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Demystifying governance and its role for transitions in urban social–ecological systems

Tischa A. Muñoz-Erickson,[1,†] Lindsay K. Campbell,[2] Daniel L. Childers,[3] J. Morgan Grove,[4] David M. Iwaniec,[3] Steward T. A. Pickett,[5] Michele Romolini,[6] and Erika S. Svendsen[2]

[1]*International Institute of Tropical Forestry, USDA Forest Service, 1201 Calle Ceiba, Río Piedras, Puerto Rico 00926 USA*
[2]*Northern Research Station, USDA Forest Service, New York City Urban Field Station, 431 Walter Reed Road, Bayside, New York 11359 USA*
[3]*School of Sustainability, Arizona State University, P.O. Box 875502, Tempe, Arizona 85287 USA*
[4]*Northern Research Station, USDA Forest Service, Suite, 350, 5523 Research Park Drive, Baltimore, Maryland 21228 USA*
[5]*Cary Institute of Ecosystem Studies, 2801 Sharon Turnpike, Box AB, Millbrook, New York 12545 USA*
[6]*Center for Urban Resilience, Loyola Marymount University, 1 LMU Drive, 113 Research Annex, Los Angeles, California 90045 USA*

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Abstract. Governance is key to sustainable urban transitions. Governance is a system of social, power, and decision-making processes that acts as a key driver of resource allocation and use, yet ecologists—even urban ecologists–seldom consider governance concepts in their work. Transitions to more sustainable futures are becoming increasingly important to the management of many ecosystems and landscapes, and particularly so for urban systems. We briefly identify and synthesize important governance dimensions of urban sustainability transitions, using illustrations from cities in which long-term social–ecological governance research is underway. This article concludes with a call to ecologists who are interested in environmental stewardship, and to urban ecologists in particular, to consider the role of governance as a driver in the dynamics of the systems they study.

Key words: governance; power; social networks; social–ecological systems; sustainability transitions; urban.

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† **E-mail:** tamunozerickson@fs.fed.us

Introduction

Sustainability transitions are an increasingly important concept guiding the management and stewardship of ecosystems, particularly urban systems. Governance is a key driver of those transitions. Our goal in this article is to make the many facets and nuances of governance and its role in transitions of social–ecological systems less mysterious to urban ecologists and to ecologists in general. Transitions are processes that lead to fundamental changes in the structure, culture, and practices of a social system (Rotmans et al. 2001, Loorbach 2010, Frantzeskaki et al. 2012). Sustainability transitions in particular consist of long-term societal and technological transformations that lead to more resilient and sustainable pathways in which human well-being is enhanced, social equity is advanced, and environmental integrity is protected (Leach et al. 2010, Markard et al. 2012). It is important to differentiate between governance and

government. For ecologists, a familiar analogue would be that government is to governance as structure is to function. There are numerous well-articulated definitions of governance in the literature (Jordan 2008), but in essence, it is a process involving collective action for resource allocation and use across multiple societal actors, not just the state. Governance is thus concerned with the patterns that emerge from governing actions at multiple scales–efforts to guide, steer, control, or manage different sectors of society–including actions by government, NGOs, businesses, scientific communities, coalitions, civic groups, and households (Kooiman 1993). There is the risk that ecologists may confound government and governance and seldom consider governance concepts in their work. Yet, governance and its various forms and behaviors of collective action are fundamental to management and transitions for more sustainable and resilient ecosystems.

We propose that ecologists must understand governance if they want to help move their scientific knowledge into the realm of policy-making and social action. In all social–ecological systems, it is critical to understand how decisions are made, how resources are allocated and used, and how power operates. In human-dominated ecosystems, such as cities, the people and the institutional arrangements and resulting decisions shape and manage our cities. Sustainability transitions add a normative dimension to the governance of transitions, demanding that we confront ethical and political questions such as who gets to decide what is the "best" or more desirable transition pathway, and who benefits (or loses) from these transitions (Smith and Stirling 2010). Hence, pathways toward sustainable futures cannot be predetermined solely by ecological conditions (i.e., sustainable ecosystem), but by people's values, visions, and social relations as well. The multifaceted process of making these decisions and steering shifts toward more sustainable pathways can be considered the governance regime.

