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Design with Fourth Nature

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Abstract

This article posits designing with Fourth Nature as an alternative to dominant modes of practice in restoration ecology, heritage management and landscape architecture. We explore the contours of resistance in these fields to Fourth Nature landscapes, questioning how we might move past static and pure ideals while remaining in dialogue with the rich history of garden and landscape design. We explore why recent developments in the ecological sciences have not been more widely adopted in landscape architecture practices in the United States. Our approach questions long-held perceptions of appropriate plant assemblages and presents alternatives for managing ecosystems at historically layered landscapes where restoration of the historical reference is not practical or possible. We call for extending understandings of Fourth Nature into a framework for designed landscapes that goes beyond wildlands and spontaneous plants. This approach translates ecological values into a design language that is dynamic and process-oriented.

Fourth Nature / ecology and design / cultural heritage / nostalgia / environmental humanities

Introduction

Venturesome plants poke their way out through long-neglected railroad ties. Tree of heaven (*Ailanthus altissima* Mill.) skirts along the edges of a concrete pad that once supported a structure. The mugwort (*Artemisia vulgaris*) that dominated this field twenty years ago has given way to sumac shrubs, in front of a row of poplar and birch trees, that frame a distant view of Manhattan, across the Hudson River, from Liberty State Park (Fig. 1). Such plant communities can also be found in other vacant sites, along roadways and creeping up forgotten suburban side yards. These Fourth Nature landscapes, sites of formerly intensive human use that have been recolonized by plant communities, proliferate. However, we argue here that, while nature is dynamic, following unpredictable trajectories, American landscape designers often take static approaches focused on ideal endpoints that are difficult to achieve, requiring many inputs. In the last two decades, the two worlds of cultural and natural heritage have been theoretically linked, but in practice mostly remain sequestered within disciplinary boundaries.¹ Landscape architects and theorists have pointed to the separation between ecology and aesthetics to explain the difficulty in incorporating new ecological models. Chris Reed and Nina Marie Lister call for: 'Design[ing] effectively for adaptation to change, or to incorporate learned feedback into the designs, or to work in transdisciplinary modes of practice that open new apertures for the exploration of new systems, synergies, and wholly collaborative work.'² While scientific studies stress the important role of novel ecosystems, a negative view of hybrid communities persists.³

World Heritage consultant Letícia Leitão, who has worked with both the International Union for the Conservation of Nature (IUCN) and the International Council on Monuments and Sites (ICOMOS), pointed out that cultural and natural heritage have long been 'parallel but largely separate worlds', remaining divided in protection, preservation and mainte-



PHOTOGRAPH BY FRANK GALLAGHER

Figure 1 The undeveloped brownfield section of Liberty State Park, on the site of a former railyard. This novel ecosystem has great functional diversity, providing carbon and nutrient cycling and hydrologic efficiencies. Despite the early domination by invasive herbs, the site gradually transitioned to three guilds: herbaceous, shrub and tree. This novel vegetative community is uniquely adapted to avoid or sequester soil metals that are present due to the former industrial use of the site.

nance practices.⁴ The creation of the ‘cultural landscapes’ category by the World Heritage Committee in 1992 sought to ameliorate this distinction, and was an important step in bringing these two worlds together. Yet, this integration has remained imperfect,⁵ and both organizations are working towards this with projects like the joint ‘Nature-Culture Journey’, initiated in 2016 ‘to start a dialogue about how to integrate the conservation of cultural and natural values in the landscape’.⁶

Despite the view of American practitioners and scholars in the fields of restoration ecology, cultural heritage management and landscape architecture that we need to expand understandings of the natural world and respond to dynamic conditions, outdated views continue to play a large role in scientific studies and mechanisms for protecting species and cultural landscapes, such as legislation, international protection lists and government-funded restoration projects.⁷ These views include the simplified idea that ‘natural’ refers to an ideal previous state and involves a particular aesthetic. Continuing to work with practices that dominate today is bound to result in landscape designs and restorations that require excessive maintenance, as they ignore the increased rates of change of the Anthropocene and new landscape typologies of the post-industrial era. Accelerated frequency and speed of change lead to a desire to cling more tenaciously to pre-existing patterns, although they may not be relevant today, and might even work against adjustments that could alleviate current stresses.

We examine the obstacles to incorporating ecological models in the North American landscape today and propose an approach that operationalizes Fourth Nature for more dynamic relationships between ecology and design, with a particular focus on heritage landscapes. Such an integrated approach extends beyond mere espousal of spontaneous vegetation or wildlands to a designed landscape that embraces flexible approaches to ecosystems, while also responding to cultural significance and human use.

