

Urban Ecological Restoration

I am pleased to present in this issue a special collection of articles, notes, and book reviews related to ecological restoration in urban contexts. The discussion around ecological restoration in cities has been evolving for years. The research and practice of urban ecological restoration have grown along with the expansion of urban areas that are home to the majority of the earth's human population, and our increasing awareness of the breadth and depth of human impacts on our environment. Every day we learn of yet another facet of the profound changes human activity has wrought on everything from the survival of animal and plant species, to the hydrology of the planet's largest watersheds, to the earth's climate.

History reveals, however, that urban ecological restoration is not new; in fact, a great deal of restoration originated in, or near, urban areas. The same consciousness that led to parks, public gardens, and open-space areas within cities fostered efforts at restoring habitats in urban places. Restoration work beginning in the 1930s benefited from proximity to centers of learning, larger pools of volunteer labor, and sources of funding, and was also driven by concerns related to water quality, aesthetics, quality of life, endangered species, and other issues that continue to shape urban restoration efforts today. "Hearths" of ecological restoration in the U.S., where the sparks of new ideas caught fire, include places like the Morton Arboretum near Chicago, the Botanical Garden at Vassar College, and here at the UW-Arboretum in Madison (Egan 1990, 1997).

The current discussion about ecological restoration in cities is seasoned by a heavy dose of dismay over the challenges to restoration created by urbanization. One obvious source of dismay stems from the decidedly negative influence of urban (and suburban) development on nonhuman species diversity and such fundamental ecosystem functions as nutrient cycling, hydrological processes, and water quality. Challenges of urban ecological restoration include isolation of protected areas within surrounding seas of asphalt, concrete, and lawns (Lindig-Cisneros and Zedler 2000), negative impacts of fast-moving and polluted stormwater (Stiles et al. 2008), and elevated levels of nutrients, heavy metals, and other chemicals toxic to wetlands and other

ecological communities (Baldwin 2004, Ehrenfeld 2000, Iannuzzi and Ludwig 2005).

Urban ecosystems present altered soil conditions and processes (Heneghan et al. 2004) and rapidly shifting and often warmer microclimates, creating numerous barriers to fostering native plants or animals, or even predicting what types might survive in such an environment. Human activities have created "novel ecosystems" with changed hydrological and soil processes and new species assemblages (Hobbs et al. 2006). The San Francisco Bay, for example, is an estuary dominated almost entirely by non-native species, with entirely novel species combinations. This "new ecological world order" suggests that many places may have crossed various environmental thresholds precluding native species reestablishment. There is no going back.

On top of all of these shifts in natural processes and disappearances of native organisms, restorationists have suffered from the unpredictable, conflicting, seemingly irrational behavior of the most ubiquitous of species—humans. Uninformed visitors to a restoration project can trample fragile vegetation and disturb wildlife, or even be vandalous (Galbraith-Kent and Handel 2007). Awareness of the objectives and benefits of restoration is certainly no guarantee of support. The Chicago Wilderness controversy is the most infamous incident of urban restoration plans stymied by groups of people protesting the cutting of trees, the eradication of certain species, or arguing for different project goals (Alario 2007, Gobster 2001). People have challenged the objectives of restoration projects as well as specific restoration technologies, and while collaboration and community involvement have proved to be critical to the long-term success of many restoration efforts, the pathways for enabling and guaranteeing that involvement remain unclear if not downright hidden. Thus, in urban contexts, restorationists must not only map the ecological processes and species of novel ecosystems, but must also anticipate the charged social-political atmosphere of neighborhood groups, birders, cyclists, city administrations, dog walkers, animal rights groups, and other organizations with differing interests in how a piece of urban land is managed and ways of valuing nature (Gobster and Hull 2000).

Alongside the growing list of challenges presented by ecological restoration in cities, however, is a growing excitement about the opportunities and new horizons presented by the practice, science, and theory of ecological restoration in urban settings. The science of urban ecology, developing

in places like the Cary Institute for Ecosystem Studies in Millbrook, New York, the U.S. National Park Service's Center for Urban Ecology, and the Australian Research Centre for Urban Ecology in Melbourne offers a number of new models and approaches for systematically assessing and mapping social and ecological factors together in urban contexts (e.g., Pickett et al. 2008). Although not particular to urban settings, ecologists are also developing new conceptual frames to understand the linked dynamics of social and ecological systems, in particular how those systems adapt to change. Part of this effort is the continued move of ecology as a discipline away from longstanding metaphors of growth, equilibrium, and stability to systems defined by novelty, memory (which enables learning), and instability (Berkes et al. 2003). Although the study of coupled human and natural systems is a longstanding endeavor for researchers in anthropology, geography, and sociology, the development of these ideas by ecologists, many of whom build on the work of Buzz Holling, articulate with a new interest in understanding and building resilience, or sustainability, of ecosystems in the face of change.