The literature is replete with institutional analyses of governance mechanics, apparatuses, and functions (Ostrom 1990). This article is not a review of that literature. Rather, we discuss the importance of governance in transitions toward more sustainable futures, with a focus on urban ecosystems. We briefly review key governance features that appear to enable or constrain urban sustainability transitions that currently are underway in some cities (Fig. 1). We present several key propositions for understanding the role of governance in sustainability transitions based on examples from social–ecological governance research in several U.S. cities. And, we conclude with a call to ecologists who are interested in environmental stewardship and sustainability transitions, and to urban ecologists in particular, to consider and incorporate the critical role of governance to transitions in their systems.

Governing Sustainability Transitions

Similar to adaptive governance approaches proposed by resilience theorists (Folke et al. 2005), transition governance seeks to overcome management failures of the past that may have resulted from rigid, hierarchical, fragmented, conventional, top-down, government-centric approaches and to move toward more systems-based, flexible, and participatory strategies that foster social learning through governance networks (van der Brugge and van Raak 2007; Fig. 2). Transition governance emphasizes the need for transformational actions to purposefully steer changes in how society governs itself and its natural, cultural, and built resources. In other words, transition approaches set goals and objectives that move the systems toward new system states.

Sustainability scholars recognize that sustainability is not an end point or a goal, but rather is a process, driven by values and visions of multiple sectors in society (Leach et al. 2010, Childers et al. 2014). Multiple pathways toward sustainability are therefore possible (Moore 2007). Historically, cities have gone though many transformations to

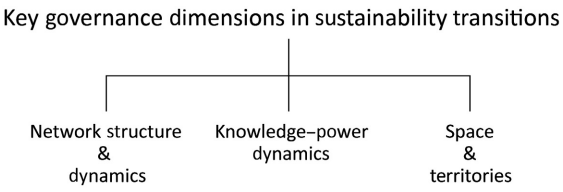

Fig. 1. Key governance dimensions that are described and illustrated with examples from cities in which long-term social–ecological governance research is underway.

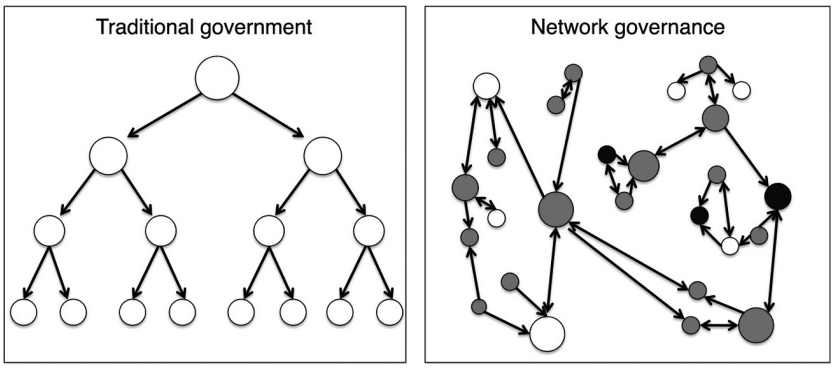

Fig. 2. Simplified illustration of the difference between traditional, hierarchical governance approaches (left) and more diverse, systems-based structure that allows participation and interaction of multiple actors (right). White circles are government organizations, and the gray and black circles are non-governmental organizations (e.g., civic or private organizations).

address the contested needs and values in highly diverse landscapes (Pickett et al. 2013). An example is the Sanitary to Sustainable City transition that characterizes many postindustrial cities in the "Global North." In this transition, cities shift away from rigid and centralized infrastructures designed mainly to address sanitation and health goals, toward a focus on human well-being and a more holistic, integrated management of urban resources (Melosi 2000, Grove 2009, Childers et al. 2014). Key governance features that have been distinguished in a sustainable city, in contrast to a sanitary city (Pickett et al. 2013), can be summarized as follows: (1) holistic alternatives to top-down decision-making and technocratic solutions, which rely on decentralized infrastructure and ecological solutions, (2) integrated management and planning that do away with agency boundaries in favor of networked approaches, (3) inclusion of multiple organizations, community-based groups, and public–private partnerships that involve all stakeholders beyond formal government structures in the management strategy, and (4) integrative knowledge systems that span multiple disciplinary and policy sector boundaries.

