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Civic ecology: a pathway for Earth Stewardship in cities

Marianne E Krasny* and Keith G Tidball

In an increasingly urban society, city residents are finding innovative ways of stewarding nature that integrate environmental, community, and individual outcomes. These urban civic ecology practices – including community gardening, shellfish reintroductions, tree planting and care, and “friends of parks” initiatives to remove invasive and restore native species – generally begin as small, self-organized efforts after a prolonged period of economic and environmental decline or more sudden major disruptions, such as earthquakes, hurricanes, and conflict. Those practices that are sustained expand to encompass partnerships with non-profit organizations; local-, state-, and federal-level government agencies; and universities. Civic ecology practices reflect local cultures and environments as well as the practical knowledge of city residents, and thus vary widely across different cities. When viewed as local assets in some of the most densely populated urban neighborhoods, civic ecology practices offer opportunities for scientific and policy partnerships that address the Ecological Society of America’s important Earth Stewardship initiative.

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Recognizing that scientists alone will not change the risky trajectory that the Earth’s systems are currently on, the Ecological Society of America’s (ESA’s) Earth Stewardship initiative has called for research that includes “partnerships among experts and practitioners of many disciplines and professions and draws on local knowledge of people who observe and seek ways to mitigate and adapt to social–ecological changes” (Chapin *et al.* 2011). Marshall *et al.*’s (2011) related “Action Ecology” agenda focused more specifically on considerations for scientists working in a diverse society, and called for the incorporation of culturally based forms of knowledge; opportunities for young people to spend time in nature; collaborations in the realms of policy, environmental justice, education, and community participation;

and partnerships with existing stewardship activities.

Identifying local activities that reflect Earth Stewardship and Action Ecology principles and offer opportunities for partnerships with practitioners is increasingly important, particularly in cities. Through research- and outreach-related experiences in urban community gardening, community-based watershed restoration, community forestry, and similar initiatives, we have come to recognize a suite of “civic ecology” practices that integrate social and ecosystem outcomes as well as local and scientific knowledge and that may be sources of social–ecological resilience (Figure 1). Here, we draw from a community of scholars who use the term “social–ecological systems” to emphasize the complex interconnectedness among social and ecological processes, and the term “resilience” to focus attention on the ability of such systems to adapt and transform in response to ongoing small disturbances as well as to earthquakes, hurricanes, oil spills, conflict, and other major disasters (Folke *et al.* 2002).

We have deliberately chosen the term civic ecology to suggest social and environmental outcomes and also to indicate that such initiatives are part of a larger “ecology” of processes, interacting at multiple scales (Krasny and Tidball 2009a). Because civic ecology practices often emerge in urban neighborhoods, they reflect how “the demographic shift to cities provide[s] unprecedented stewardship challenges and opportunities” (Chapin *et al.* 2011).

In this article, we present civic ecology as an area of inquiry and practice, and present ten principles that have emerged from our participation in and study of such practices. We then provide examples of how universities and federal, state, and city governments have partnered in the implementation of these practices in ways that contribute to the Earth Stewardship and Action Ecology agendas.

In a nutshell:

- Civic ecology practices are self-organized stewardship initiatives, often taking place in cities
- These initiatives have positive outcomes for individuals, communities, and local ecosystems, and thus represent a change in thinking – from humans as apart from and destructive of the environment to humans as part of and stewards of the environment
- Because civic ecology practices reflect local cultures and environments, they vary across space – for example, from oyster seeding efforts in the New York City harbor to Laotian refugee community gardens in Sacramento, California
- Those civic ecology groups that are successful often form partnerships with government agencies, non-profit organizations, universities, and the private sector, thereby expanding their overall impacts