Rethinking Fourth Nature

Our Fourth Nature approach is drawn from existing concepts. The terms First, Second and Third Nature have been used to refer to the relationship between nature and culture embodied in landscapes since the sixteenth century, respectively meaning untouched land, nature modified to be useful to humans such as for agricultural cultivation, and a harmoniously balanced blend of art and nature.⁸ In recent years the term Fourth Nature has come into use by scholars and practitioners from various fields. Since the early 1990s, ecologist Ingo Kowarik has described ‘Nature of the fourth kind’ (*Natur der vierten Art*) as one that emerges spontaneously on urban sites such as vacant lots or industrial sites.⁹ About a decade later, landscape architect Gilles Clément presented a broader view on marginal spaces that can be thought of as sanctuaries for diversity, for which he introduced the term *third landscape* (*tiers paysage*). Abandoned lots, road margins and forest edges are sites of potential when taken over by pioneer species. According to Clément, this is the ‘privileged site for biological intelligence: the aptitude for constant self-reinvention’.¹⁰

In order to develop a useful framework for practitioners, the term Fourth Nature needs to be further theorized and contextualized. Although ideas about designing with nature have existed in the United States for quite some time—with a long line from Ian McHarg, through Anne Whiston Spirn, Catherine Howett, Susan Child, Richard Haag and many others, these ideas still have not been adopted on a large scale.¹¹ In 2008, Elizabeth Meyer wrote of the paradigm shifts in the ecological sciences from stable endpoint systems to more emergent and adaptive systems: ‘These theories have enormous implications for landscape design, and yet twenty years after their general adoption in the sciences, many landscape architects and their clients operate on outdated, even romantic, conceptions of nature and its beauty.’¹² Today, Meyer’s observations are still valid for North American landscape design.



Figure 2 The Landschaftspark Duisburg-Nord in Germany is an example of designing with Fourth Nature. The site of a former Thyssen-Krupp steel mill was transformed into a park by Peter Latz in 1991, utilizing phytostabilization and soil sequestration strategies to address contamination, and transforming industrial elements into a piazza, rock climbing walls and gardens.

While there are examples of Fourth Nature landscapes at brownfield sites such as Bussey Brook Meadow in Boston,¹³ they have been more commonly embraced in countries like Germany, for instance the post-industrial Ruhr Region with the well-known foundational project of the Duisburg-Nord Landscape Park, designed in 1991 (Fig. 2).¹⁴ Another example is Schöneberger Südgelände Park in Berlin, constructed in 2008–2009 on the site of an old railyard. Buildings, rail lines, water tower and piping have been transformed into a vibrant mixture of the remaining industrial infrastructure and novel vegetative communities. Works of art and a graffiti wall provide spaces for cultural use. The ecologies of such areas are unique in that they consist of distinct blends of native and newly migrated species, representing adaptation to the forces shaping the environments of the Anthropocene. In these examples, ecology and design are brought together to recognize and celebrate novel vegetative communities while creating places for human use. Horticulturists and ecological landscape designers James Hitchmough and Nigel Dunnett have demonstrated how designs with Fourth Nature landscapes can create places that bring together natural, cultural and social aspects. They can look wild and abandoned, but do not have to.¹⁵ To be valued by the public at large, they say, such vegetation ‘must be strongly informed by aesthetic principles’, and ‘preferences can change through experience and learning’.¹⁶ In Germany, too, there are still challenges to the acceptance of Fourth Nature among the general public. This is evidenced in the case of the renaturalization of the Isar River in Munich. Here residents reacted strongly against a design that paired engineered concrete river plates with ecological design that would strengthen biodiversity. Instead, they wanted ‘naturalistic’ curving riverbanks, and the design was revised.¹⁷

In the United States, Fourth Nature landscapes are often strictly consigned to the ecological domain to remain ‘abandoned’ and grow as they will, rather than being tended to as openly managed sites that consider human presence and use.¹⁸ Even if designers and ecologists cooperate and see value in such systems, public perceptions and opinions will affect what actually gets built, and the challenges in the United States are steep. People are acclimated to picturesque landscape designs and the importance of public perceptions and understandings in actualizing landscape projects still needs to be recognized. Also, nature as a coherent set of ideas no longer operates as it once did, offering the perception of a stable background. Today’s rates of change, driven by climate variation and weather extremes, are unprecedented,¹⁹ with well-documented changes in the density and structure as well as the phenology of many biotic communities.²⁰ Many plant species may not be capable of migrating fast enough to remain functionally viable.²¹

Nostalgia

Despite the avid use of the term Fourth Nature, ecologists, heritage managers and landscape architects have not managed to comprehensively operationalize the idea in their practices. Instead, a nostalgia for certain landscape forms, based on traditional understandings of nature and the natural, holds sway. The organic lines and vistas of the picturesque were part and parcel of the partitioning trend of modernity to separate nature and culture, placing nature into the domain of science, where it remains off-limits to culture, that is, society, history and the human.²² Sociologist Bruno Latour has argued that the hybrids that exist at the nexus of these ‘opposites’ are the target of a ruthless project of elimination and suppression.²³ It is this separation that historian Pierre Nora was most critical of when he explained *lieux de memoire* (sites of memory) as objects produced as a result of this fissure.²⁴ More recently, heritage studies scholar Rodney Harrison argued that recognition of the Anthropocene is a signal that the nature-