Over the past several years, we have collaborated with each other to explore emerging patterns in governance from cities that are engaged in reorganizing toward sustainability. We have aimed to build upon the growing literature addressing governance of sustainability and climate change in cities (Bulkeley 2010, Burch 2010, Schroeder et al. 2013) by uncovering features of governance that we have empirically observed to enable or constrain transitions in cities and collectively synthesizing "lessons learned." We have studied New York (New York), Baltimore (Maryland), and Seattle (Washington), three cities that have made substantive efforts to transition to more sustainable futures. We have also studied San Juan (Puerto Rico) that is seemingly unsustainable but has initiated plans to transition to more sustainable futures.

For our synthesis, we draw on observations and experiences from decades long place-based, multimethod, social–ecological research in these cities (Muñoz-Erickson et al. 2014, Grove et al. 2015, Svendsen et al. 2016), including through historical and spatial analyses, interviews, surveys, content analysis, and case study research. In working with ecologists and practitioners in the field, we have observed that there is often an implicit assumption that an idealized form of institutional arrangement exists to manage and govern urban ecosystems. Yet, our empirical experience suggests that different forms of governance coexist within social–ecological systems in much the same way that a multitude of evolutionary strategies produces ecosystem structure and function. These different forms of governance include hybrid governance, where entities have changed their roles and responsibilities enough that entirely new forms of governance are created. We also find more traditional, hierarchical governance structures, where clear

boundaries are maintained among government and civic organizations, or among the neighborhood, city, region, and state scales.

To visualize and interact with these different, and often complex, forms of governance, we focus on how social relations and power dynamics among actors—organizations, institutions, and social groups–engaged in governance from the perspective of networks. In the social sciences, this is referred to as a relational approach because it exposes the interactions that constitute governance. Clearly, other institutional elements, such as rules and property-right regimes, are fundamental to understanding urban governance. Nevertheless, we find this relational approach to be key to improving our understanding of transition governance, but the use of network language may also facilitate communication with ecologists, following the argument that networks serve as metaphors, models, and theories to a broad set of social and natural sciences (Rocheleau and Roth 2007). We present these observations as a set of propositions that draw upon examples from our empirical research across the four study cities.

Network Structure Matters

The ability of an actor to influence governance is crucial for understanding transitions and the potential outcomes that may result. Along with other well-known sources of power, such as financial resources and political capital, the position of an actor in the network structure is an important variable affecting the level of influence that any actor, including non-state and civic actors, may have on governance. This insight, along with the fact that governance actors are embedded in thick webs of social relations and interactions (Borgatti et al. 2009), has spurred great interest in network theory and social network analysis (SNA) as tools to investigate social–ecological systems governance (Bodin and Prell 2011). We have mapped the social networks of organizations involved in environmental and sustainability-related work in New York, Baltimore, Seattle, and San Juan. (For detailed methods on the analysis of stewardship networks, turf, and characteristics, see Svendsen et al. 2016.) This work revealed that actors occupying central positions had greater influence over the network because these actors were more connected and had more links than other actors. Thus, they had greater influence over how resources, such as information or funding, flowed through the network.

The types of actors in central positions can differ among cities. In Baltimore, local non-profit and municipal actors play the most influential roles in sustainability governance. Indeed, two civic organizations, The Parks & People Foundation and Blue Water Baltimore, along with two city agencies, the Office of Sustainability and the Recreation and Parks Department, were the most active and influential actors in the network (Romolini 2013). For San Juan, it was the state government actors that traditionally had control over the land and resources in the city: Puerto Rico Planning Board and the Department of Natural Resources and the Environment. Although the Municipality of San Juan gained autonomy over land use decisions over a decade ago, these two state agencies continue to hold central positions in the network. Nevertheless, the city and a small number of other non-state actors, such as research institutions, NGOs, and a community-level alliance, also showed high levels of centrality that were not expected given the dominance of the state actors (Muñoz-Erickson 2014*a*). In addition to having central municipal and state actors, in New York City, approximately a dozen civic organizations were identified as having central positions in the city's stewardship networks. These groups served as brokers within the network, thus transmitting resources and information across different sectors, and serving important governance functions for the provision of ecosystem services (Connolly et al. 2014). The relational approach provided by SNA highlights the diversity of actors that were influencing, or had the potential to influence, transitions toward more sustainable futures in these cities.

