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Introduction

Robert R. Hewitt

The collection of essays presented in Landscape Imprints: Culture, History, Sustainability, Technology, Learning trace their origins to an international gathering of landscape architects and educators hosted by Clemson University’s Department of Landscape Architecture and the Council of Educators in Landscape Architecture in the fall of 2003 at CELA’s annual conference in Charleston, South Carolina. For the reader, the second edition of the twenty-two peer-reviewed essays assembled here present a range of significant topical discourse on the landscape in the first decade of the 21st century by leading authors in the field of landscape architecture and landscape studies. Sustainability, globalization, gendered landscape, landscapes of power and race, technologically-mediated landscape, the geography of terrorism, learning environments, and post-ethnic landscapes offer a brief spectrum of the dialogue that runs through the collection’s five topical sections on culture, history, sustainability, technology, learning and the landscape.

Culture

The first selection of essays addresses contemporary culture, and the relationship between environmental art, material culture, sustainability, multiculturalism and the landscape. In the first essay in this series, author Mark Treib examines Michael Heizer’s series of earth sculptures created between the 1960s and 1980s, which describe a range of “displacements” that Treib asserts are essential acts of making landscape. Defining each sculpture as an intervention, in effect a disturbance of a prior order, Treib observes that while landscape architects often stress addition when designing, they also shift and remove elements such as living material, construction, or just earth. Displacements then lie literally at the very heart of landscape architecture, and are the foundation upon which all other operations build. His suggestion that we might imagine a lexicon of earthen displacement as a basis of landscape making that would modulate climate, provide defense, support ceremony, accommodate purposeful activity, posits a method for creating landscape, which interweaves utility with intellectual and aesthetic pleasure: intertwining landscape and the realm of art.

Envisioning environmental art as a source for landscape experimentation, Timothy Baird explores the meaning of Michael Heizer’s Effigy Tumuli Sculptures and Herbert Bayer’s Mill Creek Canyon Earthworks. These pieces, Baird suggests, are representative of an emerging sense of sustainability in the environmental art movement of the 1970s and 80s, which ushered in a new wave of landscapes, and dramatically affected the way many landscape architects approached design. Accordingly, Baird advocates an adoption of this early sense of sustainability in environmental design through a measuring of human impacts on the landscape, suggesting that the making of landscape as art must enhance and reinforce natural processes over time to encourage the remediation of environmental damage and the improvement of ecological health.

In “Multiple Exposures: Reading Landscape Values in Contemporary Mass-media Advertizing,” author Carla Corbin explores landscape as “material culture,” providing tangible connections between landscape as art, nature as cultural product and cultural landscape as object. Relying on landscape representation as an important source for understanding cultural values and the dimensions of power and social practices, she records
the contemporary role of landscape imagery in the pervasive advertising that links brand-name commodities with social and cultural conceptions of landscape. For Corbin, the ubiquity of media messages about social standing, personal relationships, and security that use images of nature or the outdoors to communicate health, purity, and lack of artifice, ultimately shape our consumer product preferences, our consumption behavior, and our landscape values.

In the last of four selections focusing on the cultural landscape, Arthi Rao examines the changing relationships between multiculturalism, cosmopolitanism, pluralism and universalism in her essay on the creation of cemetery landscapes in post-ethnic America. Defining mourning rituals as both cultural sanction and personal need, Rao explores how funerary ritual and mourning processes unfold in contemporary cemetery landscapes. In response to what she suggests is an increasing loss of functional meaning in cemeteries, she proposes the transformation of existing cemetery landscape to reflect the diverse cultural mourning processes of contemporary societies and the landscape’s capacity to heal.

**History**

The second selection of essays presents eight perspectives on landscape history with particular emphasis on the landscapes of the South and the Eastern Seaboard of the United States. The essays suggest multiple interpretations of landscape history from intersections of “wilderness ideology” and natural history, to the relationship between historic landscape and the development of historic musical form, to the origins of American feminist landscape, the landscapes of urban and rural slavery, to landscape archaeology and preservation and contemporary biography.

In “Stewarding Nature,” Paul Kelsch, broadens the scope of Treib’s, Baird’s, Corbin’s and Rao’s conceptions of landscape creation from the intersection of art, material culture, and ritual to that of natural history. His “constructive history” of Cathedral Pines, an old-growth forest in Cornwall, Connecticut wiped out by a tornado in 1989 interprets the controversy that surrounded the influence of “wilderness ideology” on the reforestation of the historic landmark. Emphasizing nature as an historical construct rather than abstract ideology, Kelsch proposes that human beings imprint the land through use and modification; and that through those imprints subsequently construct landscape as a product of both landscape ecology and imagination.

In “Imprint of a Blues Stained Landscape,” Michael Robinson explores historical relationships between the creation of music and landscape form. His essay traces the development of archaic country blues (the Delta Blues) in the Yazoo Mississippi Delta at the end of the 19th century, focusing on the transformation of the Delta from wildland-swamp to flat alluvial cotton plantations, jook joints, railroad depots, steamboat landings, and turpentine camps. In tracing the musical origins of the Blues from West African traditions of music, agriculture and labor, to freed slave and sharecropper traditions of weaved work hollers, track calls, and ring shouts used to fell forest, drain swamps, clear land for crops, and lay railroad tracks, Robinson exposes the often tenuous connections between cultural narrative, art form, and the creation of landscape.

