would be a contributing member. Much as the Joint Fire Science Program is a broad partnership representing agency and organization interests in fire science and management, the JSSP would: 1) serve as a national, multi-agency, and multi-organization entity for advancing the science of urban stewardship; 2) fund the next generation of urban stewardship science; 3) establish the stewardship inventory and analysis (SIA) program to initiate standardized and baseline inventories of stewardship networks (Svendsen et al. 2016); 4) oversee the creation of a regional stewardship knowledge exchange consortia (SKEC) that links practitioners, researchers, and policy leaders; 5) enhance community stewardship capacity that serves a critical technology transfer

function in urban centers of the United States; and 6) create an urban stewardship learning network.

From these activities, a JSSP would stimulate the creation, synthesis, and exchange of stewardship knowledge through unprecedented support for hydrological, climatic, biophysical, social, economic, biocultural, and disaster resilience research and knowledge needs of urban resource stewards while also directly supporting technical assistance needs of communities (Figure 1). Further, we see a great need for the integration of multiple data streams (e.g., numerical biophysical models and collaboratively developed decision support tools) into new ways of thinking about sustainability and resilience planning and policy development as well as the structures that stimulate local to international discussions on collaborative knowledge production, outreach, and management.

The Joint Stewardship Science Program



Figure 1: Draft vision for a national Joint Stewardship Science Program.

Background and Rationale

Global change is having unprecedented impacts on coupled human and natural systems and challenging the capacity of human dominated landscapes to provide resources and services to humanity. Efforts to understand why people steward a place, how people benefit from these stewardship interactions, and in turn how people shape the green and blue spaces in natural, residential, industrial, commercial, and agricultural land use types are emerging globally, but are constrained by: 1) access to relevant information on the independent and interactive effects of global change on coupled and natural human systems; 2) lack of a comprehensive science for managing the composition, structure, function, and dynamics of coupled natural human systems, especially in urban centers; 3) weak coordination of resource data exchange among research, management, and policy infrastructure; 4) lack of integrated information on how social, hydrological, and ecological variables support the resilience of communities; 5) lack of collaboratively developed,

model based decision support tools; and 6) limited capacity to forecast global change impacts on stewardship capacity and associated linkages. These capacity gaps are made larger by the rapid pace of global change, and the lack of infrastructure to develop, organize, and share this knowledge.

Of course, distributing scientific information about the dynamics and benefits of built environment stewardship may not influence policy or practice if the information is not used or if it has unanticipated or even negative impacts. Scientific understanding can clash with the way that communities understand, experience, and live in the environment (Jasanoff 2010). Knowledge production is an inherently social process (Mitchell et al. 2004), and the credibility of scientific knowledge is not the only or even the most important reason that information is taken up by potential users. The utility of scientific information often has more to do with the way it is salient and legitimate within a specific social context (Cash et al. 2003), and for many communities it is stewardship groups, not scientists, who have the greatest ability to combine science with local understanding of place, and put this understanding into practice. Accordingly, if we want to create usable science, we need to find ways to engage stewardship groups in research design, development, analysis, and dissemination of findings, as well as promote collaborative learning among stewardship groups. Participation in assessments allows stewardship groups to engage each other in the crafting of meaningful and motivating stories about their communities (Shaffer 2014). This requires developing partnerships with stewardship groups because these groups are best situated to work with communities to develop and share stewardship knowledge.

We suggest that holistic community and built environment-focused approaches are needed to develop and implement effective resource management and resilience strategies—approaches that integrate social, hydrological, ecological, and cultural knowledge on resource use (who needs it) and sustainability (how to manage change) in order to inform management and policy with the most current and relevant information. While several networks for policymakers and planners have emerged in urban resilience and sustainability planning and implementation (e.g., Urban Sustainability Directors' Network, Rockefeller Foundation's 100 Resilient Cities), there is no complementary network that connects the science of built-environment stewardship with community practitioners, which may include building bridges and networks between urban and rural areas. A JSSP could meet this need locally to nationally, with anticipated opportunities to encompass international initiatives. Developing this holistic approach to guide management, policy, and approaches to community sustainability and resilience in the face of global change and natural disasters will be made more achievable through the

creation of a national program and network of regional consortia and practitioners to help guide the next generation of urban stewardship research and practice. In addition to strengthening community-based efforts, a JSSP would support development of cutting edge anticipatory management actions and inform policy.

The Approach

It is critical that a JSSP be grounded in a thoughtful planning process and a concrete framework for knowledge co-production and exchange among researchers, practitioners, decisionmakers, community leaders, stakeholders, and benefactors. We propose that the program rely on six principles for executing its vision: 1) improve access to information sources, 2) provide better and more comprehensive information, 3) enhance stewardship inventory and analysis capacity, 4) improve and diversify technical assistance, 5) create a more collaborative information exchange environment, and 6) create a stewardship learning network. The strategies for achieving the principles are described below in detail.

