Chapter 8
Alternative Approaches to Urban Natural Areas Restoration: Integrating Social and Ecological Goals

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8.1 Introduction

Ecological restoration incorporates land management principles and activities aimed at returning a damaged or degraded ecosystem back to a key historic trajectory in order to achieve goals of ecosystem health, integrity, and sustainability (Society for Ecological Restoration 2004). Please consult Chap. 1 (Lamb et al. this volume) for additional perspectives.

In the United States, many restorationists look to ecological conditions present before the time of European settlement as the key historic landscape they are seeking to restore, and employ an approach to restoration management that has been called "classical ecological restoration" (Callicott 2002). Nine attributes of successfully restored ecosystems identified in the Society for Ecological Restoration International's *Primer* (2004) conform closely to this classical management approach, and have been summarized by Ruiz-Jaen and Aide (2005) as falling along three major ecological dimensions: (1) diversity measured in terms such as the richness and abundance of native plants and other species; (2) structure measured in terms such as the age, distribution, and density of vegetation; and (3) processes measured in terms such as the presence of natural disturbance regimes such as fire. While these dimensions and their measures can help guide restoration efforts on a trajectory toward ecosystem health, integrity, and sustainability, the ultimate success of classical ecological restoration is judged by how well the measures fall within an historic range of variability found in closely matched reference sites (Ruiz-Jaen and Aide 2005). Thus in a broader sense, the overarching goal of the classical approach is authenticity or fidelity in how a restored site looks and functions like one before European settlers arrived, minimally influenced by contemporary human impacts and values (Higgs 2003).

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While this classical approach to management has led to many successful restoration projects, ecologists and other environmental professionals are increasingly questioning its efficacy in dealing with severely disturbed landscapes (e.g., Martínez and López-Barerra 2008) and unpredictable trajectories (e.g., Choi et al. 2008). These concerns might be especially apparent in urban areas, where landscape fragmentation, soil and hydrologic alterations, and microclimatic patterns introduce novel and often substantially different effects than what may have occurred historically. Perhaps even more significant are concerns raised about people's uses, perceptions, and values of the landscape and its restoration, which may pose formidable challenges for managing urban natural areas in socially acceptable ways (Gobster 2010; Ingram 2008).

In this paper I examine these issues within the context of urban ecological restoration, with an emphasis on incorporating social goals alongside ecological ones in managing natural areas. While the *Primer's* nine attributes of restored ecosystems strongly imply the classical approach as a dominant model, its mention of additional goals suggests that other approaches could be considered as conditions warrant:

> For example, one of the goals of restoration might be to provide specified natural goods and services for social benefit in a sustainable manner. In this respect, the restored ecosystem serves as natural capital for the accrual of these goods and services. Another goal might be for the restored ecosystem to provide habitat for rare species or to harbor a diverse genepool for selected species. Other possible goals of restoration might include the provision of aesthetic amenities or the accommodation of activities of social consequence, such as the strengthening of a community through the participation of individuals in a restoration project (Society for Ecological Restoration 2004).

In light of these additional goals, it is important to examine how restoration managers and stakeholders negotiate the implementation of restoration activities and practices for different urban natural area restoration sites and programs. In what follows, I describe restoration programs in two major North American cities and suggest that there may be a number of alternative approaches to restoration that could be applied to achieve social and ecological goals. From this work I outline a framework for how appropriate approaches to natural areas restoration in urban contexts might be identified for a given site or a system of sites. This framework, adapted from the USDA Forest Service's (1982) Recreation Opportunity Spectrum, could provide restoration managers with a systematic way for matching ecological goals and management practices with people's broader desires and expectations for urban nature.

8.2 Case Studies: Key Issues and Constraints

In order to better understand the diverse goals that underlie the restoration management of urban natural areas, I examined restoration activity in Chicago, Illinois and San Francisco, California to identify the key issues faced by practitioners and public stakeholder groups when restoration programs are implemented within metropolitan

areas (for details see Gobster 2000, 2001, 2007a, b). Both locations have significant amounts of protected open space within their metropolitan boundaries: there are more than 279,000 ha of open space in the 9-county "Chicago Wilderness" planning region (9% of land area; 12 ha/1,000 residents) and more than 400,000 ha (24.8% of land area, 65 ha/1,000 residents) in the 9-county Bay Area Open Space Council region (Gobster 2007a). But while extensive restorative management is happening throughout these two metropolitan areas, I focused my case studies on sites within each city and its host county because of the diverse range of social and ecological issues that are being dealt with. In Chicago, there are 49 restoration sites in City of Chicago parks and another 70 sites in the Forest Preserve District of Cook County. The sites range in size from a fraction of a hectare to 1,500 ha in size and include prairie, savanna, woodland, and wetland communities. In San Francisco, there are 30 restoration sites in City of San Francisco parks and another 12 sites in Golden Gate National Recreation Area within the County of San Francisco. These sites range in size from less than 1 ha to more than 160 ha in size and include coastal dune, scrub, grassland, wetland, and non-native forest communities (Gobster 2007a).