Martha Zierden examines the landscape as more than a reconstruction of social elite and the enslaved visible in the buried debris exposed through archaeology and research by garden historians, landscape architects, and material culture specialists. According to Zierden, Charleston’s urban landscape was more than an amalgamation of individual landscapes...
of the elite, middling, and poor, slave and free, but a unique and definable type of its own that is simultaneously collective and contradictory. These landscapes expressed not only the elaborate and innovative formal landscapes of the powerful, but the landscapes of filled swamps, refuse dumps, maintenance yards, and livestock pens, reflecting a myriad of social relations that were played out in the constricted space of our historic cityscapes.

In “Slave Landscapes of the Carolina Low Country,” Elizabeth Brabec, examines the landscape settings of plantation slave communities and their day-to-day lives. Brabec’s essay is particularly valuable as a companion to Zierden’s in its presentation of formal and informal characteristics of the rural plantation, providing a richer understanding of the range of social landscapes developed in antebellum South Carolina. Brabec convincingly illustrates that while the myths and realities of slave life have become largely indistinguishable in period plantation depictions, valuable interpretation of the regional, temporal and cultural aspects of those landscapes are still possible through an examination of plantation plats, extant plantation sites, archaeological findings, plantation owners’ journals, travel accounts; slave narratives, and Civil War era photographs.

Suzanne Spencer-Wood explores a very different kind of social landscape in her examination of urban transformation, gendered landscape and American civic culture. In her depiction of the Women’s Reform Movement and the American Playground Movement in Boston at the end of the nineteenth century, she describes the creation of playgrounds, parks and other green spaces influenced by the belief that women landscape designer’s contributed to a more moral, natural, and domestic public realm. She suggests that these transformations represent a significant form of early feminism that has shaped Boston’s public landscape, which has in turn shaped Boston’s Women’s Heritage Trails preserving the important role of women in shaping Boston’s landscape.

Sherene Baugher further elaborates the role of gender in shaping the landscapes of the Northeastern United States in her description of New York’s Sailors’ Snug Harbor in 1831 as a model charitable institution for retired and injured seamen. Baugher suggests the creation of two interrelated landscapes at Snug Harbor: one which perpetuated on land the male hierarchy, power dynamics, and strictly ranked society that had existed onboard ships at sea; and another which reflected the charitable organization’s institutionalization of class roles that were the foundation of nineteenth-century American industrial society.

In her essay describing Phoenix, Arizona’s Native American School as an example of “assimilationist education for the Indian problem,” which took place between 1890 and the 1930’s, Hemalata Dandekar proposes a process to interpret and interconnect new landscape creation with historic cultural landscape preservation. She suggests that in creating these intertwined landscapes, we best employ public democratic processes that respond to the needs of all users, even those oblivious to the past. Dandekar refers to a typology for the meanings of gardens based on faith, power, ordering, cultural expression, personal expression and healing. In recognizing that a park represents the interplay of landscape as idea, physical space, and as action, she proposes that we can raise awareness of the complex history of landscape that respects and celebrates Native American meanings and symbols; yet meets the multicultural community needs of current, and future inhabitants.

In the last of the essays that address landscape history, Sarah Georgia Harrison pays tribute to regional landscape architect Robert E. Marvin, examining the intimate intersection of landscape and personality so often revealed in the biographies of those closely tied to nature.
and the landscape. Her essay describes the evangelical zeal of an early landscape modernist steeped in the traditional settings of the Southeast that nourished profound physical, emotional, intellectual and spiritual needs. Her reading of Marvin provides important insight into conceptions of our regional and national landscape that embodied the creation of landscape in the South during the second half of the twentieth century.

**Sustainability**

Seven essays follow the first two series of essays on the cultural landscape and landscape history, addressing two increasingly important dimensions of contemporary landscape discourse: sustainability and digital technology. Four of these essays explore prevailing streams of thought on sustainability related to the urban landscape, the rise of “green infrastructure,” the psycho-ecological role of urban streams, and the deliberate “mimicry” of natural processes in landscape creation. The last of the seven essays elaborate the increasing influence of digital technology on landscape creation, representation, and conceptualization at the beginning of the 21st century, examining issues of community participation and landscape visualization, urban sprawl, and global terrorism.

In “A Dialogue for Sustainability,” Alf Simon and Teresa Cordova argue for the generation of a new ‘technologically sublime’ landscape similar to those that were admired and celebrated in the early twentieth century. They suggest that rather than the isolated and arguably unsustainable energy, water, drainage and waste systems of contemporary America, we should instead create profound social, cultural and ecological infrastructure as part of a psychologically and socially significant interconnected urban network. As such, infrastructure and urban sustainability would be joined as balanced multi-dimensional processes that assimilate social, technological, political, environmental and economic dimensions within the contemporary landscape.

Chia-Ning Yang explores the social, cultural and environmental ramifications of the kind of “green infrastructure” proposed by Simon and Cordova in her essay “Spontaneous Uses in Urban Streams.” In her study of Brentwood California’s urban streams, Yang posits whether “wild and scenic rivers” better serve wilderness purists, waterfront resorts better serve comfort recreationists, and wheter the majority of the urban streams can ever be genuinely wild or completely tamed. Her research suggests the promotion of spontaneous use as a central theme of urban stream restoration based on the therapeutic effects of nature, on the beneficial effects of play, on the beneficial social effects of raising environmental literacy, the ecological benefits of habitat preservation, and on the ecologically dynamic benefits of human interaction with natural processes.