1. Easier Access to Information Sources. Stewardship science has no centralized information source or repository, with rural to urban-relevant information often identified as being needed to assist resource planning and decision making, but it is currently difficult to access by researchers and practitioners. For example, managers of landscapes are left to use Internet search engines to locate information of sometimes uncertain reliability. Some peer-reviewed sources, such as journal articles, are often accessible only through academic institutions or for purchase, and so are not readily available to managers. Even when broadly relevant publications are accessible, applicability to specific management situations or built environments is often hindered by differences in geography or practices, writing styles that are difficult to interpret by managers, and lack of content describing management implications. As a result, managers most often learn through on-the-job training and trial-and-error experiences. Upper-level resource managers, agency leaders, and policymakers also require clear yet comprehensive data and information that would be easy to access through a data management structure that can promote effective knowledge and technology transfer. There is a need for information and products that are “manager-ready” and “policy-maker-ready.” Centralized, Web-based, and region-focused clearinghouses for readily accessible, relevant, and understandable summaries addressing specific management needs will provide an important vehicle for meeting the knowledge needs of stewards.

2. Better and More Comprehensive Information. The types of information that are most often used in making management decisions, and the types of new information most useful in stewarding natural resources are limited and what exists is scattered across sources (libraries; individual researchers; university, federal, and state data-bases). Unmet information needs, especially with regard to scientific research and real-time data, include high resolution forecasts of urban resource information, for example hydrological modeling capacity, because this information is inadequate or lacking across most if not all urbanized areas of the United States. Other needs include greater capacity for real-time data collection and trend analysis—including weather, impacts of climate, site-specific and species-specific model outputs, and for certain areas, drought maps/warnings. Further, a JSSP could: promote creation of stewardship-focused knowledge exchange (SKEC), which would serve as regional knowledge clearinghouses for stewardship information; expand collaboration on research proposals with explicit input from regional managers on the design of requests for proposals; and finally provide a central Website connecting users to data, maps and trend analyses. Through improved communications and reciprocal, double-loop and triple-loop learning (Peschi 2007), consortia will improve the reach and appropriateness of information.

3. Enhanced National Stewardship Inventory and Analysis Capacity. A critical new investment area for a JSSP would be the creation of a stewardship inventory and analysis (SIA) program, which will be designed to provide a national approach to and funding for understanding the composition, structure, function, and dynamics of stewardship groups and networks. As part of the envisioned planning process, the program would elaborate: desired outcomes, required approaches and methods, potential pilot sites and demonstrations for stewardship inventory, and required technical capacity for running such a program including the conveying of information to user groups and decisionmakers. Through baseline inventories and periodic re-surveys of stewardship nodes and resulting networks, a JSSP seeks to provide a national-scale understanding of how stewardship is meeting the needs of people, shaping the rural to urban environments, responding to disasters and change, and over time, shifting and adapting to new conditions. Additionally, a national urban tree canopy program (high-resolution land cover data and tools) would be a fundamental component of our efforts to be used in concert with stewardship inventory data.

4. Improved Technical Assistance. Information and technology exchange are important challenges for a JSSP because in the past century, threats to community-relevant resources (e.g., invasive species, climate change, fire, sea level rise) have expanded dramatically across local, county, and state geographies, but capacity to deal with these threats has not kept pace. Managers repeatedly identify capacity to address topics such as watershed planning, disaster recovery, climate mitigation, and invasive species control as being constrained by inadequate funds or limited knowledge exchange. In turn, knowledge exchange is constrained by limited access to “translated” science summaries and dialogue, technical assistance lacks centralized planning and adequate resources, and training opportunities are inadequately supported. Other suggestions include: a database of community, built environment, urban specific or otherwise relevant technical research; coordinated sharing and access to cameras, weather stations, and equipment; expanded training opportunities such as webinars and workshops; Web-based “ask an expert” service; and built-environment focused best management practices. Through multi-directional exchange, a JSSP will help to improve the quality of technical assistance by creating opportunities for technical experts to received feedback from stewards.

5. More Collaborative Information Exchange Environment. Currently, a lack of structured sharing mechanisms among stewards, partners, resource managers, and policymakers may be the biggest hindrance to effective information sharing. Improved communication mechanisms and a feedback process between scientists, managers, stewards and policymakers would help scientists conduct research that better addresses user needs. Potential mechanisms for information and knowledge exchange via the SKEC network could include: 1) Web-based tools and regular meetings, symposia and workshop; 2) facilitated transfer of science and information that directly addresses management and policy needs, particularly building upon the place-based science hubs of the USDA Forest Service’s network of urban field stations (e.g., www.nrs.fs.fed.us/ufs/ and www.laurbanresearchcenter.org/); 3) organize information by responsibility area (e.g, land management, policy, climate science); and 4) create opportunities for one-on-one practitioner-researcher exchanges to better address issue/site specific needs. Other opportunities include: targeted list-serves; Web-based and facilitated discussion boards; local, regional, and national symposia at workshops and conferences; list of partners, areas of expertise, and resources; and interactive maps showing study sites, key research findings, available extension and outreach products, and points of contact.