The fragmented character of these urban natural areas imposes significant restrictions on what ecological conditions *can* be restored through management programs (e.g. Vidra and Shear 2008). For example, a prairie restoration at the scale of even the largest of sites in Chicago or Cook County is unlikely to become home to an American bison (*Bison bison*). Instead, most restorations focus on recovering or reintroducing the key flora of a target community and hope to attract smaller fauna such as butterflies and birds. By the same token, a dune restoration in the city or county of San Francisco cannot be given the freedom to shift across a park road or into a neighbor's backyard. Instead, ecological communities are necessarily fixed in space and any movement of elements in the community must take place within site boundaries. And while prescribed burning may be used to manage the understory of open oak woodlands in Chicago or reduce woody shrub growth in coastal scrub area of San Francisco, setting back succession with an all-consuming fire is not in the urban restorationist's playbook. Thus temporal dynamics are also more or less fixed and give the impression that such communities are stable and climax in character.

Along with these structural constraints there is a host of social and political issues that further define what conditions *should* be restored in urban settings (e.g., Trigger and Head 2010). Demand for open space by a diverse range of user and interest groups not only limits the number and size of restoration projects within a program but also what other uses might take place, how sites are managed, and by whom. In San Francisco, designation of natural areas and concomitant restrictions on off-leash dog access have led to a major conflict between natural area restorationists and dog owners and threatened progress toward adoption of the city's Significant Natural Resources Area Management Plan (San Francisco Recreation and Park Department 2006). Removal of exotic trees from restoration sites, especially Australian blue gum eucalyptus (*Eucalyptus globulus*), has also been a point of conflict in plan adoption, and, along with tight air quality restrictions and strong attitudes against the use of prescribed burning, public sentiment has forced restoration managers to consider alternative ways for managing natural area sites. While restoration

in Chicago has also been contentious at times (e.g., Gobster and Hull 2000), volunteer-based restoration has long been a hallmark of the metropolitan region's restoration movement and has been a model emulated in other cities nationally and internationally (Ross 1994). Nonetheless, many of the Chicago Park District's larger restoration efforts have been done under contract with professional firms, with volunteers entering the scene to assist with maintenance only after the restoration design has been implemented. The magnitude and complexity of the transformation is a major reason for this, but desire for professionalism, accountability, warranty on plant materials, and time frame for implementation are also important considerations (Gobster 2007b).

8.3 Alternative Approaches to Urban Natural Areas Restoration

Constraints can often spark creativity, and in the case of natural areas management, practitioners and scholars are beginning to advocate for a broader conception of restoration and document a diversity of restoration approaches that are more in tune with the social and ecological goals they seek to achieve (e.g., Choi 2007; Gross 2003; Low 2002; Rosenzweig 2003a). Based my case studies in Chicago and San Francisco, I have identified the following range of approaches as potential alternatives to the classical approach for restoring urban natural areas in consideration of the various ecological and social constraints and opportunities present at different sites. The approaches are not intended to comprise a mutually exclusive or exhaustive typology of possibilities, but rather to illustrate how social and ecological goals might be addressed at particular sites and, at larger scopes of concern, balanced across a system of sites.

8.3.1 Classical Approach, var. 'boutique'

The steep topography of San Francisco and broad floodplains of Chicago have been good deterrents to prior development of many of the now-designated natural areas in these two cities, and while most of these sites have been damaged by overgrazing or other past alterations to vegetation cover, soil, or hydrology, some places still retain significant remnant populations of indigenous flora (e.g., Chicago Region Biodiversity Council 1999; San Francisco Recreation and Park Department 2006). Restoration of these sites conforms most closely to the classical approach to ecological restoration, where native plant diversity is maintained and enhanced through invasive species control and other management practices. However, restoration activities on small sites are sometimes carried out in unconventional ways to deal with environmental and social constraints.

Fig. 8.1 At small urban restoration sites like Brooks Park in San Francisco, volunteers rely on "boutique" methods like hand weeding to maintain sites when other practices such as prescribed burning or the use of herbicides are risky or contentious (Credit: Paul Gobster)

For example, Natural Areas Program gardeners in San Francisco, aided by a substantial force of volunteers, often resort to "boutique," labor intensive methods (Hull et al. 2004) on many of their small sites that would be impractical in larger restorations. For invasive plant control, herbicide use is generally frowned upon by the public and prescribed fire is highly controversial as many sites are in close proximity to residential areas. Consequently, nearly all plant removal is done manually, pulling weeds by hand and using simple hand tools to remove larger specimens. These techniques, along with hand planting and direct seeding of native plants, constitute the bulk of restoration management for sites such as Brooks Park, a 1.4 ha rocky hilltop grassland natural area (Fig. 8.1). For larger sites, such as the 24 ha Glen Canyon Park natural area, managers have experimented with using goats to graze back unwanted vegetation, and have proposed using machinery such as "weed whackers" and power mowers (San Francisco Recreation and Parks Department 2006). Recent research suggests that while the classical approach's prescription for reinstating natural disturbance processes such as fire may be preferable, similar results might be achieved using these alternative methods and thus may be the most feasible in high risk situations (MacDougall and Turkington 2007).