In “Biomimicry as a Runoff Management Strategy,” Sykes, Neckar, and Mikonowicz propose biomimicry as an important component of sustainable landscape development based on two underlying principles: its deliberate replication of natural processes to solve human problems, and its incorporation of ecological evaluative standards. Their essay proposes a combination of quantititative and qualitative approaches to sustainable landscape evaluation intended to define landscape in a manner capable of influencing political decision makers.

In the last of the four essays on sustainability and the landscape, Lance Neckar examines a genetic code for urban sprawl inflected by runoff treated as waste, and settlements as subdivisions. Comparing the effects of conventional development based on Euclidian notions of zoning, and on Commuter Rail-Oriented Development, Neckar suggests
derivatives of three landscape types that define modern America: “sprawl,” “nicesprawl,” and “hydroburbia.” His essay stresses the continuing significance of scientific rationale as a basis for understanding and describing sustainable landscape quality.

**Technology**

In their essay on the “Aesthetic, Recreational and Ecological Value of a Rural Landscape on the Edge of Town,” Eckart Lange and Sigrid Hehl-Lange focus on subject matter at the heart of landscape architecture: the perception of aesthetic, recreational, and ecological landscape values. Their use of technologically generated images representing a variety of landscape scenarios illustrates the changing methods of representation offered by technology, providing methods of landscape analysis reminiscent of English landscape architect Humphrey Repton’s use of analytical “Redbooks” more than two hundred years ago.

In the second of these three essays, Stephen Sperry expands the scope and scale of technologically-mediated landscape assessment, addressing the influence of regional scale landscape on decision-making processes, policy formulation and urban development utilizing geospatial data rather than the visual representation, perception and experience advocated by Lange & Lange. In this essay, Sperry examines approaches to changing patterns in land use, large-scale watershed change, ecosystems and biodiversity, as methods for change detection in deforestation, changes in vegetation phenology, agricultural practices, and water quality. His focus on contemporary change rather than scenario representation, illustrate the extent to which landscape creation and conceptualization has become a subject of both process and time.

Douglas Way’s essay contributes to the short but rich history of landscape analysis and experience at global scale using geographic information systems to explore the terrain of insurgents, smugglers, and terrorist bands. Way’s use of technology to define landscapes mediated by “stateless zones,” rugged terrain, distant populations with extended lines of communication and control, and poor governance, suggests a landscape associated with military and intelligence applications at a scale beyond traditional military engineering. His inclusion of quasi-legal territories and violently contested landscapes provides pragmatic counterpoint to the landscapes envisioned by both the Lange’s and Sperry.

**Learning**

The last selection of essays presents recent developments in contemporary landscape discourse addressing education and learning. Robert Hewitt and Hala Nassar introduce this series of essays on learning and the landscape with their description of international education in landscape architecture. Hewitt and Nassar suggest that in an increasingly globalizing world, landscape architecture educaiton must encourage the realization of sustainable, culturally and historically sensitive landscape at local, regional and global scales. Their essay aptly addresses contemporary trends in international education, multiculturalism, and pedagogy, specifically related to landscape architecture in a globalizing world.

Kim Wilson, in her essay on learning and teams, identifies interdisciplinary and multidisciplinary collaboration as a critical component of sustainable landscape. In her elaboration of criteria and methodology relevant to instructor-assigned teams, Wilson examines heterogeneous teams that mix technical skill, student preferences, learning style, interpersonal style, and aptitude to promote greater team learning and performance. She
aptly illustrates how interpersonal understanding of the spoken and unspoken preferences, concerns, and strengths of team members enables effective knowledge sharing and open communication; and how proactive problem solving reinforces team learning and performance, leading to more sustainable design.

In their essay on the value of vegetation in learning, Beth W. Darnell, Margaret Livingston, and Lauri Johnson, examine the value of work and play integrated with physical, social, emotional, and intellectual development. They remind us that the educator’s role in these settings best reflects that of environmental facilitator, with play used as a tool for teaching and extending the play experience. They recommend children’s outdoor environments that are sensory-rich and that facilitate play involving all the domains of development (physical, socio-emotional, cognitive, and sensory). Citing the growing concern that opportunities for outdoor play and direct experiences with nature are shrinking, they note the increasing potential of attention deficit behaviors, childhood obesity, and a general lack of concern for the natural environment.

These twenty-two essays in the second edition of Landscape Imprints serving as a representative body of contemporary thought on the landscape, reminds us of the extraordinary scope of contemporary landscape architecture. This edition’s various themes related to landscape representation, landscape history, and the cultural landscape have resonated for centuries, while emerging themes associated with power, gender, sustainability, material culture, ethnicity, and technology clearly reflect the continuing reevaluation of its subject. As such these essays, like the earthen imprints from our earliest landscape displacements to the digital visual scenarios of our conceptual landscape creations remind us that landscape reflects not just our thoughts and actions over time, but the landscape as it was, what it is at the beginning of the 21st century, and what it might become.