It turns out there is great ecological possibility in cities: amidst acres of paved over, built up land, people have discovered a surprising degree of biodiversity, harbored by people and surviving in unmanaged refuges, although this may well be in spite of urban development as caused by it (Kühn et al. 2004). At New York's Fresh Kills landfill, for example, restorationists observed birds importing thousands of native plant seeds to a densely populated, industrial area. They also found that more than 70 native bee species visited replanted flowers at the site (Mattei et al. 2003). Landscape architects, urban planners, and restoration practitioners are working together on strategies for restoring degraded urban landscapes and doing so in a way that facilitates cultural and social renewal (France 2008). Decommissioning, replacing, or removing obsolete and aging infrastructure in urban areas can work hand in hand with restoration efforts (Doyle et al. 2008), and "city improvements" can benefit both humans and nonhumans.

Broadening the connection between ecological restoration and social justice is another area being pushed by restorationists involved in urban areas (Platt 2006). Paul Gobster has elaborated on the opportunities in urban restoration to successfully weave together the needs of diverse groups of people and wildlife, creating habitats for human recreation and native plants and animals, providing a range of critical ecological services, and also a better understanding and appreciation by people of their environment (Gobster 2007). Urban ecological restorations can be a tool for education, providing opportunities for learning about the environment such that people come to be more cognizant of nonhuman species and more aware of the care needed to foster ecological health (Light 2006, McKinney 2002).

In her article in this issue Andrea Newman builds on this promise of urban restoration, and issues a call for people working on restoration in cities to focus on race, ethnicity, and justice. Inclusivity in restoration projects cannot be accomplished simply by being open to diverse stakeholders, she argues. She identifies a number of barriers that prevent marginalized people from participating in urban restoration projects, even while they are some of the most deserving. Efforts must be made to target underserved areas of cities and to reach out to include people, Newman says, also pointing out that decision makers can hold problematic misconceptions, such as that poor people do not care about their environment and so will not be interested in ecological restoration. Newman suggests that there is great support and potential in including marginalized groups in restoration efforts.

Authors Dan Salas and Joseph Shisler and colleagues focus on very different urban objectives in their articles in this issue. While Salas focuses on restoration planning for a protected area—the John Heinz National Wildlife Refuge near Philadelphia, Pennsylvania—Shisler and colleagues describe efforts related to improving habitat and water quality in the intensively urbanized and severely degraded lower Passaic River in New Jersey. Certainly maintaining the basic ecosystem service of clean water has been a key driver of many urban restoration efforts. Although their goals are different, both articles identify history, planning, and collaboration as critical to their projects. Both people and ecosystems have memories, and those memories are critical to planning for the future. Shisler and his colleagues emphasize the importance of history as well as a regionally informed perspective in order to expand the palette of possible species beyond the very limited range of plants that might exist in current conditions. Salas describes his efforts to gain a better understanding of the history of human development and different life histories of plants and animals. He relies on interviews with staff at the refuge and stakeholder feedback, as well as traditional field research and data management in order to generate plans useful to on-the-ground managers.

Sean McDermott and his colleagues report on work using blue mussels to improve water quality in an urban tidal pond. They describe their success in establishing a reef, but also their efforts to work with the community to change people's perspective from viewing the pond as a sewer to seeing it as part of a living, healthy urban place.

So, although ecological restoration practitioners working in urban contexts face an impressive set of challenges, not the least of which is working with people, these efforts are informed by a broad sense of possibility—perhaps to surmount the nature-culture divide once and for all! In a recent book on the Los Angeles River, Peter Bowler (2008, 52) describes the many small projects that comprise a revitalization master plan for the river:

By doing these stair step, progressive small projects, there will be a cumulative lifting of the ecological condition of the river, and the species richness from birds to vascular plants will rebound . . . And so will a new appreciation of the river as an integrated anthropocentric/biocentric experience for humans. Restoration can be a resurrection of what has been viewed as a closed case.

Europeans have long viewed nature and humans as having coevolved together to produce their landscapes and ecologies (Hall 2005). It has often been said that there is not a square meter in Europe that has not received influence from humans in some way. Perhaps it is an increasing condition of modernity that urbanites all over the world love their parks, river courses, and open spaces of any kind, and increasingly seek means to protect them and to improve their ecological condition. In the context of climate change, urban restoration efforts, which can have the advantage of intensive and extensive management, may even enjoy relative success at serving both wildlife and human needs.

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