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■ Civic ecology

The term civic ecology has been used by landscape architects (Poole 1998), community planners (Smith 2008), and social scientists (Wolf 2008), in addition to ourselves (Tidball and Krasny 2007). Here, we define civic ecology as a field of interdisciplinary study concerned with individual, community, and environmental outcomes of community-based environmental stewardship practices, and the interactions of such practices with people and other organisms, communities, governance institutions, and the ecosystems in which these practices take place. Civic ecology practices refer to local environmental stewardship actions taken to enhance the green infrastructure and community well-being of urban and other human-dominated systems (Tidball and Krasny 2007). These practices often emerge after a period of sustained environmental and social deterioration, and are “self-organized” by community members. Examples include community gardens planted on degraded vacant properties by neighborhood activists in New York City during the high-crime era of the 1970s, and similar efforts today in Detroit and Cleveland. People sometimes turn to civic ecology projects as a source of individual and community resilience after crises (Tidball and Krasny in press), as when community gardens became sites for spontaneous “living memorials” following the terrorist attacks of September 11, 2001 (Svendsen and Campbell in press). Although often initiated by community activists, longer-term civic ecology projects generally involve partnerships with non-profit organizations, government agencies, universities, and the private sector.

Even though their activities involve environmental stewardship, civic ecology practitioners invariably speak about the outcomes of these initiatives for their communities. For instance, in interviews conducted by the second author (KGT) shortly after the landfall of Hurricane Katrina, citizens in New Orleans’ Tremé district recounted stories of how, before the elevated Interstate-

Figure 1. Civic ecology projects draw on “social–ecological memories”. Cultivation practices transported to cities by migrants from rural areas are referred to as “social memories”, whereas the seeds and other propagules that are similarly transported are referred to as “ecological memories”.

10 was built, the trees that lined Clairborne Avenue provided sites for gathering and socializing. After Hurricane Katrina, residents replanted trees in an effort to recreate a sense of community remembered from earlier times (Figure 2; Tidball *et al.* 2010). Because they involve contact with nature, civic ecology practices can also promote emotional and psychological well-being (Okvat and Zautra in press). Finally, these restoration and stewardship activities enhance local biodiversity and provide ecosystem services. However, because these activities vary widely and because most of our understanding about their outcomes is based on observations, we need to develop a set of defining principles and testable hypotheses that set the stage for a civic ecology research agenda. Below, we present ten principles of civic ecology.

(1) Civic ecology practices emerge when threats cause a system to reach a tipping point

Holling and Gunderson’s (2002) “adaptive cycle” provided a useful metaphor for how social–ecological systems change over time, with a period of rapid growth followed by a conservation phase, eventually leading to rigidity or inability to absorb shocks or disturbance. Tipping points are reached when disturbance forces the system into a new state, characterized by different processes. Although initially chaotic, such drastic change and “energy release” also provide opportunities for reorganization and rebuilding. It is during this phase, whether following war, earthquakes, or other disasters, that civic ecology practices – such as community gardening in post-conflict Bosnia, renewed interest in the Martissant Park project in Port-au-Prince, Haiti, following the 2010 earthquake, or the greening of the Berlin Wall Trail – emerge and contribute to the subsequent reorganization phase (Tidball and Krasny in press).

(2) Encompassing social–ecological memories in civic ecology practices fosters individual and community resilience

Some African Americans grow okra and other southern vegetables in New York City’s Harlem neighborhood, and a group of Hmong refugees cultivate a colorful panoply of Southeast Asian eggplants, foot-long beans, and hot peppers in community gardens in Sacramento. These are examples of how urban gardeners bring with them both seeds and practical horticultural knowledge from historic and rural cultural traditions, which may be used to recreate green spaces similar to those in their ancestral or home land. Such green spaces serve as “pockets” of



Figure 2. (a) Painted columns below Interstate-10 in the Tremé neighborhood of New Orleans, Louisiana, recall a past in which trees along Clairborne Avenue provided sites for residents to congregate and share stories, while offering protection from intense sunlight and heat. (b) After Hurricane Katrina, residents of Tremé demonstrated their resolve to recover from storm-related damage in their neighborhood by planting trees.

social–ecological memories that store and pass on experiential knowledge and practices to the next generation (Figure 3; Barthel *et al.* 2010). Sometimes, those who hold the practical memories of how to cultivate particular species, such as oysters in the New York City harbor, have passed away. Yet the current oyster restoration projects in New York’s waterways suggest that these memories may somehow resurface and be acted upon.