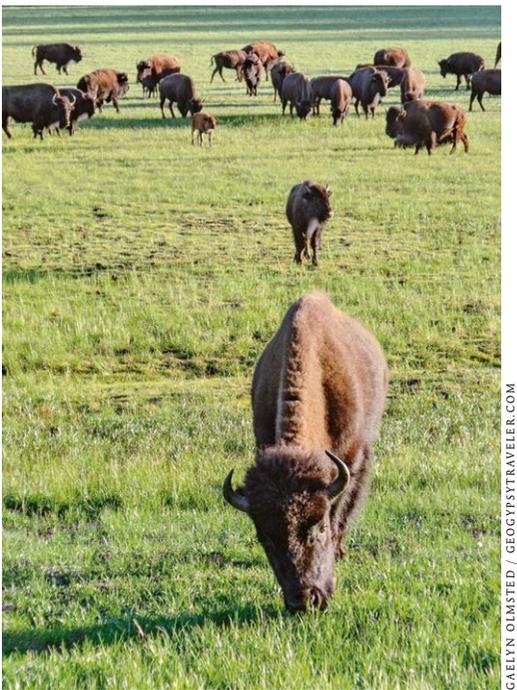


Figure 3 A beefalo herd near the Grand Canyon. Some of the herds stay in the House Rock Wildlife Area, but many cross over into the National Forest and Park, causing consternation and leading to many headlines about the beefalo problem.

culture divide is coming to an end, while at the same time embodying nostalgia for that separation.²⁵ Idealized landscape forms such as meandering rivers²⁶ and naturalistic design²⁷ are the visual and material representation of this nostalgia, where novel ecosystems do not fit. Idealized nature and landscapes contribute to antipathy towards Fourth Nature landscapes and do not allow for a dialogue between ecological, cultural, social and economic systems in this period of accelerated environmental change.

The problem of static and unambiguous designs for dynamic and varied nature

The sense of loss of the expected (although inaccurate) unchanging stability of nature contributes to the nostalgic underpinnings of the conservation and design of heritage landscapes, comparable with the impulses that informed arising movements for commemoration and historical preservation in the nineteenth century.²⁸ In landscape conservation this view is still valid today: change, flux and dynamism fuel a desire for equilibrium, for the static, for control. Many reports in the American popular press today are rife with alarming discussions of threatening invasive species and hybrids that elicit negativity, antipathy and even hatred. Take, for example, the screaming headlines that have brought the beefalo, a hybrid of a North American bison and domestic cattle, to the attention of the American public: 'Scheming buffalo herd roams amok at Grand Canyon', 'Failed experiment beefalo destroying Grand Canyon with uncouth ways', 'Grand Canyon Bison hybrids trampling . . . sacred sites' (Fig. 3).²⁹

This example illustrates the complexity of environmental issues; there is rarely a singular cause and effect relationship, and there are many difficulties in the reception and perception of complicated scientific information.³⁰ Oversimplified narratives can result in vilification of newly migrated or hybrid species. Historical sociologist Anthony Smith's discussion of the 'drama-mythologies' employed in nationalist projects is useful for theoriz-

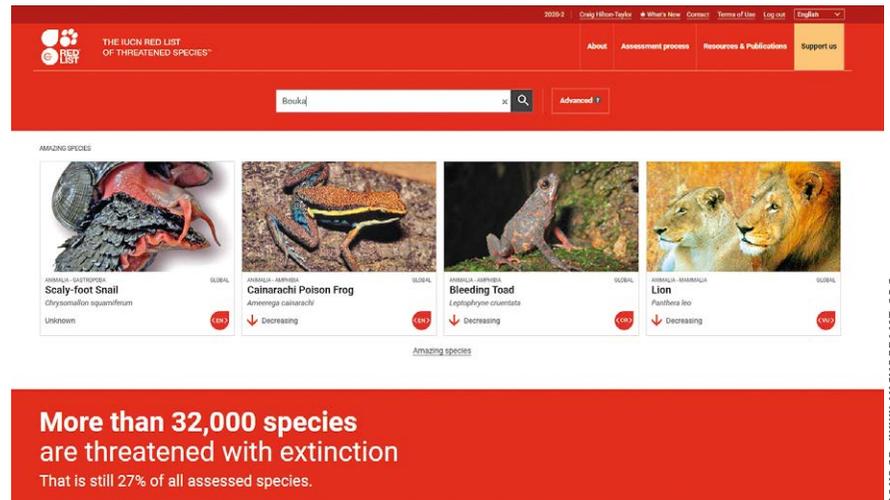


Figure 4 The IUCN Red List of Threatened Species website (July 2020). This list is one of the most influential databases documenting endangered species. Such lists focus mostly on megafauna and charismatic large mammals and birds. Studies have found that only a small percentage of species have been evaluated using the IUCN red list categories and criteria.