6. Opportunities for Practitioners and Scientists to Engage in Collaborative Framing of Science and Collaborative Knowledge Production. A JSSP could encourage interaction between scientists and the public in ways that both influence the conduct of science and shape how stakeholders understand the application and practical value of the knowledge about urban stewardship (Lemos and Morehouse 2005). Collaborative framing (coframing) of science needs and collaboratively produced (coproduced) knowledge is more likely to be attuned to social, political, and cultural context in ways that make it practically relevant, usable, credible, legitimate, and actionable (Edelenbos 2011, Akpo et al. 2014). Coframing and coproduction require relationship building, clarity about terms and assumptions, and authentic dialogue about the choices and assumptions that go into scientific assessment (MacLean and Cullen 2009). Many of the collaborative design guidelines that have been developed to support co-production require long-term partnerships, since there is often social distance or even a legacy of distrust to overcome between communities and scientists as well as the agencies who sponsor scientific work (Mitchell et al. 2004). Ultimately, learning networks will enhance capacity and accelerate learning across networks.

These six principles and associated strategies would serve as a preliminary foundation for a JSSP, which will rely on collaborative evaluation, iterative exchange, and adaptive methodologies to enhance success in these six principle arenas.

Outcomes of a Joint Stewardship Science Program

While centers of stewardship activity support a number of permanent research and technology transfer positions focused on stewardship issues, including via the USDA Forest Service network of urban field stations, a national level coordinating, synthesis, promotion, and leadership entity whose primary focus is place-based stewardship science, management, and policy does not exist. Given adequate, but even minimal stewardship-focused resources, a JSSP may be uniquely capable of filling coordination, synthesis, communication, delivery, promotion, and leadership functions while supporting the activities of existing and especially urban-dedicated positions and organizations. The structure and approach of the JSSP would parallel that of the highly successful Joint Fire Science Program (Figure 1). In similar fashion, a JSSP would need multi-agency support and stakeholder trust (locally, regionally, and nationally) to be successful. Here we articulate specific functions that such a program could serve the urban stewardship community.

National Coordination, Synthesis, and Leadership.

A JSSP could provide a national operating platform and structured organizational venue for promoting stewardship science. Such a body will enhance efforts, from local to regional to national and even international levels, to coordinate local to regional research and knowledge exchange activities, synthesize this rapidly growing field of study, promote needed integration across disciplines, and enhance leadership capacity in and advocacy for stewardship science.

National Stewardship Science Grants. Currently urban stewardship has no centralized structure supporting a state-of-the-science grants program. We envision a JSSP as managing a national stewardship science grants program, which could provide a national home to stewardship science, much the way the Joint Fire Science Program serves as a multi-dimensional, national coordinating body for stakeholder driven fire science in the United States. National stewardship science grants would provide rigorously administered, peer-reviewed funding for stakeholder identified priority urban stewardship research, resulting from annual integrated evaluation and assessment of program successes and future needs. Again, modeled after the Joint Fire Science Program, JSSP grants would provide multi-year grants of sufficient size to address applied research needs of significant scope. Identifying priorities and coordinating research would result from a national dialogue among JSSP board members, practitioners and stewardship leaders, SKEC coordinators, managers, policy and agency leadership.

Stewardship Inventory and Analysis. Relying on the Stewardship Mapping and Assessment Project (STEW-MAP; www.nrs.fs.fed.us/urban/monitoring/stew-map/), a USDA Forest Service developed methodology that combines social science surveys, geospatial techniques, and social network analyses to map stewardship connections in domestic and international urban centers, stewardship inventory analysis (SIA) would provide a nationally coordinated approach to elaborating urban stewardship networks including establishing baseline inventories, conducting periodic resurveys, devising national monitoring and synthesis standards, and implementing revisions to existing or new methodologies.

The resulting and unprecedented understanding of stewardship networks will provide planners, disaster relief and recovery agencies, and stewards themselves with critical insights required for resilience planning and preparation. An SIA program would be in a position to rely on decades

of experience provided by the USDA Forest Service's Forest Inventory and Analysis Program and by expanding applications of STEW-MAP, already in a dozen U.S. cities, as well as in Paris, France; Santo Domingo, Dominican Republic; and Valledupar, Columbia. Ultimately, an SIA would help to lead comprehensive and standardized approaches to mapping and understanding stewardship networks; with repeat inventories, the dynamics of stewardship networks over time could be elaborated. This last feature is especially valuable in the context of understanding responses to change and disasters.