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C. Timothy Baird

Multiple Exposures:
Reading Landscape Values in Contemporary Mass-media Advertising
Carla I. Corbin

Redefining the Cemetery Landscape:
A Multicultural Perspective
Arthi Rao
Displacements

Marc Treib

In 1976 Michael Heizer created a sculpture, *Adjacent, Against, Upon*, on the Seattle shoreline. [Figure 1]. The work’s title reflected three plausible relations between a rough and massive boulder and a smooth geometric plinth of concrete. Heizer’s proposition embraced the contrast and affinity between the natural and the constructed, but also between bodies in space. “Synthetics are intensifications of the organic sources,” Heizer has stated, suggesting a continuum rather than a true opposition of material orders.¹ Behind many of Heizer’s works from that period stood a proposition as its instigating force. How were two objects related in space? At what angles might planes relate to the ground? How might the shifting of matter transform existing conditions and human perceptions of them?²

![Figure 1. Adjacent, Against, Upon. Seattle, Washington, 1976. Michael Heizer.](image1)

Beyond these sculptural explorations was the simple idea of displacement. One took some thing from somewhere and deposited it in another place or situation. As a result of that operation both objects were fundamentally changed. The sculptor’s act was thus essentially one of transformation of pre-existing conditions through intervention. Disturbing existing conditions effected a new situation, which garnered a change of our perceptions of it.³ Form and space constituted the language by which the intentions emerged. Changing existing conditions changed perception of those conditions. Like the missing tooth that calls attention to the remaining dentures, or a gap in a bookshelf that shines new light on a book long taken for granted, or a mass of building materials huddled on a street and blocking normal access — the void or the pile provoked the contemplation of prior conditions. In the work of a sculptor like Michael Heizer, disposition was a basic trait; displacement was the vehicle for the transformations.

The sculptor’s early inscriptions in the desert surface were termed “drawings,” and the excavated medium shared much in common with the crayon or the pencil. “When I made the negative sculptures, I realized the possibility of an entire vocabulary,” said Heizer in an interview. “I felt that if you made sculptures like this with basic materials such as earth you should also develop the areas of drawing and painting so as to expose the whole vocabulary. I made the ground drawings and the ground paintings with this index in mind.”⁴ Linear in aspect, the engraved line traced the route of shovel, using digging in place of graphite and the earth in place of paper. Taken in this respect, *Double Negative* of 1970, near Overton, Utah, may be read as a drawing at a gigantic scale, as firmly established in mass and space as an ink and wash drawing by Giambattista Tiepolo.⁵ But here, in the vast spaces of the American Southwest, the size has increased to the point where it enfolds the human being: the drawing becomes a space, and the space a commentary on a larger set of issues, historical, geological, and ecological [Figure 2].

![Figure 2. Double Negative. Near Overton, Nevada, 1970. Michael Heizer. [Photo: 1999](image2)]

In reading *Double Negative* one can follow differing tracks. The inclined planes that resulted from its earthmoving operations comment equally upon bulldozer and human
effort as they facilitate entrance and exit into
this canyon created through displacement. The
path of descent is also a journey back through
time: as the movement horizontally becomes
transposed into vertical depth, the visitor
encounters geological strata and translates
depth into eons passed.

Like landscapes designed for a broader range
of criteria, *Double Negative* guides movement
and perception. We shift from the complete
openness of the mesa top to the directive
channel of the chasm, with our view leaping
the gap between the two cuts. There is relief:
at the end of each cut, the talus has poured
outward and taken a more naturalistic form,
its static flow encouraging the visitor to look
outward and downward to the distant river and
surrounding landscapes.

As a group, Heizer’s sculptures from this period
outline the range of earth movements that are
part and parcel of making exterior places. Each
design is an incursion into a prior order. While
we tend to stress addition when designing, we
also remove and almost always shift, whether
employing living material, construction, or
merely earth. Displacements lie — literally —
at the very base of landscape architecture, and
they provide foundations upon which all other
operations build, unless the work is superficial
in a non-pejorative sense of the word.

Heizer’s later works, which might be termed
propositional, furthered the investigations that
first propelled his terrestrial incisions. They
pose questions about the relationships between
things, and between characteristics positive
and negative. Through the 1970s and 1980s
the sculptor executed a series of works that
addressed these permutations of oppositions.
*Elevated, Surface, Depressed* (1969–81), for
example, referenced forms and voids related
to ground level. Rock remained the ostensible
subjects of the works, although the extracted
or mounded earth could lay equal claim to
that status. The piece 45°, 90°, 180° at Rice
University in Houston, dating from 1984,
posited the potential angular relationships of
a red granite slab to the plane of the ground,
from the vertical to the horizontal; the support
structure, while necessary, in many ways is
extraneous to the instigating idea, although
necessary for executing the concept and
inescapable as part of the sculpture [Figure 3].

In Heizer’s works — and in designs by others
so conceived — the proposition is generic and
framed to lay out the full range of possible
relationships, long before any specific forms
have been envisioned. In this, the practice is
similar to the anthropologist Claude Lévi-
Strauss’s use of the periodic chart of chemical
elements as a model for plotting kinship
relations in tribal society. To Lévi-Strauss the
marvel of the periodic chart was its embrace
of all possible relationships, even those then
unknown. Today we might simply term it
a matrix, and in some ways Heizer’s artistic
project has exploited certain properties of the
matrix as a basis for inventing and selecting
conditions.

As Heizer inventoried the possible associations
of rock, plinth, mass, and void, we might also
posit a lexicon of earthen displacement as a
basis of making landscapes [Figure 4].