(3) By engaging people in working with nature, civic ecology practices foster psychological and physical well-being

In addition to social–ecological memories of horticultural practices, less tangible, evolutionary memories of humanity’s relationship to nature may come into play (Tidball 2012). Kellert and Wilson’s (1993) notion of biophilia (ie “the connections that human beings subconsciously seek with the rest of life”) is useful in understanding our need for and the benefits derived from being in and safeguarding nature. Louv’s (2006) book synthesized several decades of research on the emotional, psychological, and cognitive outcomes of time spent in nature; a much smaller body of research has addressed the benefits of active stewardship of nature (eg Austin and Kaplan 2003).

(4) By reflecting local history, cultures, and aspects of the built and natural environment, civic ecology practices foster a sense of place

Civic ecology practices reflect local cultures and ecosystems, and participants in such practices may learn to attribute ecological meaning to highly urbanized environments (Kudryavtsev *et al.* 2012). Members of Friends of Parks in Seattle remove invasive ground cover and replant trees in an attempt to recreate the majestic Douglas fir (*Pseudotsuga menziesii*) and western red cedar

(*Thuja plicata*) canopies that are emblematic of the Pacific Northwest. Similarly, community forestry initiatives in New Orleans focus on stewarding the southern live oaks (*Quercus virginiana*) that are symbolic of nature and “place” in southern US cities (Tidball *in press*). Sometimes the built environment becomes a prominent part of a restoration effort. For instance, Toronto’s Evergreen Brickworks is a civic ecology initiative located in quarries that once supplied the clay for the bricks used to build houses in Toronto; activities today include tree planting, wetland restoration, children’s gardens, and conversion of the historic kiln-lined brick factory into a civic meeting space. Similarly, High Line Park in Manhattan incorporates patches of native woodland and prairie species along an elevated railroad that once served the Meatpacking District (Figure 3), and the Berlin Wall Trail has integrated historic guard towers that are symbolic of the tensions that characterized the Cold War (Cramer *in press*).

(5) Civic ecology practices that are sustainable expand from small-scale, self-organized efforts to encompass multiple partnerships

A community gardening movement emerged in the 1970s in New York City as local activists, tired of government neglect of their neighborhoods, self-organized to clean up vacant lots and degraded parks. Eventually, a quasi-governmental agency, Green Thumb, was launched to provide compost, fences, technical advice, and other support, and the non-profit Green Guerillas emerged as an advocacy organization. In the late 1990s, dramatic protests against then-Mayor Rudy Giuliani’s push to convert community gardens to commercial properties spurred then-Lieutenant Governor Eliot Spitzer to grant official park status to community gardens that fulfilled certain criteria. Recognizing the value of these civic ecology initiatives, actress Bette Midler created the non-profit New York Restoration



Figure 3. Manhattan's High Line Park incorporates patches of native prairie species along a former elevated railroad.

Project, which joined forces with the Trust for Public Land to buy gardens to ensure their permanent tenure. Today, community gardeners in New York City partner with numerous governmental agencies and non-profits, including urban land trusts and community and youth development organizations, as well as with university researchers (NYC Department of Parks & Recreation 2011). Such an array of partnerships is consistent with studies showing that government institutions and civil society organizations acting together create governance systems that are flexible and resilient (Ostrom 2010). Furthermore, by forging ties with government agencies and non-profit organizations, civic ecology practices “scale up” their impacts from the very local to state, regional, and even national levels.