The classical approach maintains that the success of a restoration lies in part in its ability to sustain itself and follow a historical trajectory without substantial human intervention. Such a criterion, however, is simply not realistic for sites like these (Hobbs 2007). Instead, some suggest that continued human intervention *is* the key ingredient to sustainability (Jordan 2003), and in dense urban areas like

San Francisco and Chicago restoration success lies in the ability of program managers to sustain a robust corps of volunteers to steward the sites in perpetuity (e.g., Ross 1994). Boutique restoration may sound overly labor intensive, yet when viewed as a leisure activity on par with gardening it meets desired social and ecological goals for many people (Jordan 2000). And in an urban setting, even non-participants understand the need for routine landscape maintenance to sustain the beauty and function of their yards and parks, and thus extending this level of management to urban restoration is perhaps not so unfamiliar.

8.3.2 Habitat and Sensitive Species Approaches

Many early land protection efforts were aimed not so much at preserving the diversity, structure, and function of native ecosystems and processes described by the classical approach of restoration as they were at setting aside and managing habitat such as wetlands and woodlands for timber and game production (e.g., Hall 2005; Jordan and Lubick 2011). Society's interests in wildlife and plant species diversity have since broadened considerably, but habitat conservation continues to be a dominant paradigm of natural land management. Reconceptualizing urban open space as habitat has also helped to underscore the key role that restoration can play in providing essential habitat patches and corridors to ensure the survival of species in an increasingly human dominated landscape (e.g., Lundholm and Richardson 2010).

In Chicago for example, local ornithologists and recreational birders have over the last decade been persuasive advocates for the need to manage parkland to provide bird habitat along the city's 42 km Lake Michigan shoreline. The lake is an important branch of the Mississippi Flyway and more than 300 resident and migratory bird species have been documented as using the city's shoreline across the seasons. Research has shown that in urban areas, migratory birds need habitat patches at regular intervals along their route where they can safely rest and refuel (e.g., Pennington et al. 2008; Seewagen et al. 2010). The City of Chicago has responded to this new awareness by establishing a number of bird sanctuaries along its shore and is managing the vegetation and beaches to provide essential food and cover (City of Chicago 2006). Because most of the lakefront parks were built on fill to extend land holdings into what was originally open water, the classical approach to ecosystem restoration is already a considerable conceptual stretch. This ambiguity has given natural areas managers greater license in what they plant, and they use a range of natives along with native and introduced cultivars that not only provide food and cover but are adapted to the often harsh site conditions (Gobster 2001).

The oceanfront beaches and bluffs in San Francisco are also important habitat areas for migratory birds, but the city's unique geographic, climatic, and geological characteristics make some of its natural area sites additionally critical to the protection of a number of endemic species. These include flora such as the Presidio manzanita (*Arctostaphylos hookeri ssp. ravenii*) and Marin dwarf flax (*Hesperolinon congestum*) and fauna such as the Mission blue butterfly (*Plebejus icarioides missionensis*) and

Fig. 8.2 While the presence of sensitive species often requires tight controls over recreational use, some species such as the San Francisco lessingia (*Lessingia germanorum*) at this Lobos Creek restoration site needs periodic disturbance for recovery. Understanding the conditions needed to meet ecological goals may enable managers to broaden allowable uses and allow users more direct interaction and exploration of nature (Credit: Paul Gobster)

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) (Gobster 2007a). Because of the natural rarity and threatened existence of these species, site restoration is sometimes less focused on providing a classical ecosystem makeover than on providing optimal habitat conditions for the propagation of a sensitive species. The weight these species are given in restorative management invokes a kind of "ecological primacy," which in some cases makes the existence of incompatible exotics such as blue gum eucalyptus and access for uses such as off-leash dog recreation relatively non-negotiable. Incompatibilities do not always happen, however, and in other cases sensitive species might be maintained under novel conditions (e.g., Hobbs et al. 2009). For example, a 5.3 ha dune restoration was created at Lobos Creek in Golden Gate National Recreation Area to increase the dwindling population of the federally endangered San Francisco lessingia (*Lessingia germanorum*), a tiny sunflower. While the current boardwalk design discourages off-trail use of the site (Fig. 8.2), the plant requires periodic disturbance to perpetuate itself (U.S. Fish and Wildlife Service 2003). To rectify this situation, designers have thought about scheduling fun activities like annual "dune dancing" (Terri Thomas and Michael Boland, personal communication, 5 May 2004).