Among them we might note displacement
to modulate climate, for defense, to support
ceremony, to accommodate purposeful activity,
and of course, for intellectual and aesthetic pleasure: the realm of art. These situations will be discussed further below. It should be noted, however, that the artist, unlike the designer, has an advantage in having to consider only as many parameters as he or she might want. For example, James Turrell may focus completely (or nearly completely) on light and perception. His interior installations use light as a vehicle for sensing space as well as sensing ourselves sensing. His outdoor works explore either changes in lighting conditions over time, or other effects such as what is called celestial vaulting. Whether in a small work such as the 1996 Celestial Vaulting at the Kijkduin outside The Hague in the Netherlands, or the colossal Roden Crater project in Arizona, Turrell’s reconfiguring of earthen contour heightens the perceived dome of the sky and reveals periodic celestial conditions [Figure 5]. Here displacement serves artistic, and, one might add, philosophical purposes.


A more obvious and focused use of displacement was Robert Smithson’s Asphalt Rundown, executed in Rome in 1969. This piece raises issues about the value of its operation and the degree to which an aesthetic rather than an anti-aesthetic was involved, but it is a significant gesture nonetheless. Here a dump truck full of asphalt unloaded its cargo along the bank of an abandoned gravel and dirt quarry. A simple enough procedure. This could be taken as a mundane maneuver (except that fresh asphalt in this particular location is somewhat strange); in other ways, however, should we so desire, many of its aspects grant the piece evocative qualities. Informing the work were questions of gravity; of grain size, friction, and ultimately the angle of repose; of color, of the difference between action and residue and thus between verbs and nouns. Perhaps all of this is a romantic (and somewhat academic) reading of a prosaic act, but in any case, there is little question that Asphalt Rundown was rooted in the practice of displacement.

Grading and drainage, cutting and filling, are part and parcel of most landscape operations, and we could say that as the skeleton for the garden or park or plaza, they are in themselves aesthetic operations. But they are only one element of a larger constellation of landscape operations, and in many respects their identity is often lost once the planting has been completed or the building erected. The significance of displacement in these artworks, in contrast, derives from their continuing at the forefront of perception. The question, then, is whether we can maintain a focus on these displacements when incorporating them into a larger set of issues and operations.

The lessons of labor tell us that neither removing soil from, nor bringing soil to, the site constitutes the most efficient handling of earth movement. In an era of bulldozers, and dump trucks, perhaps this dictum is less universally applied, but in former times, when displacement meant shovels and manpower, the dictum was almost absolute. In no other situation was its rigor more desirable than for defensive purposes, in particular, for creating ramparts and moats. It would seem a truism that by complementing digging out with piling up fortification builders could reduce the effort involved in each by exactly one half. By using the earth excavated from the moat to create the adjacent bulwark any labor was given double agency by introducing water into the moat.

Figure 6. Stone Circle. Avebury, England, c. 2,300 B.C.E.
At the Avebury site in Wiltshire, England, the displacement of earth served primarily religious or ceremonial purposes (or so it is believed), but the reformation operations were basic to those of defense. Each shifting of terrain constitutes an essential disturbance to an existing order as a means for shining light on some new condition [Figure 6].

One reforms in order to refocus attention psychologically, if not necessarily proscribe movement physiologically. All mounded structures — the Cahokia site in Illinois and the Serpent Mound in Ohio are good examples — require resources from somewhere, and in the process, these tons of soil are reformed to create a recognizable feature, either iconic shape or at least massive in aspect.

The tenth-century Viking camps in Denmark, such as Trelleborg and Fyrkat, demonstrate how extracting and heaping soil for defensive purposes ultimately proffered aesthetic subjects as well. Through their orientation, shape, and apertures, these earthen ramparts protected a settlement of wooden structures, itself set in symbiotic relation to its earthen enclosure [Figure 7]. For the most part the residential structures have retreated to the state of archeological evidence, but excavations and partial reconstructions have revealed how the wall of earth and the wall of wood played upon each other, both poised in a state of perceived security.

Earthen forms modulate climate as well as effect defense and enclosure. In Iceland, where wood was so scarce it required importation, two walls of the house were made in earth, leaving the narrow gable ends as the sole wooden surfaces. Soil, of course, provides excellent thermal mass for insulation, whether used in simple heaps, or in a more sophisticated fashion, as adobe bricks. The properties of thermal mass retard the passage of cold to the interior and heat outwards (or vice versa if so desired), and thickness only increases the effectiveness of the mounding.

In an era where passive solar performance has gained greater acceptance, the popularity of the berm has followed suit in short order. But long before this recently acquired sustainable consciousness, projects such as Frank Lloyd Wright’s second Jacobs House in Madison, Wisconsin of 1949, demonstrated the positive effects of attaching soil with stone. The north wall of the hemicycle features only restrained amounts of fenestration and is backfilled with earth for insulation and to blend the stone walls of the house more completely with the surrounding landscape [Figure 8]. In contrast, the southern façade, partially sheltered by the concave geometry of the plan, is extensively glazed to admit generous amounts of sunlight and radiant heat. In this house, Wright niftily paired aesthetics with thermal modulation to achieve a house design in which a simple shifting of earth achieved considerable success in both arenas.