(6) Citizen engagement in monitoring of civic ecology practices enables ongoing adaptation based on information about outcomes

In some cases, civic ecology participants monitor the outcomes of their projects. For example, the Chicago Wilderness prairie restoration initiative has adapted management strategies based on experimentation and



Figure 4. Students from Rocking the Boat monitor the results of their oyster seeding efforts on the Bronx River in New York City.

learning about controlled burns and seed stratification (Stevens 1995). In New York City, trained “scientific divers” and watershed stewards check fish traps and photo-monitor estuary health during cruises conducted by the Urban Divers Estuary Conservancy, and students from the non-profit Rocking the Boat monitor the outcomes of oyster seeding efforts on the Bronx River (Figure 4). Such monitoring represents a type of information feedback that enables participants to change their practices based on data they collect in an adaptive co-management process (cf Armitage *et al.* 2007).

(7) Civic ecology practices provide opportunities for culturally embedded learning about social-ecological systems

Young people in cities across the US who participate in the Garden Mosaics science education program learn alongside older, more experienced community gardeners about the relationship between planting practices and cultural traditions. In addition to being exposed to the practical knowledge of experienced gardeners, young people learn about the science of plants, soils, and ecosystems using curriculum materials produced at Cornell University (Figure 5; Krasny and Tidball 2009b). Schools and non-profit groups often join in ongoing civic ecology practices to enhance learning opportunities for students, such as the Harbor School on New York's Governor's Island and the previously described Bronx non-profit Rocking the Boat. Sociocultural learning theories, which emphasize the interactions between learners and their social and physical environments (Alexander *et al.* 2009), are useful in understanding how younger generations gain knowledge in civic ecology contexts. Furthermore, social learning explains how a group of stakeholders monitors the outcomes of civic ecology or other environmental stewardship practices and adapts their practices based on monitoring results (Blackmore *et al.* 2007).

(8) Civic ecology practices may contribute to transforming vicious cycles of crime and unhealthy behaviors to virtuous cycles of greening and community well-being

Many are familiar with the notion of vicious cycles of poverty leading to crime, abandoned neighborhoods and vacant lots, and unhealthy behaviors. Branas *et al.* (2011) demonstrated that Philadelphia neighborhoods with greened vacant lots had lower incidences of gun assaults and in some cases vandalism, as well as residents who reported feeling less stress and exercising more, as compared to neighborhoods with vacant lots that were not greened. This work suggests that green spaces in poor urban neighborhoods could play a role in converting vicious cycles associated with poverty, crime, and unhealthy lifestyles to more virtuous cycles of healthy behaviors (Tidball *et al.* in press). Moreover, the positive individual, community, and environ-

mental outcomes that result from actual engagement in civic ecology practices may motivate participants to become more involved in such efforts, thus reinforcing virtuous cycles.

(9) Civic ecology practices represent nested processes that interact across individual, community, and ecosystem scales

In his book *Nested Ecology*, Wimberley (2009) described how a personal ecology – that is, an individual's relationships with material goods, people, and other forms of life – is nested in a social ecology encompassing family and community, which in turn is nested in an ecosystem ecology. The notion of nested ecologies helps to explain how civic ecology processes at different scales lead to multiple outcomes. As an example, in a stream restoration project, individuals actively cut branches and place them in a stream, which has positive outcomes for their physical and psychological well-being. By forging connections with others, participants also contribute to social well-being, and both individual and collective actions enhance local ecosystems.

(10) Civic ecology practices can be sources of social–ecological resilience

Civic ecology projects emerge when local people, acting on social–ecological memories and biophilia, steward a neglected resource. Such practices integrate learning through small-scale experimentation and observations (adaptive management) and collaborative or participatory processes (co-management), and thus can be considered as an emergent form of adaptive co-management (cf Ruitenbeek and Cartier 2001). Social learning occurs when participants experiment with and assess the results of different restoration practices and ways of engaging their broader community; the information garnered from such experiments and assessments provides feedback that enables practices to be refined. Although the local knowledge of and initiative shown by community members are critical, linkages are often made with universities, governments, and non-profit organizations. These linkages create opportunities for integrating multiple forms of knowledge and for scaling up outcomes. In short, civic ecology embodies several attributes that may foster social–ecological system resilience, including local and scientific forms of knowledge; self-organized or bottom-up stewardship initiatives; partnerships among community groups, non-profits, and government agencies; social learning that provides information to adapt practices; and the provisioning of ecosystem services (Figure 6; Walker and Salt 2006).