The Regional Stewardship Knowledge Exchange Consortia Network. Again, modeled after the regional consortia of the Joint Fire Science Program, a JSSP would support a network of regional consortia. These consortia would be staffed with coordinators who would coordinate the program's work within a region, and serve as a regional urban stewardship hub, while overseeing/coordinating the production of outputs and solutions resulting from consortium activities. Coordinators would facilitate communication and coordination among consortium staff, partners, and end-users, and assist with developing and filling research, extension and outreach positions associated with other entities, with the goal of enhancing capacity to achieve the JSSP's objectives.

Consortium coordinators could serve any of the following specific roles:

- Link program activities to upper level management and decision-makers via regular attendance at meetings and workshops.
- Represent the regional consortium at national meetings, as well as other national urban-focused meetings.
- Identify opportunities and secure support from regional to national funding sources for JSSP enhancement or development.
- Develop, maintain, and expand consortia and JSSP websites.
- Coordinate stewardship staff to ensure information is shared and addresses practitioner needs.
- Periodically assess program effectiveness in meeting the needs of end-users, while identifying new needs.
- Organize symposia at city, state, or national levels on topics of interest.

- Support recipients of national program grants to regions including managing budgets, staff schedules, agendas, and grant reporting.
- Collect existing and new research ideas according to practitioner needs, and develop and disseminate research-based extension information and products for practitioner use.
- Help researchers understand management information needs and develop long-term research agendas.
- Help create summary research products and communicate these with networks.
- Lead or assist development of multi-media communication strategies.
- Lead or assist development of management-driven research projects.
- Help collaborative development of decision support and other tools for urban stewardship applications.

As with the Joint Fire Science Program's consortia, the JSSP would implement strong and regular evaluation protocols, with goals of seeking actionable feedback from on-the-ground stewards and stewardship groups.

A Stewardship of Place Learning Network. A JSSP would design a practitioner-centered learning network, coordinated closely with or even by the above SKEC, to collaboratively produce actionable knowledge about urban stewardship. This learning network would be staffed with network facilitators who would recruit participants, support communication and logistics, and facilitate interaction. Learning networks are interorganizational, voluntary, collaborative organizations that focus on nurturing expertise in applied fields such as environmental management, public health, and education (Dolle et al. 2013). Each participating site in a learning network defines problems in its own way, accommodating local context and contingencies to generate distinct strategies and solutions. This autonomy is balanced with a network-wide coherence that advances collective action to address the systemic issues that require integrative planning and policymaking. Learning networks can foster an open culture of inquiry and trust, increase willingness to take risks in order to extend learning opportunities, promote the transparency required

to challenge embedded values, and enable development of shared meaning and understanding through dialogue (Goldstein and Butler 2010). Learning networks not only can nurture an evidence-base for urban stewardship that communities are more likely to understand and use, they provide researchers the opportunity to explore how they can be effective partners in knowledge co-production. These capacities can promote shared identity and a sense of ownership among all participants, increasing their commitment over time and expanding network capacity and impact (Goldstein and Butler 2009).

Building Community Stewardship Capacity. An important function of the JSSP could be to enhance stewardship capacity to meet the enormous needs of urban centers across the United States with regard to rapid access to technical expertise in understanding and assessing urban stewardship needs, support of planning and policy processes required to address needs, and building a national resource base for stewardship and resilience actions at the local, regional, and national level. This function of the JSSP could rely on the large and sophisticated network of USDA Forest Service experts as well as university and private sector partners to support short-term but also longer-term assignments designed to directly meet the needs of urban stewards. A particularly important role for JSSP could be to: manage conflicts or unintended outcomes for greening efforts in urban environments, for example green gentrification; work within broad collaborative partnerships to reduce or eliminate barriers to stewardship; or address why private sector stewardship may not be effective. It would be advantageous for this aspect of the JSSP to be closely linked to the USDA Forest Service's Regional State and Private Forestry Urban and Community Forestry programs. Given the research and knowledge exchange functions of the JSSP and its various component programs, but the highly applied nature of this work, planning would necessarily engage multiple branches of the USDA Forest Service.

Conclusion

To date, urban-focused stewardship science has made enormous progress in understanding the patterns and processes of complex coupled human and natural systems—progress that has been led by passionate individuals operating in a mostly unstructured field. But important questions regarding global change and more pedestrian questions about coordination and long-term support are pushing the limits of the current case-study approach that has typified this field. Much the way the USDA Forest Service's Forest Inventory and Analysis Program brought standardization to the inventory of forest composition, structure, function, and dynamics, and much the way the Joint Fire

Science Program brought coordination, collaboration, synthesis, and higher levels of support to fire science and extension in the United States, we envision the JSSP greatly enhancing capacity for engaging partners, knowledge creation, and coordinated and collaborative synthesis to the stewardship science community. As with any ambitious initiative, careful planning will be required to learn from and improve upon previous learning network based initiatives.