Turning from architecture, we might also look at the use of simple displacements to accommodate or regulate occupancy of the landscape for dwelling, production, or pleasure. At the root of these examples is the regard for the earth as the basic tray upon which life is played out. Most students and historians study the work of André le Nôtre primarily in plan, which is a quite limited investigation of his considerable talent. The French garden maker’s use of the section—his modulation of
the terrain — was, in fact, equally if not more sophisticated than the planning of the axes and bosks which structured most of his gardens. The axis on a slope, for example, was normally stepped to provide increased level surface and more gradual ascents and descents. On the rise, their subtlety also supported visual continuity from level to level, and abrogated any radical fractures of perspective on the descent [Figure 9]. In actuality, the abrupt drop in elevation around the Latona Fountain at Versailles is almost singular in le Nôtre’s work, for its vertical dimension disrupts the continuity from the upper parterre to the principal axis, creating two distinct zones. More often, the flow of the ground plane, and movement upon it, was invitingly smooth.

Le Nôtre’s handling of earthen contour is today most evident at the chateau of Dampierre, near Port Royal, outside Paris. Built upon the remnants of a sixteenth-century structure, the new chateau was designed by Jules Hardouin-Mansart and constructed from 1675-1683.

Figure 9. Central Axis, Versailles, France, late 17th century. André le Nôtre.

The reformed landscape provided a radical base for the ensemble, with the mansion set hugging one bank of the valley. In several ways, the layout is bizarre and audacious, countering every normal axiom of classical site planning. As a river valley, one would have expected the arrangement of the chateau and its gardens to follow the lay of the land and the direction of water flow. But le Nôtre and company established the thrust of the house and gardens as a cross axis to the sweep of the hollow, damming the river to form a grand pièce d’eau that suggests the grand water parterres at Studley Royal in Yorkshire of the following century. The river bottom at Dampierre is reformed and leveled, neatly shaped and bounded by a series of canals that embrace a nearly square domain for the chateau garden. To continue the thrust of the garden across the valley, a counter axis took shape, excavating from the far hillside sufficient earth to gnaw into the dominate swoop of the landform—and not incidentally offer soil for fill [Figure 10]. Given the almost complete disappearance of the chateau’s vegetation, Dampierre is less visited today by landscape architects and historians, and yet in its vegetal nudity its lessons are perhaps the most evident of any of le Nôtre’s works.

Figure 10. Château Dampierre, France, 1683. André le Nôtre (attributed).

In the last decade, the most identifiable use of earthworks has peppered schemes by the San Francisco / Cambridge firm of Hargreaves Associates. For sites as geographically dispersed as California, Portugal, and the American Midwest, the earthen form has become a signature element for the office’s work. Of course, even today, using earth forms makes considerable economic sense, balancing cutting and filling as conditions best allow. But there is more to it than that. In some instances, the earth forms serve as thermal protection, blocking unwanted winds and creating still pockets to catch solar rays and their thermal blessings. Aesthetically, of course, the meandering cigar shapes of the earthen landscape have produced a visually exciting modeling of the land’s surface, especially apparent in two- or three-dimensional representations. Their order, said to derive from the forces of hydraulic process, suggests the flow of liquids through lowlands and hillsides, even where the water may, in fact, be absent. In models and plans, the patterning of earthen forms promises an exciting and varying field of modeled ground, one in which
spatial and visual restriction and closure plays against release and the open vista.

Parts of Byxbee Park in East Palo Alto, California of 1992, for example, are sufficiently strong to regulate both movement and view [Figure 11]. In other applications, however, — for example, the Louisville Waterfront Park— the gestures ultimately appear too small, too numerous, and too similar—as a result, the experience of one mound valley is more less the same as any other. One questions, too, the use of forms said to be based on natural processes that follow different orientations, at times more or less perpendicular to the river or shore, at times nearly parallel. It would seem that water doesn’t flow along more than one course in any particular situation, causing the thought that one of them is accurate while the other is only an affectation. Alas, in a number of the projects, the promise of the models’ richness is left unfulfilled in the realized work. At the other extreme — the recent campus landscape work for the University of Cincinnati, for example — the gestures appear too complex, too stuttering, for the limited available terrain. They tend to fragment the space and further divide rather than unify the spaces and transcend the network of walkways.

Getting this balance of size and complexity right is not an easy job, and one hopes that the measure of success for the work will improve with time and rigorous post-construction evaluation. The power of the original earthworks like Double Negative or Robert Smithson’s 1971 Broken Circle derived in large measure from the singularity of the gesture — essentially just one thought, one concept, one form, or one void [Figure 12].

Landscape architects who have adopted the idea of the earthworks have often neglected to master the relation of formal complexity with the scale of site, creating displacements which have been too few and too large, or too many and too weenie. As noted above, artists are privileged in their option whether or not to deal with the full panoply of the factors that face designers. They can address as few as one parameter should they so choose, perhaps increasing the power of their work through a concentration on fewer aspects. In some ways, however, we can regard these works as the pure research, while designers are faced with development and application for broader human utility.

But from them, and from other historical examples, we can learn. We can learn about formulating a more conceptual approach to the site free of specific function, and we can learn how enacting that proposition may accommodate the panoply of factors that determine the making of landscape architecture. While I have tended to present earthen displacement in terms of singular factors or intentions, in fact, each has served— and should serve — more than one purpose at any given time. We have seen how defense might also possess a ceremonial aspect, or that ceremony may also benefit from a thermal dimension. I return your attention here to the sculptures by Michael Heizer that I termed propositional at the opening of this paper. A consideration of the full range of relationships between earth and built form may suggest to us alliances until now unconceived.