ing this disparagement. Smith shows how 'poetic spaces' (in landscapes) and 'golden ages' (in history) are used to define the national community in its 'pure' or 'unmixed' state.³¹ Ideas about the original or 'correct' state of nature are strongly influenced by many cultural factors, not only science.³² In fact, biologist Stephen Jay Gould has explained that evolutionary theory and biologically based claims are 'difficult to utilize for the defense of intrinsic native superiority'.³³

As in public opinion, nostalgic impulses in ecological discourse have a strong impact on restoration, which we characterize as the practice of returning an altered system to a former reference, using traditional methodologies.³⁴ This influences how the goals of restoration projects are established and which species are valued and protected, all requiring significant human intervention to 'return' environments to idealized states of nature, by eradication, removal or replacement of subsequent states. Such nostalgic undertakings tend to maintain focus on the establishment of dominant historical or 'legacy' community structures (composition of plant species) as a benchmark of success.³⁵ The desired state for ecosystems is set far back in historical time: in settler societies like the United States this is before the arrival of Europeans, or at least before the impacts of the industrial revolution.³⁶ A number of mechanisms for protection—such as biodiversity databases and laws—are influenced by romanticized notions.³⁷ Environmental humanities scholar Ursula Heise argues that 'biodiversity, endangered species, and extinction are primarily cultural issues, questions of what we value and what stories we tell, and only secondarily issues of science'.³⁸ Conservationists like the International Union for Conservation of Nature (IUCN) use a narrow set of species to depict endangered communities, consisting mostly of megafauna, less frequently plants, very few insects and no representatives from the microbiological community (Fig. 4).³⁹ The focus is often on charismatic large mammals, such as gorillas, as well as birds—species that evoke an emotional response in humans.⁴⁰



GARRY WHEELER STONE, BRAVO [BATTLEFIELD RESTORATION AND ARCHEOLOGICAL VOLUNTEER ASSOCIATION]

Figure 5 As part of the restoration of the historic Battle of Monmouth site, the woodland that had become established was removed and replaced by a peach orchard, the agricultural typology that was present during the period of historical significance.

The substantial amount of human intervention required at standard heritage landscapes is illustrated by the experience of the New Jersey Division of Parks and Forestry, where Frank Gallagher served as administrator at the Office of the Director. In the 1980s the office received a grant to re-establish an orchard and meadow at the site of the Battle of Monmouth, an American Revolutionary War site. The importance of the historical event outweighed the ecological benefits associated with the woodland, shrub and young forest, which had become established after the agricultural use of the land had ended, and it was removed. Quickly realizing that the maintenance of an orchard was far beyond the capabilities of the Division staff, the land was leased to a local farmer who would have exclusive rights to the site, limiting public access. In essence, the basic tenet of the public trust doctrine, public access, was sacrificed to maintain the site as it looked during its period of historical significance. A smaller-scale restoration, a representative typology or a graphic representation could have achieved the same interpretive goal while maintaining the ecological function of the successional forest along with use by visitors (Figs. 5, 6 & 7). A Fourth Nature approach provides an alternative to expensive, resource-intensive processes like this one, which resulted in compromised ecological benefit and limited public access.

Newly migrated species and hybrids at work

Newly migrated and hybrid plant and animal communities can increase biodiversity, support endangered species, and grow without need of excessive inputs or maintenance, even in severely compromised landscapes. They can form effective, hybrid communities and sometimes even attain functional superiority.⁴¹ Despite the fear of invasive species, conservation biologist Chris Thomas has argued, most do not displace natives, and immigration usually increases the diversity of the recipient community. For the Southern European region of the Alps, he has pointed out that the diversity of forest trees and shrubs is increasing, since the number of new species that have established new populations is greater than the number of native species that have disappeared.⁴² While Thomas acknowledges the

current state of mass extinction by the large number of species lost due to human actions, he argues that immigration, hybridization, mutation and adaptation offer a counterbalance to that loss.

Given time, most invasive species develop relationships that begin to either decrease their rate of spread or increase their functionality within the new environment. For example, a species from Asia, the seaside rose (*Rosa rugosa* Thunb.) was not listed as an invasive by the Massachusetts Invasive Species Council due to its role in stabilizing coastal sands dunes; it does not displace any native species within this specialized niche environment and it has provided the native Cynipid wasps with a new host.⁴³ In such cases, an obsession with natural purity fails to hold up in light of the fact that many species are abundant in human-created landscapes. Researchers have found greater butterfly diversity and higher bird numbers in agroforest environments as compared with forest-only landscapes and the number of species usually increases along with the diversity of habitats, including human-generated ones.⁴⁴ Nonetheless, a negative view of foreign species persists among ecologists and the public. In New Zealand some areas have been enclosed by predator-proof fences, and volunteer militias have been formed to poison and trap predators living in areas outside of the fences.⁴⁵