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The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

Epilogue: The Power of Stewardship

Sarah J. Hines,¹ Lindsay K. Campbell,²
Nancy Falxa Sonti,³ Erika Svendsen,² David Maddox⁴

1. USDA Forest Service, Baltimore, Maryland
2. USDA Forest Service, New York, New York
3. USDA Forest Service, Baltimore, Maryland
4. The Nature of Cities, New York, New York

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Massive social-ecological disturbance and disasters have struck the United States within recent years. In 2017 alone, the country dealt with devastation, destruction, and displacement from three major hurricanes, a nearly unprecedented wildfire season, and senseless acts of violence and terrorism. The scope and scale of these disasters requires appropriate, large-scale coordinated emergency response and recovery efforts. Many of our colleagues have expressed, through their experiences in this book, that there is a need to acknowledge that longer-term mitigation and adaptation are critical to building long-term resilience. Both research and practice demonstrate that natural resource stewardship activities can play a role in helping communities to recover, heal, and become more resilient.

The role of community-based stewardship of natural resources in helping to prepare for, respond to, and recover from disturbances is already well-known to some communities—such as those recovering from tornado damage in Joplin, MO, and communities rebuilding from the devastation of Hurricane Sandy in New York City. The goal of this book is to build a compendium of case studies and perspectives that provide examples of communities that have both rebuilt and created capacity over time through innovative partnerships centered on community-based stewardship of natural resources. It has been our privilege to learn from the many authors in this book. In so doing, we hope to share this knowledge and these practices to a broader audience of practitioners, policymakers, and communities. They might use these lessons to prepare for disasters that we hope never strike and to rebuild if they do. We also hope to come closer together and engage, face-to-face in an effort larger than oneself, an effort that helps remind us of our collective humanity, dignity, and responsibility to take care of one another and all the places we call home.

Many of the stories found in this book have positive outcomes that emerge from great hardship and learning. But there is very important work to be done in disseminating the lessons learned from these efforts to communities beyond those represented in this book. There is also important work to be done in understanding negative cases—where disturbance did not lead to successful, resilient outcomes for communities. What are the characteristics that might explain these different outcomes? What are effective ways to spread learnings from places with successful outcomes to other communities, not yet affected by disasters?

This area is potentially a key role for some of the developing federal programs in mid- to long-term recovery. Whereas the emergency responders must act for immediate health and safety, the programs that support mid-term recovery can often assist by supporting processes of community building. How can we plan ahead for funding streams and programmatic responses that can be tapped for the inevitable, future disturbances that will come?

We are still on the path to a more generalized construct or theory of change for community-based stewardship as it relates to disaster recovery. For many of the communities represented in this book, the responses were built in an “emergent” or needs-based way. They created programs that suited their particular needs at the time with the materials, labor, and energy that was available. Is there a way to devise a process to make this easier in the future? Most likely, there is no magic formula, but precepts for better processes in community-based resilience are emerging through case study research, peer-to-peer co-learning, and sharing what we already know with a wide audience. In the meantime, here are a few of our core understandings from the many voices heard in this book and those still at work in the field:

- There are universal patterns of human response to disturbance that include the need to participate in one’s own recovery and to create a shared purpose.
- Re-greening efforts are relatively accessible to many communities and could be elevated as part of a program of long-term community disturbance response and recovery.
- We must leave room for stewardship processes to emerge as people often want and need to take action in their communities at the appropriate time—to remember and to reflect—but also to create and innovate.
- Look for signs of social resilience in unexpected places. We have found them through empirically observable stewardship practices such as place attachment, social cohesion, knowledge exchange, collective identity, and social networks.
- Center the need for equity and inclusion in the process of long-term recovery and restoration.
- Embrace multiple ways of knowing, including story, song, walking, and feeling.
- Building on existing institutional structures, such as the Extension Disaster Education Network and collaborative science-action arrangements like the Joint Fire Science Program, foster novel learning networks that span space, place, and sector to support the science and practice of stewardship.

- Food, shelter, and safety will always be critical, but social meaning is a sometimes less visible resource that is also required for a shared and sustainable future.

It is important to note that in these stories of loss and pain are the building blocks of greater resilience and resolve. We need to continue to build this body of knowledge and practice for the benefit of all.

But perhaps of equal importance, we need to believe that there is power in what some consider simple acts of stewardship. For within these simple acts are unseen forces like social trust, responsibility, and care that are nurtured and strengthened over time. After all, what gives every tree life and stability is a rather fantastic and unseen energy exchange called photosynthesis. Without it, there would be no street trees or forests. And so, we call for new ways to acknowledge the importance of stewardship in the aftermath of disturbance as it creates an exchange that is critical for our social resilience and for the continuation of our species.