But I would caution against the use of this
practice uncritically. It would seem that the great landscape designs—and I will oppose them to works which are singularly artistic—attack the problem on more than one battlefield, and integrate the positive aspects into works that, should they not achieve all their desired goals, at least achieve as many of them as is practical. Rather than utilizing the matrix of factors only for displacements of ground, one needs to expand that matrix to include the propositional relationships that enfold other aspects of design—for example, people and their activities, rather than form and aspect alone [Figure 13]. This is the greater challenge for employing displacements, as it is the challenge for any other approach to landscape, whether social, vegetal, political, or environmental.

Figure 13. Red Rocks Amphitheater. Morrison, Colorado, 1941. Burnham Hoyt.

Notes

2 Michael Heizer’s work appears in virtually every study of earthworks or land art, such as John Beardsley, Earthworks and Beyond, New York: Abbeville, 1984. On the other hand, monographs have been somewhat limited; principal among them is Julia Brown, editor, Michael Heizer: Sculpture in Reverse, Los Angeles: Museum of Contemporary Art, 1984, and Douglas McGill and Michael Heizer, Effigy Tumuli, New York: Harry Abrams, 1990.


4 Interview with Julia Brown, p. 28.


7 Writings about James Turrell are extensive. The major publications are Julia Brown, editor, Occluded Front: James Turrell, Los Angeles: Museum of Contemporary Art, 1985; Craig Adcock, James Turrell: The Art of Light and Space, Berkeley: University of California Press, 1990; and Peter Noever, editor, James Turrell: The Other Horizon, Vienna: MAK and Cantz Verlag, 1999. No writer I have read conveys the artist’s ideas as well as Turrell himself does and the interviews in many of the articles and catalogs provide extremely valuable insights into his life’s project. For example, see Interview with Richard Andrews and Chris Bruce, in Richard Andrews, editor, James Turrell: Sensing Space, Seattle: Henry Art Gallery, University of Washington, 1992.


13 In the making of Studley Royal in the early decades of the eighteen century, a river was dammed and its water converted to a series of water parterres patterned on classical models. See The National Trust, *Fountains Abbey & Studley Royal*, North Yorkshire: The national Trust, 1988.

14 Le Nôtre’s development for the terrace at Saint-Germaine-en-Laye also demonstrates the landscape architect’s effective leveling of a slope for maximum aesthetic effect. It bears certain parallels with a later English project, Rievaulx Terrace in North Yorkshire created by Thomas Duncombe around the middle of the eighteenth century.

Illustrations
Credit All Photos: Marc Treib
Environmental Art as Sustainable Design: Mill Creek Canyon Earthworks and Effigy Tumuli Sculptures

C. Timothy Baird

Introduction
The environmental art movement of the 1970s and 80s ushered in a new wave of landscapes that dramatically affected the way many landscape architects approached design. This new generation of landscape architects was influenced not only by the strong formal gestures on the land, but also by the conceptual ideas and writings of some of these environmental artists. The connections between contemporary landscape design and the works, ideas, and writings of Robert Smithson, Michael Heizer, Walter de Maria, Nancy Holt, Robert Morris, and others is well documented. Not so clearly documented, however, is the level of sustainable design that was achieved by some of the environmental art of the period. While sustainability was usually not typically a primary objective of these works of art, there is much to be learned from careful study of these pieces and it will be argued that some have, in fact, achieved a certain level of sustainability.

While environmental artists certainly have had a great impact on the profession of landscape architecture – from Robert Morris and Nancy Holt to Robert Smithson (who referred to Olmsted as the first earthworks artist) – not all of their work could be considered environmentally sensitive. In fact, some of the work, such as Michael Heizer’s early pieces in arid areas such as Complex One and Double Negative, was thought to be ecologically damaging to the subtle and fragile desert environment. While some environmental artists like Michael Singer, Alan Sonfist, and Helen and Newton Harrison worked to reveal natural process and perhaps to remediate problems, for the most part the genre was more about moving out of the gallery and into the landscape (environment), in opposition to the commercialization of art, than it was about ecological sensitivity. The work these artists were doing was originally called earth art or land art. It was not until later that it become known as environmental art, when more and more artists came along “with ambitions to articulate, even to shape, the contemporary relationship to nature.” This thread of ecological sensitivity continues today in the work of artists such as Buster Simpson and Lorna Jordan.

Long before the terms “sustainable design” and “sustainability” were in common use, some environmental artists were creating landscapes that reclaimed abused land and, as a result, healed scars on the land and promoted landscape regeneration. This paper will present two examples of environmental art that were conceived in the context of land reclamation and were, arguably, early examples of sustainable landscape design. Herbert Bayer’s Mill Creek Canyon Earthworks in Kent, Washington and Michael Heizer’s Effigy Tumuli Sculptures near Ottawa, Illinois, will be examined in terms of their similarities and differences in formal strategy, reclamation context, public process, level of sustainability attained, and change over time. A comparison of these works, through a review of the literature, site visits, interviews of project participants and a close examination of documents such as drawings, models, photographs, and correspondence reveals similarities in conceptual framework and emphasis on the landscape experience as well as sharp contrasts in the approach to the public process and the time required to actually regenerate the despoiled or problematic landscape.