Newly introduced species certainly can cause extreme ecological damage, but this is bound to historical and spatial circumstances. The eradication of *Phragmites australis* (Cav.), the common reed, has long been the target of many wetland restoration initiatives. Interestingly, now that it has become accepted as a stabilizing force for many marsh systems that are vulnerable to storm surge in Louisiana, officials have become concerned about the invasion of *Nipponaclerda babiawokoensis*, a pest commonly known as the scale, which contributes significantly to the loss of wetlands in Louisiana by attacking the common reed.⁴⁶ Large outbreaks of the gypsy moth (*Lymantria dispar*) caused major loss of oak trees in forests in the Northeastern United States during the 1980s. The complete loss of most species of oak was predicted, as there were fears of a repeat of the phenomenon of the chestnut blight that had practically eliminated the American chestnut



Figure 6 & 7 Photos of Monmouth Battlefield State Park. The restoration of this heritage landscape, the site of the Battle of Monmouth during the American Revolutionary War, illustrates the substantial amount of human intervention required by traditional practices.



PHOTOGRAPHS BY JAMES DOUGLAS

from the forest. However, an entomopathogenic fungus (*Entomophaga mai-maiga*) became established in the region and has become an effective control. In other words, given the amount of biomass available in the moth, and now the common reed, something found a way to take advantage of it. In the long run most ecological systems, while they may adjust, do eventually normalize and retain their function.

Other invasive species have become integrally interwoven with existing ecosystems, at times even with endangered species that have become dependent on them. For instance, the endangered Taylor's checkerspot butterfly (*Euphydryas editha taylori*) eats common plantain (*Plantago major* L.), or 'white man's footprint', a non-native species brought to the United States by early European settlers. Conservationists are now planting plan-

tain to support the endangered butterfly populations.⁴⁷ Leadwort (*Amorpha fruticosa*), native to the Midwest, has come into wide use in the Northeastern United States, where it has been planted to stabilize streams and riverbanks as a 'socially and ecologically functional plant throughout New England', despite its non-native status.⁴⁸ This dependence of native species and environmental systems on invasive species is but one example of many prevalent hybrid conditions that shatter notions of the functional superiority of native over invasive species in all cases. When native species or historical communities grow without the need for excessive inputs or maintenance, they are key components of sustainable systems. But when this is not the case, we must open up to other possibilities, seeing that our ability to control ecosystems is questionable.

Design with Fourth Nature

Over the last few decades, norms have been shifting from the fixed endpoint model of restoration ecology towards recognition of the need to work more flexibly with novel ecosystems. Species are dynamic, adjusting to changes in the climate, while environmental stability is ‘an illusion’.⁴⁹ Freezing organisms and communities (both human and non-human) in place to maintain a status quo that is constantly being challenged by dynamic conditions, and pursuing visions of ‘purity’ as defined by a legacy condition requires huge and constant investments of time, energy and money. This becomes a fight *against nature*, rather than *design with nature*. Designing with Fourth Nature landscapes must balance dynamic trajectories and processes with human use.

A Fourth Nature approach assumes the emergence of the unexpected. Uncertain and variable conditions prevail as species adapt. There is no pre-conceived endpoint, and long-held perceptions of appropriate typologies are questioned. To create room for unexpected interactions between natural, cultural, industrial and social systems, control should be relinquished. Kowarik has written that:

Nature of the fourth kind . . . emerges spontaneously as a novel urban green space on vacant lots or other urban-industrial sites despite severe habitat transformations. It may be shaped accidentally by human agency but may also develop towards wild urban woodlands.⁵⁰

We must extend such understandings of Fourth Nature into a framework for designed landscapes that embraces the spontaneous and the wild, but that also allows for more controlled landscape forms and processes. It is important that this approach be strongly integrated with the history of landscape design and the traditions that have been developed in recent decades. This can be thought of as staging the landscape for unpredictable results.

While the boundaries of empirical research in the ecological disciplines are still being established, the foundational concept of systems developed from novel assemblage is accepted.⁵¹ In Fourth Nature systems the species, limited or facilitated by abiotic and biotic filters, have inherent characteristics that mitigate the risk associated with typical contaminants found at post-industrial sites. Describing ecosystem typologies resulting from such communities, ecologists Richard Hobbs et al. recognize that ‘the definitions of “natural”, “historic”, and “altered” are rarely clear and are often determined in relation to cultural, national, religious, or personal experiences or values’.⁵²

This raises questions about how to manage ecosystems at sites where retention or restoration of a fixed historical reference is not practical and at times no longer possible. Design with Fourth Nature allows for movement away from reactive towards more proactive strategies that are able to respond to unpredictability. Such designs can meld restorative ideas with functional, dynamic and appealing landscape designs that are socially responsive and that recognize the interconnections between ecological and cultural heritage. Shedding the nostalgic ideals of nature that will become increasingly difficult to maintain is not a suggestion for an interpretation of nature that sheds all ideas about the past. Instead, it is a positive and more flexible way of viewing and working with the past in landscape design. It must broaden the timeframe of historical significance, engag-

ing with different times, allowing new and different interpretations, and bringing the unpredictable future into the frame. For instance, an endangered species that elicits an emotional response may now be supported by, or even rely on, an invasive species. Or, preserving a historic site like the Monmouth battlefield could allow for a different ecological assemblage that would require less maintenance, recognize that the orchard was not always there and keep the site open to the public.