As these examples show, habitat and sensitive species approaches could provide managers with a greater savings than that afforded under a classical restoration in terms of the cost or time devote to management or the maintenance of existing green

space uses and functions. In this way, the approach parallels ideas described by Rosenzweig's (2003a, b) "reconciliation ecology," where the outcome of saving species is given priority, opening up a variety of different and sometimes novel ways of achieving that outcome.

8.3.3 Hybrid or "Third-Way" Restorations

In most of the larger parks in San Francisco and Chicago, the landscape has been so thoroughly modified that few vestiges of indigenous nature remain. Yet in their quest to create a human habitat for aesthetic pleasure and recreational use, the original designers of these parks developed naturalistic landscapes that often had considerable ecological value (Grese 1992; Young 2004). Restoration efforts in these parks thus sometimes attempt to integrate two (or more) periods of significance—one focusing on classical ecological restoration and another on restoration of the historic designed landscape. Successful projects of this type respect the goals and intent underlying both ideas of restoration yet can produce a hybrid landscape that is its own unique expression of human and ecological values.

One example of this "third way" restoration approach in Chicago is the Lily Pool (Fig. 8.3), a 2.5 ha naturalistic oasis in Lincoln Park designed in the 1930s by noted Prairie School landscape architect Alfred Caldwell, who used a primarily native plant palette to create a symbolic rendition of the Illinois landscape as it existed prior to European settlement. In the restoration effort, Chicago park historians worked with a diverse team of professional and civic interests to restore the integrity of this historic designed landscape while enhancing native plant diversity, bird habitat, and other ecological functions and accommodating access for disabled users as required under the Americans with Disabilities Act. The restoration received a 2001 historic preservation honor award from the American Society of Landscape Architects and an innovative docent program has been established with the non-profit Lincoln Park Conservancy to interpret the site's unique values and perpetuate Caldwell's vision of the Lily Pool as a "hidden garden of the people of Megalopolis" (Maloney 2001).

A larger scale example of third-way restoration is being realized at the Presidio of San Francisco, a 600 ha former military site now managed by the National Park Service under a new model that aims to protect and restore natural and cultural values while promoting sustainable economic development through adaptive re-use of the site's substantial built infrastructure. Much of the non-native forest cover planted by the US Army in the 1880s over approximately 20% of the naturally treeless site was slated for removal as part of natural area restoration efforts until critics successfully lobbied to maintain it for the historic reasons why it was originally planted—as a windbreak and symbol of military presence. A revised vegetation management plan seeks to maintain and rehabilitate the structural characteristics of key historic forest stands in four highly visible areas and manage the remaining forest area to increase ecosystem health and biodiversity. Forest management

Fig. 8.3 Hybrid or "third-way" landscapes such as the Lily Pool in Chicago's Lincoln Park blend ecological restoration other site goals, in this case the restoration of a 1930s historic designed landscape by Prairie School landscape architect Alfred Caldwell (Credit: Paul Gobster)

strategies outside of the key historic stands aim to increase the species, spatial, height, and age diversity of trees; encourage natural regeneration; and promote a varied understory and mid-story layer of native grasses, forbs, and shrubs (Presidio Trust 2001). While critical natural and cultural areas are being restored to their original integrity, this third landscape between the two represents a new hybrid of nature and culture.

Green spaces perform many human-oriented uses in urban areas, from historic and recreational park areas to storm water retention basins, power and transportation rights-of-way, cemeteries and institutional grounds, among other functions. While it may not be the objective of the owners of these sites to manage them for ecosystem health, integrity, and sustainability, the hybrid approach has good potential in helping to demonstrate that such ecological goals can be successfully integrated with human goals and uses of the site.

8.3.4 Designer and Accidental Ecosystems

Humans have shaped the land for millennia, and studies of aboriginal subsistence hunting and agricultural economies have shown that land use practices in some cases expanded local and regional species diversity (e.g., Minnis and Elisens 2001). Contemporary land use usually has the opposite effect, though in a few cases human

Fig. 8.4 Designer and accidental ecosystems such as Alcatraz Island in San Francisco's Golden Gate National Recreation Area create entirely new assemblages of species and conditions, in this case habitat for the endangered black crowned night heron (Credit: Paul Gobster)

designs on the land have created novel conditions for valued species to flourish that would have never occurred under "natural" conditions (Britt 2004). By diverting from the template of classical ecological restoration, these "designer ecosystems" create an entirely new approach to nature restoration where habitat creation, endangered species recovery, or other ecological goals are a byproduct of dominant human goals such as recreation or flood prevention (Palmer et al. 2004).