Appendix 1: Workshop Report

This appendix is the USDA Forest Service report for the 2016 workshop “Cultivating Stewardship, Recovery, and Resilience,” a key outcome of which is this book.

Topic

Cultivating Stewardship, Recovery, and Resilience: Post-Workshop Summary

Issue

The “Cultivating Stewardship, Recovery, and Resilience Workshop” was held in New York City, June 7–9, 2016. Approximately 60 people gathered, including leaders, program staff, and researchers within the USDA Forest Service, and other federal agencies; representatives from community groups; and academics interested in social-ecological resilience in urban areas and the wildland-urban interface. The workshop was convened and organized by the Northern Research Station’s NYC Urban Field Station, working in collaboration with The Nature of Cities and the NYC Department of Parks and Recreation.¹ This document is a brief summary of the event, key points, and anticipated outcomes.

Background & Purpose

Natural resource stewardship activities, including tree planting and other community greening efforts, can help restore nature and revitalize neighborhoods. Research and experience have demonstrated that can these activities can also play a key role in helping communities prepare for, respond to, and recover from natural disturbances (such as hurricanes, floods, tornadoes, and wildfire) or human-caused disasters (such as terrorism and other violence). While the immediate aftermath of an event necessitates a focus on swift response and mitigation, mid- to long-term recovery efforts offer an opportunity to adapt, learn, and cultivate community resilience.

This workshop was convened to help catalyze new networks focusing on the best available science, practice, and applications around:

- **Facilitating mid- to long-term disturbance recovery** in communities through stewardship activities that strengthen social trust, enhance civic participation, and foster creative innovation.
- **Reducing vulnerability to future disturbances** through both local-ly led and multi-agency collaborative efforts that enable green infrastructure and community stewardship investments, in both urban and rural areas, and especially among vulnerable communities.
- **Improving the lives of all people** using green infrastructure design and implementation and community stewardship as a means to partially

1. Support was provided by the USDA Forest Service Branching Out to Urban Audiences program and TKF Foundation’s NatureSacred program. Special thanks to collaborators in the Landscapes of Resilience Project: Cornell University, Drury University, Till Design, City of Joplin (Missouri), and New York City Housing Authority.

address chronic vulnerabilities and socioeconomic inequalities in communities.

Key Points

- We are living in an urban century. The mission statement of the Forest Service remains unchanged, but as demographic shifts occur, the Forest Service understands that “caring for the land and serving the people” must also occur where the majority of those people live. Just as the Forest Service restored the degraded post-logging landscapes and watersheds of a century ago, so it also seeks to enable restoration and stewardship in urban areas.
- Natural resource stewardship has long been recognized for the benefits it creates for the land; research and practice are now beginning to illuminate the many benefits that it creates for people.
- This workshop demonstrated how natural resource stewardship strengthens both ecosystems and communities; policymakers and agencies that recognize and act upon this information can build socio-ecologically integrated communities that are more resilient to disturbance and disaster.
- Many communities—from those in New York City, to Joplin, MO, to Vallejo, CA—have used natural resource stewardship as a way to prepare for, respond to, or recover from natural disturbances, acts of terrorism, or economic decline and disinvestment. All three branches of the Forest Service have been involved in many of these activities via local partnerships, collaborations, grants, and research.
- There is a need to create a network of scientists and practitioners, including leaders from within and external to the Forest Service, to further develop and share best available science and practice with communities nationwide struggling to adapt to climate change and prepare for or recover from other disasters or stressors.
- Key outcomes from this workshop will include the creation of “Green Readiness, Response, and Recovery” book and a proposal

to advance the science and practice of community natural resource stewardship, especially in urban areas, through a Joint Stewardship Science Program that is analogous to the highly successful multi-agency Joint Fire Science Program model.

Key Contacts:

- Sarah J. Hines: shines@fs.fed.us.
- Erika Svendsen: esvendsen@fs.fed.us
- Lindsay K. Campbell: lindsaycampbell@fs.fed.us

The next several pages summarize the meeting agenda and outputs in greater detail. These pages are intended as supplementary information for anyone wanting to learn more.

Agenda Summary

Day 1 included presentations from community leaders in the Rockaways, a community in New York City that was highly disrupted by Hurricane Sandy, but also with numerous examples of grassroots approaches to natural resource stewardship. The day included panel discussions at the Rockaway Institute for Sustainable Environments and visits to three sites exemplifying social resilience via different approaches to environmental governance: including a community garden on public housing land, an entrepreneurial urban farm, and a reforested woodland in a public park created via the MillionTreesNYC campaign.