There is Power in Knowledge

In some cities, such as New York City, urban sustainability transitions are being accompanied by efforts to make cities "smarter" through inclusive and networked platforms and communities to allow greater access to data and information and thus optimize delivery of urban services (Allwinkle and Cruickshank 2011). Examples of

such "smart city movements" are initiatives such as Big Data, social media, and crowd-sourcing that allow managers, planners, businesses, and citizens to obtain real-time data on the function and condition of a city's infrastructure (Batty 2013, Grove et al. 2015). We have found, however, that power dynamics occurring in governance networks may create barriers to the flow and use of knowledge for urban planning and governance. For instance, a SNA of information flows in San Juan revealed barriers to the use of knowledge in land use planning, as the network of actors involved in management of environmental quality was separate from the network involved in land use planning. Such fragmentation can discourage institutional integration and systems thinking (Shiroyama et al. 2012, Muñoz-Erickson 2014*a*). Another barrier was differences in the information various actors deemed to be important and useful. For instance, state planners in San Juan relied heavily on economic data and modeling to inform their plans and rarely considered other types of knowledge, such as ecological data or the local knowledge that was gained by living in the city and experiencing the conditions of the urban environment (Muñoz-Erickson 2014*b*).

These observations about knowledge in governance have prompted us to reflect on a key insight that science scholars have contributed to governance studies, which is the significant role that power and politics play in how we produce and use knowledge in decision-making (Jasanoff and Wynne 1998, Miller 2001). The field of science and technology studies (STS) has long established that knowledge and political processes are not separate social activities; on the contrary, they are coproduced and that "sound science" is not the only legitimate source of knowledge in governance (Jasanoff 2005). In other words, knowledge is power, but this power is not equally distributed. The implications of this understanding of knowledge for transitions are that it is not enough to build new knowledge or technologies for transitioning to sustainable futures, but about also managing the politics of knowledge and expertise. Urban knowledge systems, such as those proposed by the "smart city movement," must take into account the credibility, legitimacy, and saliency of the networks and technology built around city data and information. Although STS scholars have recently paid significant attention to knowledge systems in the agricultural sector and climate change governance (Cash et al. 2003, Miller 2007), little attention has been directed to cities and building appropriate knowledge systems for governing sustainability transitions.

Networks Change: Temporal Dynamics and Legacies

Transitions toward more sustainable futures often arise in response to pulses and presses operating in and on systems (Collins et al. 2011). Examples of pulses include a severe storm, a crash in financial markets, massive foreclosure and home abandonment, or a devastating riot. Such disturbances often reveal underlying stressors associated with persistent presses on a system, such as climate change, sea level rise, long-term unemployment, rising costs of living, or a decline in environmental quality. In certain instances, the dynamic nature of social–ecological systems may overcome preexisting inertias, such as daylighting a stream, converting a decommissioned freeway into a park, or restoring an urban forest (sensu Childers et al. 2014). Such changes may also in turn lead to new forms of governance. Moments of crisis or disturbance may thus lead to rapid and transformative changes in social networks and governance dynamics. This was the case in New York City with the emergence of nature-based and landscape-based living memorials that were created in the aftermath of the 11 September 2001 terrorist attacks. Residents reappropriated public space with temporary shrines and more long-lasting changes in the management of public space, and the emergence of new forms of multisectored stewardship (Svendsen and Campbell 2010).

In examining transitions to more sustainable futures, we must also understand resistance to change that is often manifest in systemic inertias (Childers et al. 2014), changes in power (Ballon and Jackson 2007, Caro 2015) as well as the governance challenges associated with those transitions (Turnheim et al. 2015). Many inertias are legacies or lagged effects of previous policies, decisions, actions, and built forms (Box 1; see also Turnheim et al. 2015). The built environment has a certain obduracy; that is, it is characterized by persistent structures that are difficult to change

Box 1: Examples of types of inertias found in urban ecosystems. Adapted from Picket and Grove (2009).

- Physical: Regional climate, topography, soils, hydrology
- Biological: Ecological communities, species, and functions
- Social: Formal and informal rules, power relations
- Cultural: Patterns of thinking, symbols, practices, and values
- Built: Transportation systems, buildings, supply and disposal of water and nutrients, and morphology

(Hommels 2005), as can particular technologies or ideologies—such as neoliberalism—shape path dependency (Sparke 2006). We can improve our understanding of systemic inertias by looking for examples of when governance did *not* change. For example, the SNA for San Juan indicated that the city's environmental governance had not transformed even after implementation of decentralization policies aimed at municipal autonomy (Muñoz-Erickson 2014*a*).