In San Francisco, a famous designer ecosystem is the 9 ha Alcatraz Island (Fig. 8.4), a rocky island 1.5 km off the mainland that for more than a century had been used as a military fortress then high security prison before it was abandoned in the early 1960s. As the atmosphere of quiet isolation returned, seabirds such as Brandt's cormorants (*Phalacrocorax penicillatus*) and pigeon guillemots (*Cepphus columba*) came to re-occupy the site, but the changed conditions of exotic vegetation and foundations of old prison buildings also provided new habitat for rare black-crowned night herons (*Nycticorax nycticorax*) that was absent in the island's original landscape (Hart et al. 1996). While this example might more correctly be termed an accidental ecosystem, National Park Service ecologists who now manage the island as part of Golden Gate National Recreation Area have been keen to acknowledge that these created conditions serve an important ecological function as well as reminding visitors of the historic layers present.

Environmental philosophers such as Katz (2000) and Elliot (1997), who have argued that even the classical approach to ecological restoration is an exercise in human arrogance, would surely balk at the idea of designing partly or wholly artificial ecosystems. Yet in urban settings where human control and cultivation of the landscape have long been the dominant paradigm, the designer approach may make sense for both human and ecological reasons. With radical changes predicted for many areas of the world due to global climate change, the artificial nature of cities may make them ideal laboratories and testing grounds for new ecological assemblages (Fox 2007; Hobbs et al. 2009; Link 2008) and reservoirs for future adapted species through assisted migration (e.g., Minteer and Collins 2010). Human population growth and land use changes are also driving ecologists to search for alternative restoration approaches that can maintain their ecological resilience while accommodating human preferences and impacts (Hitchmough and de la Fleur 2006).

Under such imperatives, the designer ecosystem approach to restoration represents a bold yet serious alternative to the classical model for coming to grips species loss and continued degradation of historical ecosystems. In light of these impending changes, a growing group of ecologists (e.g., Choi et al. 2008) argues that restoration efforts should not be constrained by classical notions of historical authenticity but should look toward future-oriented approaches that will continue to sustain critical ecosystem functions.

8.3.5 Nature Garden Approaches

Contemporary urban garden design is increasingly sympathetic to classical restoration goals such as the use of native plants and other aspects that enhance site sustainability (e.g., Van Sweden 1997). Such goals, however, are often accomplished in highly "unnatural" ways, and while ecological goals may form a rationale for design, the dominant focus is on human enjoyment, learning, and artistic expression.

One such example in Chicago is the 1.2 ha Lurie Garden (Fig. 8.5) in the city's recently built Millennium Park, where designers used plant materials to create a highly symbolic landscape. "Dark" and "light" sections of plantings represent the Chicago region's marshy past and prairie-farmland present landscapes, and are embraced by a hedge of trees symbolic of the northern boreal forest shaped to invoke poet Carl Sandburg's image of Chicago as the "City of Big Shoulders." Native and introduced plants are used in combination to accentuate these themes and provide variety within and across the seasons, and native species such as purple coneflower (*Echinacea purpurea*) are juxtaposed with their cultivars of different colors and heights to reinforce the idea of the garden as a nexus of nature and culture (Amidon 2005).

While the Lurie Garden may be an uncommon example, designed and vernacular nature gardens can provide key ways of bringing the functional, educational, and symbolic values of restoration into small urban spaces. One important variant of the

Fig. 8.5 The Lurie Garden in Chicago's Millennium Park uses native plants and their horticultural variants to create a highly stylized nature garden, and exemplifies how alternative approaches can help integrate restoration goals into highly formal urban settings (Credit: Mark Tomaras)

nature garden approach can be seen in school and community gardens, where participatory involvement, skills development, and community empowerment are often key goals (e.g., Feldman and Westphal 1999). While many school and community gardens are focused on food production, native plants are sometimes used separately or in conjunction with vegetables and cultivated flowers to build small scale habitats for butterflies or other insects, or to grow natives for eventual transplanting into larger scale restorations. The connection between the two types of gardens may help in linking the ecological goals of restoration with broader social and economic goals, and could be a particularly effective way of introducing restoration to diverse urban audiences (Irvine et al. 1999; Palamar 2010).

8.3.6 Unmanaged Sites: "Explorable Nature" and "New Wilderness" Approaches

Gardens by definition are special use areas where the rules of engagement can be highly specific as to what is allowed, how, when, and by whom. The fragility of some smaller classical restoration sites often turns them into gardens of sorts, and fencing and boardwalks needed to control use impacts can also limit the degree of interaction that those not actively involved in restoration have with nature (Gobster 2007b). While these sites may have considerable aesthetic and educational value,

Fig. 8.6 Nearby neighbors and dog advocacy groups successfully lobbied for an alternative approach to restoration of the Pine Lake natural area in San Francisco that allowed for greater recreational use than was originally proposed. Adults and children need places where they can actively explore nature, and marginal sites and buffers of more intact sites might provide opportunities for a range of explorable nature activities (Credit: Paul Gobster)

places must also be available that provide for more unstructured, active exploration of nature (Miller 2005).