Days 2 and 3 convened in Manhattan for presentations, plenary discussion, and breakout groups to plot next steps for the emerging group. Speakers included:

Panel 1: *Community stewards as 'green responders': Lessons learned from urban environmental nonprofits*

- Karen Zumach, Tree Trust, Twin Cities, MN
- Peggy Middaugh, Worcester Tree Initiative, Worcester, MA
- Rick Magder, Groundwork Hudson Valley, Yonkers, NY

Panel 2: *Interdisciplinary perspectives on community recovery and transformation: Programs, governance, and networks*

- Bruce Evan Goldstein, University of Colorado—Learning Networks
- Amy Schwartzman, Consultant, National Coalition for Arts Preparedness and Emergency Response—Arts Responder Network
- Keith Tidball, Cornell University—Greening in the Red Zone, Wounded Warriors, EDEN

Plenary Address

- Holly Leicht, Regional Administrator, U.S. Department of Housing and Urban Development

Short-term products from the workshop (planned from the organizers)

- Creation of a discussion board to facilitate continued discussion (created and in use at cultivatestewardship.slack.com)
- Shared presentation of all speakers (complete—on Slack)
- A meeting briefing paper and summary report (this document)
- A video collage of short statements from each participant—recorded during the workshop—discussing the drivers of community-based resilience (due in 2016, to be shared on The Nature of Cities www.thenatureofcities.com)
- Development of several publications on The Nature of Cities (www.thenatureofcities.com—due in 2016)

Breakout Groups

The workshop was intended to imagine specific ways relevant issues could be advanced. A collective group exercise created six concentrated areas that participants felt could lead to valuable new directions for collaboration. The following are the core recommendations or statements of need from each group. They can be used to help guide next steps. Several of these breakout areas now have dedicated discussion threads, or “channels,” on the Slack website to continue the conversation. New channels can be created at any time as additional ideas emerge.

Building Networks & Partnerships

- There is a need for a learning network for communities of practice; however, a clear value proposition needs to be developed for potential participants in such a network
- Strengthen interagency collaborations and informal peer-to-peer networks to better include natural resources in community recovery
- Forest Service could help catalyze a new Joint Stewardship Science Program, inspired and modeled on the Joint Fire Science Program to foster collaboration within and beyond the agency
- Local stewardship groups can be supported through online tools, such as resource clearinghouses/ resource ports to support community organization and communication

Training, Tools, and Publications

- An ICS natural resource/stewardship training, in 4 phases
- Begin an initiative to conceive a Green Readiness, Response, and Recovery book, potentially as a Forest Service General Technical Report (GTR)
- A collaboration with Federal Emergency Management Agency (FEMA) to create a new course on community-based resilience

Community Engagement/ Messaging for the Public

- Develop effective messaging and involvement of groups, including stories of success (and failure)
- These messages can be realized through handbook, webinar, trainings, websites, and social media

Metrics, Stories, and Statistics

- Provide guidance in how to develop metrics
- Such guidance could include case studies, indicators, evaluation frameworks from broad sources
- Defining metrics with the communities is key

Connections to Policymakers and Funders

- Build relationships over time
- Be ready for opportunities by develop ideas for proposal in advance
- Have your elevator speech ready

Research to Implementation

- Examine the iterative research to implementation cycle to determine where to initiate new studies and partnership
- Different domains of research are linked but distinct; how can they be connected through interdisciplinary collaborations?
- Note that in the response to disturbance there is a social life of projects: different phases of readiness, response, and recovery that shape what research and implementation are possible

Appendix 2: Participants¹ in Cultivating Stewardship, Recovery, and Resilience Workshop

1. Affiliations listed reflect the positions held at the time of the workshop.

James Akau
KUPU-Americorps Intern
Institute of Pacific Islands Forestry
Pacific Southwest Research Station
USDA Forest Service

Sarah Banks
Asia Pacific Program Specialist
USDA Forest Service

Justin Bowers
Public Engagement and
Restoration Manager
Natural Areas Conservancy

Debbie Caffin
Trails Program Manager for the
Southern Region
USDA Forest Service

Lindsay K. Campbell
Research Social Scientist
NYC Urban Field Station
USDA Forest Service

Glenn Casamassa
Associate Deputy Chief
Washington Office, USDA Forest
Service

Alda Chan
Senior Project Planner
NYC Dept. of Parks and Recreation

Kizzy Charles-Guzman
Environmental Policy and
Sustain-ability Professional
NYC Mayor's Office of Recovery
and Resiliency

Nancy Chikaraishi
Professor of Architecture
Drury University

Amanda Cundiff
Regional Partnership Liaison
USDA Forest Service

Craig Desmond
Woodworker
Natural Garden Landscape
Design & Build

Jeanne DuPont
Executive Director
Rockaway Waterfront Alliance

Joanna Field
Marine Resources Biologist
New York State Department of
Environmental Conservation
Region 2