Social network analysis can detect places in a system where change might be most effectively encouraged. For instance, for the Gwynn's Falls Watershed in Baltimore, SNA was conducted in 1996 and 2011 (Romolini et al. 2013). A longitudinal comparison associated with sustainability initiatives revealed a shift to a less centralized and more distributed network with a decreased role of federal and state agencies and a concurrent increase in the roles of city agencies and local non-profits. Over time, the number of actors in this governance network increased with the inclusion of some that were not traditionally relevant to sustainability (Fig. 3). These changes may be partly attributable to the 2007–2009 development of the Baltimore Sustainability Plan, which launched the Office of Sustainability through a highly publicized community engagement process (Romolini et al. 2013).

Spatial Turf and Networked Territories

Although connections among actors may span multiple geographic boundaries and scales of governance, we must also recognize that actors are grounded in particular, context-specific places with associated territorial power dynamics. Recent work on the spatial dimensions of social networks has built upon scholarship in human geography that has emphasized that politics work at and across various scales and in geographically specific spaces (Peck 2001, McCarthy and Prudham 2004). One key dimension of territory is land tenure and property ownership; whether lands are publicly held, privately owned, managed collectively as a commons, or open access without controls to use (Macpherson 1978, Heynen and Perkins 2007, Colding and Barthel 2013). Understanding ownership and management under different property regimes, and how different combinations of regimes work collectively, is crucial for steering toward more sustainable outcomes. At the same time, as we have mentioned, there is no particular governance arrangement or property regime that may serve as a "panacea" for all environmental problems (Ostrom et al. 2007). The places where non-governmental actors carry out sustainability-related work can be thought of as their *spatial turf* (Svendsen 2013). Non-governmental actors have some flexibility in claiming and self-defining their turf. Stewardship mapping in New York City has found spatial turfs that ranged in scale from a single parcel, for example, community gardens, to several neighborhoods, for example, local environmental justice groups—to citywide. (See Fig. 4 for an image of all civic turfs in New York City; US Forest Service 2007.) This research showed that turf size can change over time, as groups expand or shift their missions. In the early 1990s, for example, the New York Restoration Project worked in a few northern Manhattan parks. By the late 1990s, it had expanded to a few dozen community gardens in several neighborhoods. Their turf size continued to grow as The Project began working citywide on the Million Trees NYC tree planting and stewardship campaign starting in 2007, in partnership with the City of New York. This is an example of institutional flexibility and nimbleness that enable adaptation. It may lead to new governance arrangements and even enable transformation.

Physical factors, urban morphology, and spatial context may also shape the governance of overlapping turfs. We have observed cases in which proximity and spatial characteristics influenced creative governance strategies. For instance, the