Design with Fourth Nature can make use of recently explored aspects of nostalgia that are not just reactive, but rather connect to emotions that can be mobilized to do work in the present as a ‘way of being moved’ instead of a ‘wrong’ way of thinking about the past.⁵³ Considering the emotive power and affective potential of landscape experiences,⁵⁴ and the capacity for landscapes to communicate meaning, nostalgia for nature could be activated in a different way in design, generating new understandings of changes to linked systems. By acknowledging heritage as neither ‘fixed’ nor ‘inherent’, but as emerging in dialogue with change, it can be considered in terms of ‘maximizing its social and future values’, explain archaeologist Cornelius Holtorf and heritage expert Graham Fairclough.⁵⁵ As for the dissolution of the nature-culture divide, Rodney Harrison suggests that it has opened up ‘radical and transformative potential’ for heritage practices that could draw on and connect to fields such as biodiversity conservation, working in tandem with dynamic ecological conditions.⁵⁶ Another new understanding of change in linked systems, pointed out by environmental scientist Erle Ellis, is that sociocultural systems coevolve with biota in ecosystems, formed by cross-generational interactions. They change as three linked ‘inheritances’: cultural, material and ecological.⁵⁷ To create sound and robust, process-oriented environments that support linked ecosystems and human use and engagement, we propose an approach that involves interdisciplinary collaborations that bring the past and the future together in the design process, with a particular focus on heritage landscapes.

It will be of particular importance at sites with long human and natural legacies—sites of cultural significance that may be related to historical events, or agricultural and industrial histories. An example is Fresh Kills Park in Staten Island, New York. Created on what once was the largest municipal landfill in the United States, from 2001 its gradual closing has provided the opportunity to create a mosaic of herbaceous, woodland and wetland plant communities.⁵⁸ This capped landfill park, where landscape architects worked in coordination with ecologists, was not designed in a way that considered unpredictable future trajectories. The planned grasslands will not remain grasslands for long, as the surrounding species pool will contribute migrants to the site. There are plans to address the cultural significance of the landfill, where over one million tonnes of debris from the World Trade Center, which included human remains, were taken.⁵⁹ But it is unclear if and how the memorial will connect to the ecological realities of the site. If traditional methods are followed, what will likely happen is that a geo-textile membrane and several feet of clean fill will be placed over the remains. Unless deep pockets of soil are created in specific locations, woody plants will not be able to grow there. The presence of the membrane and the use of this process will mean that there will be no dialogue between the cultural and ecological histories of this place.

Though the three pieces of the puzzle we describe in this article—ecology, design for human use and material heritage—are considered, they are not thought of together in a comprehensive way, or in a way that connects the past with the future.

Instead, landscape architects can use unpredictability and spontaneity as drivers of more hybrid design practices, bringing together Fourth Nature plant communities with human use and social considerations in public landscapes that create alternatives to either landscapes that require heavy inputs and maintenance, or ‘wildlands’. There is much to build off in the work of landscape architects and theorists who have considered the nexus of aesthetic experience and ecological design, with proposals for new landscape structures such as Kristina Hill’s ‘armatures’⁶⁰ or Joan Nassauer’s ‘orderly frames’⁶¹ and Elizabeth Meyer’s appeal to revise antiquated conceptions of landscape beauty by employing new ecological paradigms.⁶² New relationships and collaborations will be key to translating understandings of Fourth Nature to design practices. Ecologists can use this thinking to create new definitions of functionality and develop different criteria for evaluating restoration projects. This will require engagement with fields that extend beyond conservation, including agriculture, industry and the built environment. Heritage managers can use this approach to develop enhanced views of cultural landscapes, expanding approaches for allowing more co-mingled cultural and natural heritages to fit together and grow together. They might then create management plans that take into account current ecological realities.