Kainana Francisco
Natural Resource Specialist,
Institute of Pacific Islands Forestry
Pacific Southwest Research Station
USDA Forest Service

Fabian Garcia
Director, Angeles National Forest
USDA Forest Service

Christian P. Giardina
Research Ecologist, Institute of
Pacific Islands Forestry
Pacific Southwest Research Station
USDA Forest Service

Bruce Evan Goldstein
Associate Professor
Program in Environmental Design
University of Colorado, Boulder

Celeste Grimes
Secretary, B41 Community Garden

J. Morgan Grove
Team Leader, Baltimore Urban Field
Station
Research Forester
USDA Forest Service

Bram Gunther
Co-Director NYC Urban Field
Station
NYC Department of Parks and
Recreation

Jonathan Halfon
Field Coordinator, Community
Planning and Capacity Building
FEMA

Teri Heyer
Program Specialist-Urban
Connections
Eastern Region
USDA Forest Service

Sarah J. Hines
Acting Assistant Director,
Communication & Science Delivery
Northern Research Station
USDA Forest Service

Rachel Holmes
The Nature Conservancy

David Jenkins
Director of Recreation
Wilderness, Heritage, and Volunteer
Services
Eastern Regional Office
USDA Forest Service

Michelle Johnson
Research Ecologist
NYC Urban Field Station
USDA Forest Service

Sharon Keller
Manager, Seagirt Community
Garden

Rabi Kieber
Region 2 Green Building/
Sustainability Coordinator
U.S. EPA

Beth Larry
National Program Lead, Urban
Research
USDA Forest Service

Holly Leicht
Regional Administrator
Department of Housing and Urban
Development

Erika Lindsey
Senior Policy Advisor
NYC Mayor's Office of Recovery and
Resiliency

Sarah Low
Team Leader, Philadelphia Urban
Field Station
Biological Scientist
USDA Forest Service

David Maddox
Founder and Editor-in-Chief
The Nature of Cities

Rick Magder
Executive Director
Groundwork Hudson Valley

Victoria Marshall
Founder and Principal
Till Design

Caroline Massa
Environmental Specialist
Federal Emergency Management
Agency

Cindy McArthur
National Partnership Coordinator
National Partnership Office
USDA Forest Service

Heather McMillen
Postdoctoral Research Social
Scientist
NYC Urban Field Station
USDA Forest Service

Peggy Middaugh
Former Executive Director
The Worcester Tree Initiative

Miranda Mockrin
Research Scientist, Human
Dimensions / Rocky Mountain
Research Station
Co-located at the Baltimore Field
Station
USDA Forest Service

Deborah Morris
Director of Neighborhood Planning
NYC Department of Housing
Preservation and Development

Keith Nislow
Project Leader
Urban Research Work Unit
Northern Research Station
USDA Forest Service

Jamie Ong
NYC Department of Parks and
Recreation

John Parry
Urban Forester
Northeastern Area State and Private
Forestry
USDA Forest Service

Lesley Patrick
Senior Fellow for Modeling and
Assessment
Science and Resilience Institute at
Jamaica Bay

Mateo Pintó
Co-Founder, Combo Colab

Renae Reynolds
Project Coordinator, Landscapes of
Resilience
NYC Urban Field Station

Phil Rodbell
Program Leader, Northeastern Area
State and Private Forestry
USDA Forest Service

Ardena Saarinen
KUPU-AmeriCorps Intern, Institute
of Pacific Islands Forestry
Pacific Southwest Research Station
USDA Forest Service

Amy Schwartzman
Consultant
National Coalition for Arts
Preparedness and Emergency
Response

Matt Sheehan
Grower, Edgemere Farm

Nancy Falxa Sonti
Ecologist, Baltimore Urban Field
Station
USDA Forest Service

Traci Sooter
Professor of Architecture
Director of Design/Build Programs
Drury University

Jason Stein
Stewardship Program Manager
NYC Department of Parks and
Recreation

Erika Svendsen
Team Leader & Co-Director
NYC Urban Field Station
Research Social Scientist
USDA Forest Service

Grace Tang
Coastal Project Manager
NYC Department of Parks and
Recreation

Milan Taylor
Chief Executive Officer
Rockaway Youth Task Force

Keith G. Tidball
Senior Extension Associate
Cornell University

Jayne Tratenove
Director of Communications
TKF Foundation

Tom Wagner
Forest Supervisor
White Mountain National Forest
USDA Forest Service

Kathleen L. Wolf
Research Social Scientist
University of Washington

Heidi Woolever
Grower, Edgemere Farm

Mary Wyatt
Executive Director
TKF Foundation

Karen Zumach
Director of Community Forestry
Tree Trust

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