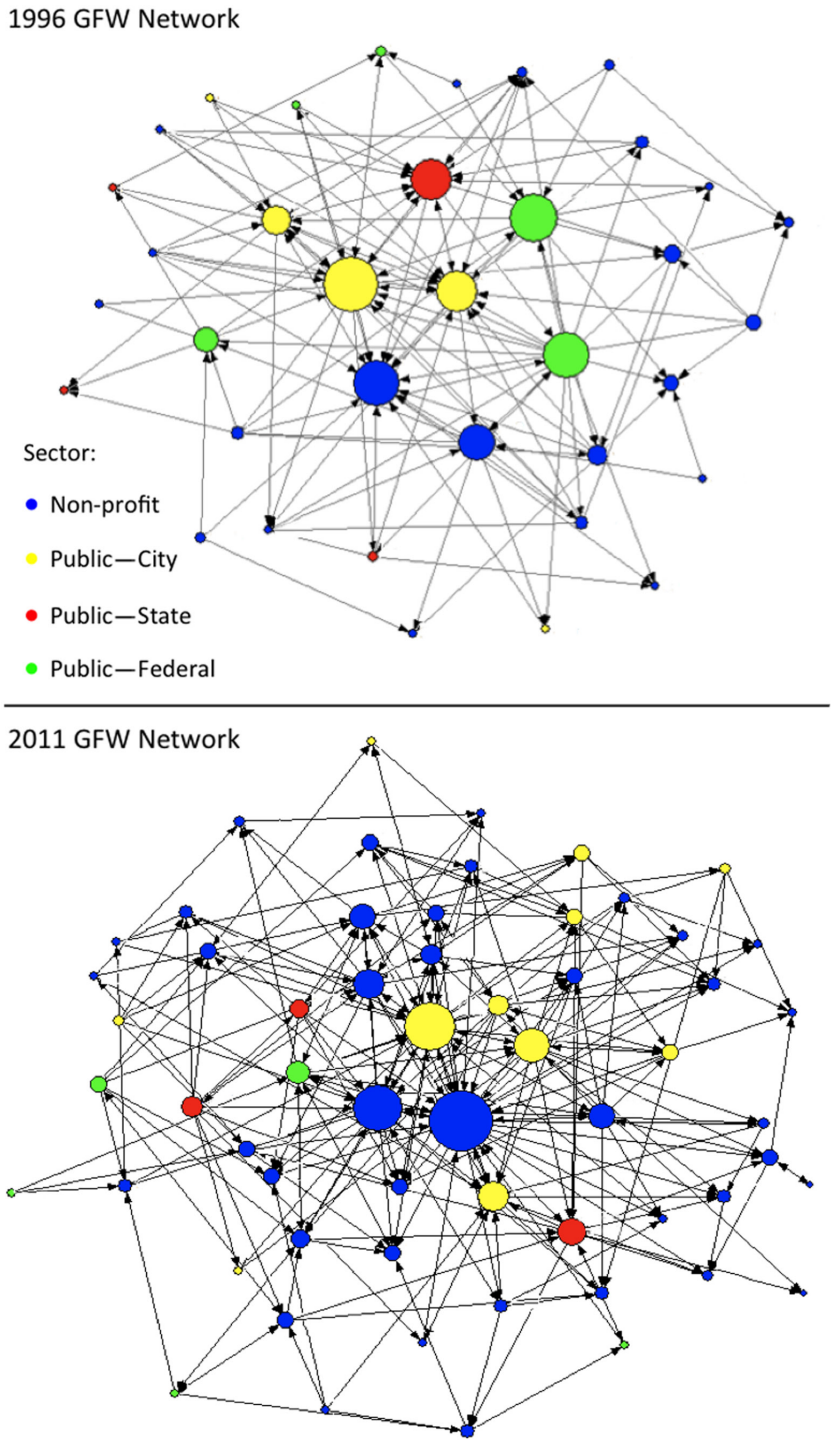

Fig. 3. Changes in the governance network for the Gwynn's Falls Watershed in Baltimore, from 1996 (left) to 2011 (right).