In San Francisco, Pine Lake natural area is a bowl-shaped 3.4 ha site surrounding a shallow, 0.7 ha lake. The rest of the park adjacent to the natural area contains a children's day camp and a popular off-leash dog play area. Local residents have long incorporated their visits to the park with a walk around the eucalyptus-shaded lakeshore trail, often accompanied by their dogs. This tradition was about to change when an endangered western pond turtle (*Clemmys marmorata*) was sighted during a lake survey. A species recovery plan was developed calling for removal of many of the trees, fencing off the shore to access, killing non-native bullfrogs, closing the day camp during mating season, and outlawing dog access. Protests by neighborhood and dog advocacy groups led to a revised plan that would allow greater access, minimize tree cutting, and relocate any endangered turtles that might be found to a larger lake nearby where a sustainable population could be realized (San Francisco Recreation and Park Department 2006) (Fig. 8.6).

Given the high-use recreation at the site, the example raises important questions about how urban natural areas should be restored to balance social and ecological goals in nature. Children as well as adults need places where they can explore, get muddy, catch insects or amphibians, and in other ways get in close contact with nature in the city. These places and opportunities for "explorable nature" might

mean foregoing classical restoration ideals at smaller, recreationally-oriented sites or building opportunities for more active exploration into less ecologically intact buffers or transitional areas.

Some cities in North America and Europe have also seen the spontaneous revegetation of larger abandoned industrial sites, and while such areas offer significant opportunities for restoration, the "new wilderness" that has evolved has unique ecological and social values that also raise questions about how far the classical approach to restoration ought to be applied (Kowarik and Körner 2005). In our efforts to make the most of the open spaces we have in cities, these unclaimed areas are often programmed out of existence, but we have to realize that they, too, are important parts of the ecology and experience of nature in the city (e.g., Foster 2010; Louv 2005; Miller 2005).

8.4 Criteria for Selecting Alternative Approaches: A *Restoration* Opportunity Spectrum?

As the examples above illustrate, there are a variety of alternative approaches for how restoration might be conducted within urban settings to address particular ecological and social goals. Although they are diverse in many characteristics, the sites focused on in Chicago and San Francisco are also quite small in scale and when dealing with larger projects such as industrial and post-industrial sites there may be a fuller range of approaches than is indicated by this limited survey (Westphal et al. 2010). Thus while it may be premature to construct a comprehensive typology or spectrum of alternative approaches, the examples above provide a sufficient basis for outlining some key considerations that might go into building such a framework.

A framework already developed by the USDA Forest Service for managing the recreational use of wildlands provides a useful starting point to help guide this effort. The Recreation Opportunity Spectrum or ROS (USDA Forest Service 1982) uses various physical, social, and managerial criteria to identify which areas within national forests can best provide desired settings and experiences for recreation activities. Physical setting criteria identify the size, remoteness, and naturalness of areas, under the assumption that large, isolated, and undeveloped tracts of land have the best potential for providing wilderness type experiences for users while smaller, developed sites near population centers better serve intensive uses where nature is more of a backdrop for than a focus of the experience. Similarly, social criteria specify the uses and density of users and managerial criteria the degree of control and regimentation placed upon them. Together, these three sets of criteria are used by managers to delineate recreation opportunities within a spectrum of settings from primitive to developed.

While originally intended for wildland applications, others have adapted the ROS to more urban recreation situations (More et al. 2003; Bell 2008). Because the system attempts to match people's desired uses and experiences in natural settings with the inherent capability of sites to provide them or be managed to minimize conflicts and inconsistencies, the basic ideas of the system also have applicability

Table 8.1 Framework of ecological, social, and managerial criteria for selecting approaches for urban natural areas restoration

Ecological	Social	Managerial
Natural values	Use values	Mission values and implementation
Intactness	Recreational	Protection vs. use balance
Biophysical conditions	Sense of place	Education/research
Functionality	Traditional	Sustaining partnerships
Criticality	Other opportunities	Acceptable practices
Sensitivity	Substitutes	Scale/severity
Rarity/uniqueness	Complements	Duration/noticeability
Size/Remoteness	Adjacent uses	Communication/Control
Zoning	Residential	Design/information
Buffers	Industrial	Access regulation

to deal more generally with the integration of social and ecological goals (e.g., Raciti et al. 2006). Based upon restoration efforts in Chicago and San Francisco, I have attempted to adapt ROS physical, social, and managerial criteria for identifying appropriate alternatives for urban restoration sites. These criteria are listed in Table 8.1 and elaborated upon in the following sections.

8.4.1 Ecological Criteria

An urban site that contains remnant patches of native vegetation is a rarity in many cities and provides a powerful justification for site protection and restoration (e.g., McKinney 2006; Ranta and Viljanen 2011). Assessment of species diversity, vegetation structure, and persistence of ecological processes will help to establish current site intactness and potential for restoration within the context of the classical approach. While a site that has little or no intactness opens up options for alternative restoration approaches that emphasize greater human use or serve functional values such as stormwater retention, attempts to recreate a classical landscape may still be justified for other reasons such as research or education.