Liberty State Park

An example of such a reality is the Fourth Nature ecosystem at Liberty State Park in Jersey City, New Jersey. It consists of a hybrid community at an abandoned railyard with great functional diversity, providing ecosystem services such as carbon and nutrient cycling, hydrologic efficiencies and habitat provisioning comparable to legacy systems.⁶³ The result is a mixture of translocated species that does not resemble the legacy condition, yet over time has formed functional communities. A review of the colonization and successional trajectories of the park documents the early domination by invasive herbs such as mugwort (*Artemisia vulgaris* L.) and the common reed. Over forty years however, the site gradually transitioned into three guilds, herbaceous, shrub and tree, each containing a novel mix of species (Figs. 8 to 15).⁶⁴

Frank Gallagher has studied the undeveloped brownfield in Liberty State Park for over thirty years, finding that novel vegetative communities appear to function in spite of environmental stress associated with soils of high metal concentration. While the composition of the community may include many newly introduced species, primary productivity values appear fairly normal.⁶⁵ Carbon sequestration at several of the sites in this brownfield were equivalent to that of remote sites in the Pinelands National Reserve of southern New Jersey.⁶⁶ In addition, it appears that the ecological risk associated with uptake and transfer of various contaminants does not follow traditional biomagnification scenarios. Most of the metals are held within the root zone or at the root-soil interface.⁶⁷ The unique vegetative community is there because the plants are metabolically adapted to avoid or sequester soil metals.



PHOTOGRAPH BY FRANK GALLAGHER

Figure 8 A Fourth Nature landscape horizon at Liberty State Park, Jersey City, New Jersey, the site of a former railyard. Novel vegetative communities such as these are able to function despite environmental stresses associated with soils of high metal concentration.

The conditions witnessed at Liberty State Park illustrate the benefits of Fourth Nature communities. Rather than the removal and replacement called for by traditional approaches, it would be more beneficial to design with and for these volunteer communities, along with the material remains of the railyard structures, honouring the legacy of the site’s industrial history. A design for the brownfield section of the park was created by Margie Ruddick, a landscape architect who understands and can implement a Fourth Nature design process. She integrated the concerns of the park historian, local residents and ecologists to design spaces for human use in a context of created wetlands, dynamic grasslands, shrublands and woodlands. The paths are designed to change over time along with the vegetative assemblages on the site, maintaining the primary interpretive theme of a dynamic functional urban ecology. Unfortunately, due to bureaucratic issues this design was not implemented, the project was deferred and this portion of the park remains mired in controversy and closed to the public. When this site becomes publicly accessible, landscape architects, heritage managers and ecologists must consider how to work with



Figure 9 Queen Anne's lace (*Daucus carota*), a common member of the Apiaceae family, is considered a generalist capable of tolerating a variety of drier upland soil conditions. A Eurasian native, this plant has been introduced throughout the world and often does well on Anthropogenic soils. It functions as a good pollination plant.



Figure 10&11 Two native species, staghorn sumac (*Rhus typhina*) and winged sumac (*Rhus copallinum*), dominate the shrub guild within the brownfield of Liberty State Park. Staghorn sumac does well

in the fringe wetland areas, often outcompeting the common reed (*Phragmites australis*). Winged sumac prefers drier areas and does well in soils with relatively high metal loads.



Figure 12 A close-up of the seed head of winged sumac (*Rhus copallinum*). The fruit persists into the winter, providing a late season or emergency winter food source for over three hundred different species of song birds as well as several small mammals.



Figure 13 Red cedar (*Juniperus virginiana*), a common early successional species, is native to eastern North America from Canada to the Gulf Coast. Its arrival at the brownfield site in Liberty State Park was relatively late, appearing only after the tree was planted in the surrounding mitigated sections of the park. This may indicate that the tree was not part of the early community due to limited seed dispersal within the regional species pool.