■ Civic ecology, scientists, and policy makers

Several aspects of civic ecology practices, including the fact that they are self-organized and often take place in urban communities, present both a challenge and an opportunity for scientists and policy makers engaged in



Figure 5. Community gardening in the Bronx neighborhood of New York City provides youth with opportunities to learn from the practical knowledge of elders with agricultural backgrounds.

Earth Stewardship. The challenge is to recognize and leverage these practices as existing assets, or “pockets of social–ecological innovations” (Galaz 2012), whereas academics and policy makers often think of themselves as having the knowledge needed to design interventions. For example, even in collaborative efforts such as community-based natural resources management, the process is often initiated by government resource managers and scientists, who invite stakeholders to comment on draft plans.

Asset-based approaches to community development, which seek to identify and build on the capacities, skills, and assets of local people and neighborhoods (McKnight and Kretzman 1996), provide guidance when considering how scientists and policy makers might support civic ecology practices. Such an approach is reflected in a *Bloomberg Businessweek* article, which claimed: “The last 50 years have shown that Detroit won’t benefit from large-scale actions by the municipal or federal government. Residents have discovered that real recovery comes from community initiatives, entrepreneurial creativity and citizen involvement” (Long 2011). This is not to suggest that scientist- and policy-maker-driven initiatives have no place in such efforts; indeed, many – including mayoral sustainability plans in US cities – have been successful in improving local environments and in paving the way for national-level discussions on sustainability. Rather, we suggest that homegrown solutions are also important to communities, including poor communities, and that recognizing, respecting, and partnering with these groups may contribute to Earth Stewardship.

Scientists are already involved in several civic ecology initiatives. For instance, Cornell University agro-ecologists Laurie Drinkwater and Megan Gregory are engaging community gardeners in collaborative inquiry to learn about the use of cover crops to enhance soil quality. Soil chemist Murray McBride applies information gained from testing for toxic metals in urban soils to design gardening practices that minimize exposure to these metals. Alex