Sites with low intactness might also be important for natural area protection and restoration if they provide critical habitat for species; host a rare, endangered, or threatened species; or contain species or community types that are locally rare or unique (e.g., D'Antonio and Meyerson 2002; Shapiro 2002). As was seen in the description of the habitat and sensitive species approaches above, ecological goals for restoration might still allow considerable human activity, though this will vary from species to species. The value placed on local rarity and uniqueness may be justified ecologically to maintain genetic diversity, though in some cases managers might feel a responsibility to restore a community within their jurisdiction even though other and better sites occur nearby. Of course, there are many cases where disturbance to biophysical conditions (e.g., loss of seed bank, contamination of soil) will make some restoration goals formidable or even futile, thus managers must choose their approach to site management realistically (e.g., del Tredici 2010).

The ROS places significant weight on the size and remoteness of sites in determining how they are best programmed to serve recreational use, and these same criteria might also usefully apply to urban restoration sites. Larger, more remote sites are less subject to exotic species invasion and more capable of hosting sustainable populations and ecological process such as fire; they also tend to be further away from adjacent and on-site uses that could generate conflict. Smoke from prescribed burns is less likely to drift into neighborhoods or cause panic among residents, and people making the effort to visit a large, remote natural area generally have nature appreciation as a central goal and are less likely to find restoration management practices out of line with their expectations (Ryan 2000).

In Chicago and San Francisco, many of the larger, outlying forest preserves and regional parks are successfully managed under a classical approach to restoration with minimal social conflict. But the remoteness criterion as applied in ROS can also be used to prescribe a compatible suite of approaches through the concentric zoning of larger sites in more densely populated urban areas. As with ROS where the interior zones are identified for primitive backcountry experiences surrounded by increasingly more intensive and developed uses, in San Francisco, a similar type of zoning has been applied to some natural areas under the Recreation and Park District's (2006) Significant Natural Areas Management Plan. "MA-1" management areas containing high quality remnants are the focus of intensive restoration activity and have more restrictions placed on recreational use. These are often surrounded by buffers of "MA-2" and "MA-3" zones that are of decreasing ecological importance, which receive less intensive management and can host a wider range of uses. Similarly in Chicago, Park District natural areas are often surrounded by zones of unmowed vegetation that buffer them from more intensively used and managed areas of the park.

In these ways, size and remoteness criteria could be used along with information on site intactness and priorities for species protection to zone areas for management under different restoration approaches. While the appropriate suite of approaches would vary depending on the goals and constraints of a particular site, a typical strategy might be to manage innermost areas under a classical or boutique approach, with restrictions placed on recreational access as needed. This zone would then be surrounded by a buffer managed under a habitat approach where species help support wildlife functions while allowing a greater variety of uses. Finally the outer zone would be managed as explorable nature, where largely unmanaged vegetation would still provide natural value while catering primarily to active, unstructured nature-recreation opportunities.

8.4.2 Social Criteria

The kinds of recreational uses that take place in urban natural areas are broad and include a range of active and passive activities where the natural environment is of both direct and indirect interest. These uses include active participation in restoration

stewardship activities such as planting and weeding as well as research and monitoring; sedentary activities such as picnicking and active activities such as walking, jogging, bicycling, and dog-walking on or off-leash where nature provides a desirable setting for exercise and outdoor enjoyment; non-consumptive nature oriented activities such as birding and nature photography that occasionally take visitors off trail; and highly interactive play, exploratory, and consumptive activities that may involve climbing, digging, and collecting.

Some activities such as restoration stewardship may help support ecological goals, other activities such as walking along trails are largely benign, and activities such as collecting and dog-walking may threaten ecological goals if done at the wrong place or time (Fernandez-Jurucic et al. 2001; Platt and Lill 2006). All of these activities, however, may be legitimate and desirable social goals that people look to in urban nature and providing opportunities for them can help promote learning and build support for restoration programs (Miller 2006; Ryan et al. 2001).

By understanding site capabilities and user desires, managers may be better equipped to choose an alternative restoration approach that best integrates ecological and social goals and best helps to cultivate a sense of place by restoring contact with the land. There may be times, however, when more lofty ecological restoration goals are proposed for sites where established uses will become incompatible. Without earnest public involvement and the provision of reasonable alternatives, restrictions on access and use of a site can become contentious (Phalen 2009).

A thorough analysis of the social setting should also look beyond the immediate use of the site to adjacent land uses and potential concerns. Some restoration sites in Chicago and San Francisco lie directly adjacent to residential neighborhoods where homeowners have heightened concerns about activities that might reduce visual attractiveness and privacy in addition to risks from erosion, fire, and herbicides (Gobster 2000, 2007a). Few such concerns may present themselves when adjacent lands are used for industrial or transportation functions, and thus natural area managers need to be cognizant of the social context before introducing restoration activities.