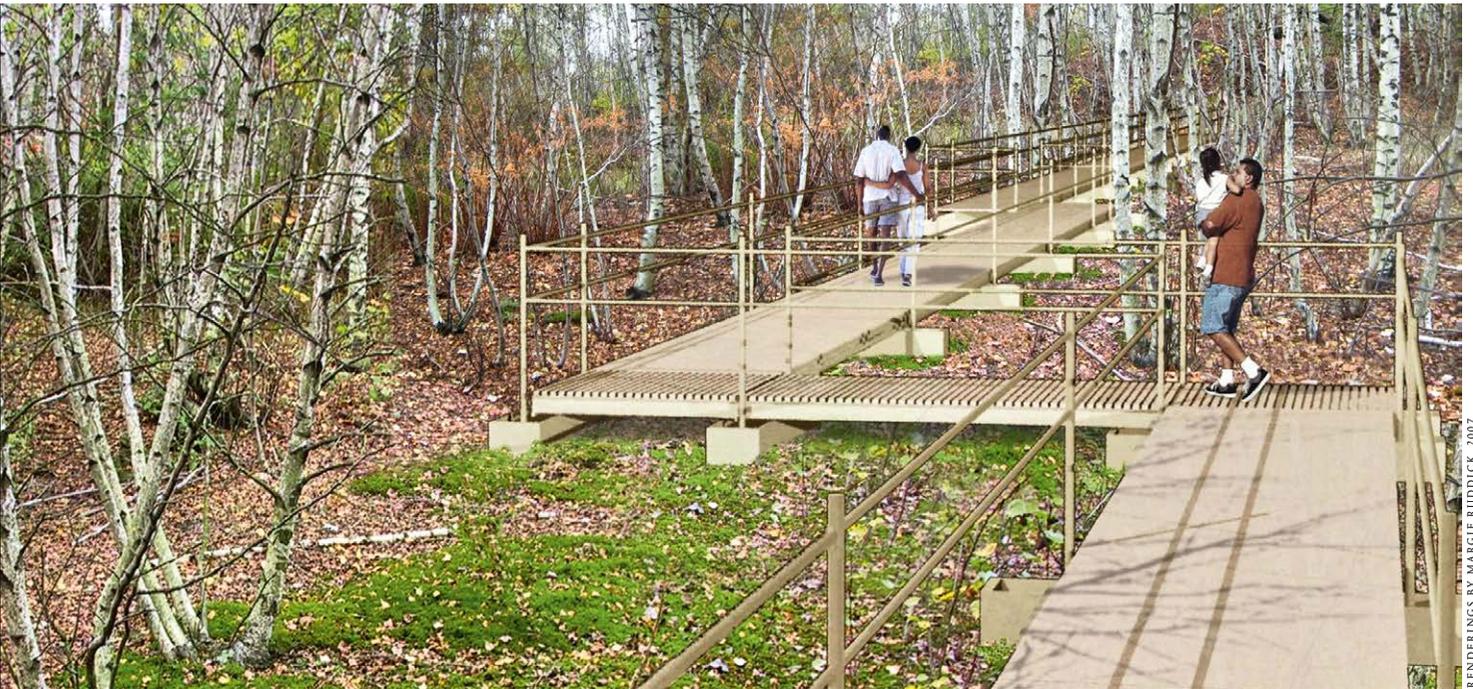


Figure 14 & 15 Renderings of a design for the undeveloped brownfield section of Liberty State Park, created by Margie Ruddick. She worked with the park historian, local residents and ecologists to create path-

ways, seating areas and interpretive trails that weave through and interact with the plant communities that have colonized the site.

Fourth Nature in the gardens, pathways, interpretative trails and spaces that will be designed—a process akin to editing an existing work, rather than creating a new one. Public access should not be limited, as it was at the Monmouth battlefield site, just to create an idealized interpretation of a landscape that will be difficult to maintain and less functional than the volunteer composition that exists today. The design should respond to the three components we mentioned earlier—environment, design for human use and heritage.

Conclusion: integrating approaches to design for dynamism

We have described approaches to ecological heritage landscapes that often assume an idealized, fixed endpoint that rarely makes sense in light of the current rates of change in North America. This ostensibly ‘pure’ endpoint is often influenced by romanticized imaginings of nature, rather than by the existing conditions. Holding on to outdated and fixed ideals leads to restoration, management and design practices that require too much energy to maintain. Such static frames do not work with the dynamism that informs species movement and adaptation to shifting conditions,

especially in the context of increased changes to environmental systems. The flora and fauna of entire national parks or islands, for instance, are inserted, manipulated, replaced and continuously monitored to preserve a nostalgic condition that plants and animals constantly work against.⁶⁸ While this might be an appropriate approach at a few selected sites, it is by no means sustainable as an overall strategy, especially for landscapes that must support both ecosystem functions and human use. Implementations like those at the Monmouth battlefield skew towards prioritizing one period of historical significance, ignoring the current ecological realities of the site. As a result, a public landscape came to be privately managed and inaccessible. At Fresh Kills, design for public use was prioritized, but future trajectories and the integration of heritage and ecology were not considered, which will create problems for managing the large park.

Connecting practices of designing for public use, heritage and ecology that are currently divided involves remaining in dialogue with the past while designing for the future and working with expected and unpredictable changes. By uniting segmented approaches and practices, the fields of restoration ecology, heritage management and landscape architecture can, jointly, look decades ahead, explore possible trajectories of human and non-human communities, and design while thinking the past and the future together. This means addressing not only how ecosystems will change, but also designing for change in human use and populations. Aligning with new understandings of heritage, we lay the groundwork for an approach for designing landscapes with Fourth Nature, building on ecological values to facilitate dynamic, fluctuating and process-oriented design. Designing with Fourth Nature means being open to unpredictability and surprise and new forms and processes that will emerge. Much work remains to develop a practical framework around understandings of Fourth Nature to inform design practices that embrace spontaneous vegetation and novel ecosystems while also creating spaces that are responsive to cultural and social needs.

Despite challenges for practitioners to find a common language and tools that will support more integrated processes, this approach will result in a number of benefits for managers of heritage landscapes and public parks by mitigating the effects of maintaining landscapes that constantly pull towards change. The general public will benefit as Fourth Nature landscapes are made more accessible, more conducive to human use and comfort, more connected to cultural significance and more accommodating of social uses. Additionally, this will advance the practice of landscape architecture, particularly in the United States, in working towards bridging the long-discussed divide between ecology and aesthetics and natural and cultural heritages.

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