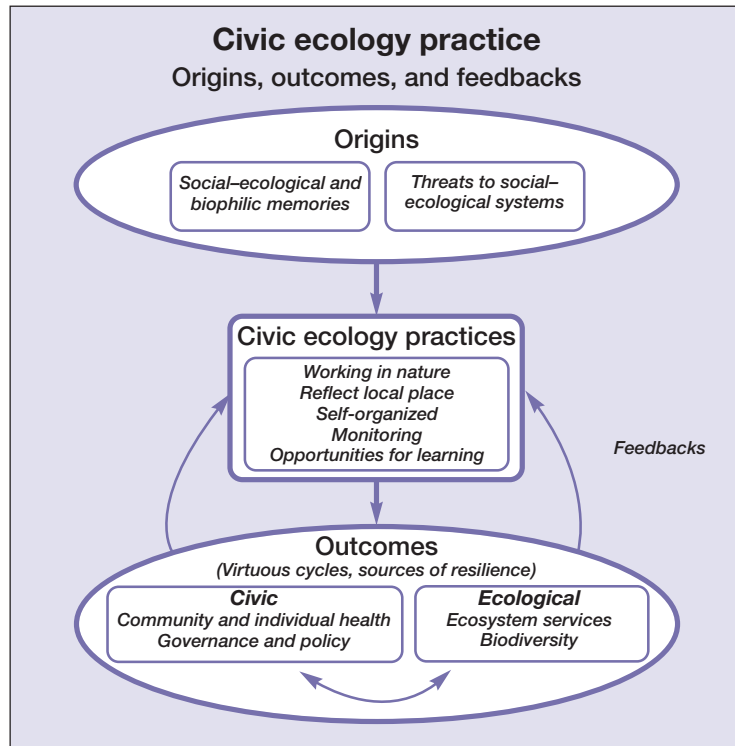


Figure 6. Conceptual model for civic ecology practice. Civic ecology projects emerge in response to threats and draw on social-ecological memories. They entail active nature stewardship, reflect local place, are self-organized, and provide opportunities for learning. Both civic and ecological outcomes lead to positive feedbacks, encouraging more people to become engaged. Different aspects of civic ecology practice can become sources of social-ecological systems resilience.

Kudryavtsev, a PhD candidate in Cornell University's Civic Ecology Lab, spent 2 years in the Bronx, helping with youth community gardening, oyster restoration, tree stewardship, and invasive species removal projects, while conducting research on sense of place among young people and educators engaged in these efforts.

Policy makers interested in supporting civic ecology practices walk a fine line as they try to "grow" an existing asset without destroying the very spirit that led to its creation. Perhaps the first step for municipal governments, in particular with regard to the growing number of urban sustainability and civic renewal initiatives, is to recognize the value of civic ecology practices, not only in individual neighborhoods and cities but also collectively across North America. Furthermore, city, state, and federal government policies should avoid introducing conflicting policies. For example, the New York City Department of Parks and Recreation and the US Army Corps of Engineers have partnered with New York City harbor oyster restoration efforts, yet the neighboring state of New Jersey issued an order to halt oyster seeding, fearing that contaminated oysters would interfere with the commercial seafood industry (Sullivan 2010).

Further insights into how government, including regulatory agencies like the US Environmental Protection

Agency (EPA), can support civic ecology practices come from writings about the civic environmental movement, which is characterized by collaboration among communities, interest groups, and government agencies, and which offers an alternative to more adversarial forms of environmental activism. Save the Bay and similar environmental stewardship organizations, for example, form partnerships with the EPA and with other government agencies to foster "ongoing civic education and the public work of restoration without losing the capacity to engage in conflict" (Sirianni and Friedland 2001). Often, an initial period of conflict is replaced by attempts to identify common interests, which may lead to a civic ecology project in which citizens restore and monitor local social-ecological systems (Figure 1). Importantly for policy considerations, this provides an opportunity for government to catalyze local stewardship initiatives using voluntary agreements and other non-regulatory tools.

■ Civic ecology and the Earth Stewardship agenda

Marshall *et al.* (2011) called for attention to community needs and ongoing efforts in implementing Earth Stewardship. Civic ecology encompasses a suite of existing efforts, or assets, that vary according to local contexts and that integrate individual, social, and environmental outcomes. Researchers are already partnering with these community-organized efforts to promote Earth Stewardship, and policy makers are working collaboratively with civic ecology practitioners to enhance environmental quality.

Drawing from the social-ecological systems resilience framework (Folke *et al.* 2002), Chapin *et al.* (2011) described an "adapting mosaic" paradigm for Earth Stewardship that "recognizes the uncertainty of future changes and social-ecological responses and seeks to maintain a diversity of future options rather than targeting specific outcomes". A diversity of species, landscapes, cultures, and social processes and institutions maximize the potential for flexible outcomes – or resilience – in the face of uncertainty. Civic ecology practices, particularly in cities, may become part of such an adapting mosaic of options (Tidball and Krasny 2007). Currently, however, the outcomes of such practices are mainly restricted to local communities, and research on how different types of practices contribute to various sources of resilience is lacking. A challenge for civic ecology practitioners, scientists, and policy makers will be to create partnerships that enable them to share their perspectives, and to scale up positive local impacts to address larger-scale threats, while maintaining the local memories, knowledge, and

“sense of place” – as well as the spirit of community initiative, innovation, and engagement – that civic ecology practices bring to the Earth Stewardship table.

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