8.4.3 Managerial Criteria

An important consideration in selecting the appropriate natural area restoration approach is how restoration fits within the mission of the managing agency or institution. For example, the primary mission of the Chicago Park District is to provide high quality recreation opportunities that respond to diverse customer needs, among which include opportunities for nature exploration, appreciation, and education (Chicago Park District 2011). In contrast, the primary mission of the Forest Preserve District of Cook County is to acquire, protect and restore lands and their associated flora and fauna as near as may be to their natural state, for the purposes of people's education, pleasure, and recreation (Forest Preserve District of Cook County 2011). While missions like the latter example may give an agency or institution greater

justification for managing lands according to a classical restoration approach, there may be instances where those with broader missions establish nature centers or possess certain habitats that also warrant classical restoration and restrictions on more intensive recreation. Like the ROS, the alternative approaches to restoration described above can help managers provide the best match of social and ecological goals across the various sites in their system as well as develop partnerships among different managing agencies and institutions. Other key partnerships in many urban restoration projects are with volunteer stewardship groups. These usually include ecological restoration groups but may also include recreation-oriented concerns such as off-road bicycle and birding groups, school and civic groups such as environmental and garden clubs, and even animal welfare groups such as feral cat stewardship programs. Thoughtful consideration of how these groups relate to an agency's mission can lead to building effective partnerships and minimizing potential management conflicts (e.g., Newman 2008; Petts 2007; Shandas and Messer 2008) .

Once the management objective for a site is decided, guidelines should be established for implementing management practices that best meet the mix of social and ecological goals. Some considerations here relate to the scale and timing of practices. For sites where aesthetic and recreational goals are important, restoration practices could be kept smaller in scale and implemented using less intrusive, "boutique" practices that minimize conflicts with user expectations. Change might be introduced gradually, for example, by incrementally thinning canopy trees to restore more open conditions over time and by allowing aesthetically valued trees that are nonconforming but ecologically benign to live out their natural lives. Removal, relocation, or chipping and distribution of brush might appear less offensive than having large brush piles in close view. While managers should not try to "fool the public" by hiding change behind vegetative screens and the like, practices should be implemented consistent with the perceived nature of the site and how it is used (Gobster 1999).

Along with the implementation of socially acceptable restoration practices, managers can work to help communicate ecological restoration goals to the public through design and information. The introduction of visual "cues to care" such as the planting of showy plants at entryways to restoration projects and mowing trail rights-of-way to provide a transitional edge can help to frame and call attention to the stewardship of a site that might otherwise be perceived as a product of management neglect (Nassauer 1995). Likewise, signage, other on- and off-site written material, self-guided nature trails, and hosted events are among a variety of ways in which information about a restoration project can help enhance understanding and appreciation of ecological goals that may not be directly perceivable. Finally, both design and information can help regulate access to sites to minimize ecological impact and direct user experiences. For example a narrow, wood chipped trail marked with a small sign can effectively limit access to more sensitive parts of a restoration area while broader, paved paths along the site's perimeter can still allow large numbers of joggers and bicyclists to view and experience the restoration at higher speeds (Kaplan et al. 2007; Ryan 2000).

8.5 Conclusions

As the approaches and criteria described above suggest, the restoration of natural lands can be a highly interpretive endeavor in urban environments. While the classical approach assumes there is an "original nature" out there to be restored as authentically as possible, the social and ecological goals inherent in urban restoration often requires the restorationist to seek alternative approaches that are realistic and can be successfully implemented (Hobbs 2007).

Given the examples identified in these case studies of Chicago and San Francisco, further investigation of alternative approaches to restoration is warranted. Indeed, evidence from other cities in the U.S. and other countries shows that approaches focusing on rehabilitation, utilization, and the provision of environmental services such as moderation of urban heat island effects, carbon sequestration, and phytoremediation are increasing in use (e.g., Westphal et al. 2010). By further examining the social and ecological goals and constraints inherent in urban restoration projects, it may be possible to develop guidelines to advise practitioners and policymakers on which approach might be most appropriately applied to a given site. Such a "*restoration* opportunity spectrum" could help to maximize sought-after values and minimize potential conflicts.

Should all of the different approaches described here be referred to as restoration? Some have argued that the term restoration should be reserved only for uses that most closely parallel what I have referred to here as classical restoration (Jordan 2003). But in their own unique ways each of these approaches contributes to the idea that in order to be successful, ecological restoration must respond to diverse and evolving social and ecological goals (e.g., Choi et al. 2008; Hobbs et al. 2004; Palmer et al. 2004). My aim here is to clarify rather than confuse, and together these examples suggest that there are many approaches to natural areas management that provide promising foundations for restoration in urban areas (Hull 2006).

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