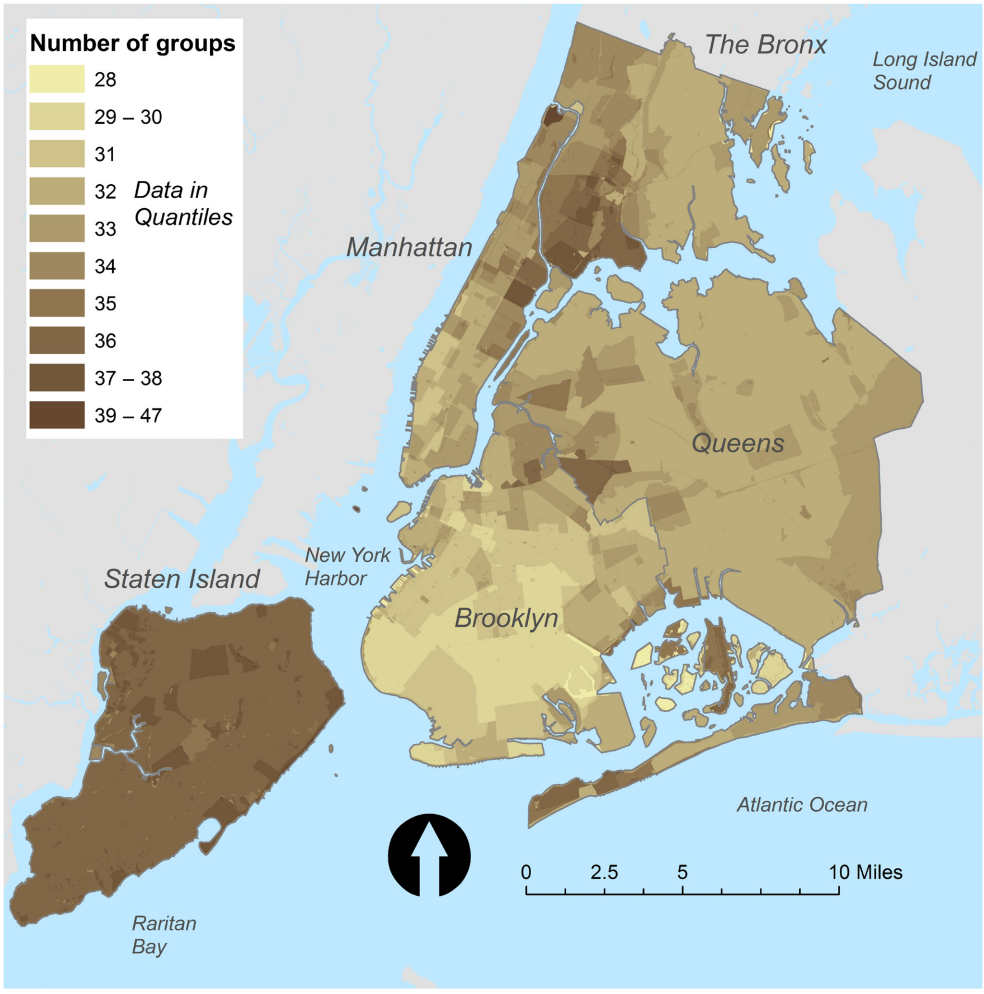

Fig. 4. Map of civic stewardship sites or "spatial turf" in NYC (US Forest Service 2007).

linear pattern of the Bronx River presented both an opportunity and challenge to residents and federal authorities who created a river clean-up initiative in the 1990s. Local groups had to organize along the river in a way that crossed political boundaries, as well as overlapping government authorities over the river itself (Svendsen 2013). From rivers to greenways to trails, features that cross jurisdictional lines are a common phenomenon in urban settings. Collaborative or hybrid governance arrangements, such as multistakeholder working groups, public–private partnerships, and interagency agreements, create the institutional mechanisms that can overcome jurisdictional fragmentation, build trust, and lead to shared management approaches in pursuit of more sustainable outcomes.

Open space can be scarce in cities, and it is often sought after and competed for as territory for use by both public entities and private capital. In New York City, for instance, a citywide network of gardeners, activists, city residents, and the media formed a collaboration in the 1990s to resist city efforts to auction off community gardens for housing developments (Lawson 2005). More recently, new political coalitions and alliances that cross different scales are forming in New York City and the region around issues of urban agriculture and food systems. These issues are often driven by open space limitations, the high cost of the built environment and thus land values, the desire of rural, regional farmers in accessing urban markets, and the need for food security among low-income residents (Campbell 2016).

Conclusions

Because sustainability transitions are crucial to ecosystem stewardship (Chapin et al. 2011), it is important to demystify and understand governance, particularly in urban systems. For ecological research, communication, and application, understanding the types and practices of governance can enhance ecologists' understanding of how social–ecological systems work. Additionally, this understanding can facilitate ecologists' involvement in social–ecological research around key social science concepts: power and networks. To advance this understanding, we presented several propositions based on our empirical research in multiple cities where sustainability transitions are underway: Governance can be understood as dynamic networks over time; these networks can structure power through differential flows of information, knowledge, and other resources; networks respond to and create spatial heterogeneity; and governance networks can be crucial to understanding and fostering transition pathways to more sustainable cities.

To understand governance as relational and spatial, we contend that there is a need to further develop and deploy methodologies that map both social networks and physical spaces that are shaped and sustained through governance. Articulated in particular physical sites and territories, social organizations operate as nodes within larger networks: gaining, using—and sometimes losing—power. An understanding of governance depends on documenting the dynamics of both space and time while being aware that acute or chronic events may (1) shift and shape social networks, (2) overcome or reinforce inertias, and (3) lead to profound changes in governance. Finally, many of these dynamics hinge on values, discourse, and knowledge systems that shape the way we envision and enable new futures for the systems being governed.

A major frontier for urban social–ecological systems research is to link the patterns and processes of the social system to those of the relevant ecosystems, and ultimately to environmental outcomes. Developing this sort of research will require novel interdisciplinary collaborations and data sets that cross sectors and spatial, temporal, and organizational scales. Such social–ecological collaborations have only begun to link environmental stewardship practices to governance networks and policies to nurture transformative changes in urban ecosystems. There is much yet to be done, and ecologists have an important role to play in governance networks.

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