Figure 1. Mill Creek Canyon Earthworks, M. Heizer

Both Mill Creek Canyon Earthworks and Effigy Tumuli Sculptures were conceived as...
abstract geometric compositions of landforms that served dual purposes. For the former, the purposes were human enjoyment and storm water management; for the latter, human enjoyment and the reclamation of strip-mined land were primary concerns. From these commonalities, the two works are distinctly dissimilar relative to their public acceptance, level of sustainability achieved, and physical condition since completion. Careful scrutiny of all facets of these two built works will provide those interested in reclamation and sustainable landscape design with insight and information that could elevate the quality of future design interventions conceptually, formally, and ecologically.

Sustainable Landscape Design
The definition of sustainable landscape design is somewhat elusive. Carol Franklin says that “we need a broader and more pro-active definition of sustainable design and this is why it may be preferable to call the new paradigm ‘Ecological Design’.” This is a design approach that should go beyond the modest goal of minimizing site destruction to facilitating community recovery by reestablishing the processes necessary to sustain natural, social, and cultural systems. Robert Thayer prefers John Lyle’s term regenerative in lieu of sustainable because “it more aptly invokes processes that ensure healthy, functioning ecosystems.”

For the purpose of this paper, sustainable landscape design is considered to be design that does not impede the natural and cultural processes of a site but, in fact, enhances and reinforces these processes as much as possible in order for the landscape to be sustained over time. In addition, it is design that encourages the remediation of environmental damage or the improvement of ecological health. Finally, it is design that engages the public through its aesthetic quality.

Because of the need to quantify sustainability, especially in architecture, the Leadership in Energy and Environmental Design (LEED) certification system was created. The problem with LEED is its lack of an aesthetic component that might address design quality. As James Wines, architect and author of Green Architecture, is fond of saying, “if a building is not beautiful and does not evoke a positive spatial experience, no amount of sustainability will ensure that it will still be standing in twenty years.”

A more useful way to determine the degree of sustainability of a particular designed landscape might be to use a checklist such as that developed by Frederick Steiner and David Pijawka (Table 1), because it includes subjective categories like beauty, noise, stress, and silence. The obvious drawback of such an evaluation checklist is the inherently difficult and highly subjective nature of evaluating the aesthetic component. At the very least, this evaluation system incorporates the aesthetic qualities of a designed landscape.

If, in fact, a designed landscape is to be sustained over time, it could be argued that there must be public acceptance. The degree to which the public embraces a landscape depends to some degree on their inclusion during the design and planning process and their appreciation of its aesthetic and experiential qualities. This, of course, is where the designer must rely on his or her communication skills to convey their conceptual ideas and proposed formal strategy to the public. These two landscapes will be assessed according to their sustainable design qualities by using the Steiner and Pijawka method. The works will be evaluated according to such criteria as their ability to maximize open space, reduce stress, create beauty, provide wildlife habitat, and create purer water and air.

Mill Creek Canyon Earthworks
Herbert Bayer’s Mill Creek Canyon Earthworks, completed in 1982, is a piece that clearly
articulates the artist’s goal of unifying art and life under technology through its serene beauty, evocative experiential quality, and usefulness to society. This work of environmental art is actually a two and one-half acre portion of a 96-acre city park in Kent, Washington, near Seattle. The Mill Creek Canyon Earthworks is a popular and renowned work of art that challenges the status quo regarding ecological design and sustainability. It was one of only two implemented works out of 8 proposals that were the result of Earthworks: Land Reclamation as Sculpture, a symposium and watershed event in the field of environmental art as reclamation in Seattle in 1979.

The compositional strategy used by Bayer at Mill Creek Canyon is reminiscent of those he used in his earlier landscapes in Aspen, Colorado. The conical landforms, circular pools of water, and ring-shaped landforms encircling water were all a part of his formal repertoire evident in Grass Mound and Anderson Park. Bayer intended to create a landscape of continually changing spatial interest with varying degrees of enclosure and views both into and out of the spaces. The forms in the landscape were for the enjoyment of the user; they were to be viewed as objects and experienced by moving through, around, and over them. The play of light and shadow across the landforms provides an ever-changing visual display throughout the day. Bayer was, in essence, creating a place of experience and memory that would simultaneously serve the community as a flood control device. The slopes and shapes of the landforms were actually conditioned by hydrologic principles to facilitate the flow and detention of water.

The City of Kent, through its Arts Commission commissioned this project as a solution to increasing urban storm water runoff and its resultant flooding and soil erosion problems. The environmental artwork was a means of enlivening the plans for a proposed storm water detention basin and creating a unique entrance to an existing public park. The city’s goals were: to control flooding, to restore fish runs, and to create an aesthetically pleasing facility that would contribute to the enhancement of the park. One of the indicators of the support for this project was its varied funding sources; grants were received from local, county, state and federal arts agencies as well as the city engineering department and a community development block grant from HUD. The local citizenry, led by their mayor, was staunchly supportive of the effort from the beginning. In their quest to raise additional funds to supplement the acquired grants, the people of Kent sold signed Bayer-designed posters commemorating the earthworks and even held bake sales. This kind of grass roots support led to the implementation and long-term success of the project.

The client’s goals were met with the creation of an internationally acclaimed work of art that reduces downstream flooding and its resultant stream sedimentation and erosion by detaining as much as 15 acre-feet of storm water while accommodating and enhancing the local Coho Salmon habitat. It has, in fact, functioned as intended over its 20-year life and is in very good condition, given the steepness of its slopes and the nature of its purpose.

Effigy Tumuli Sculptures
Edmund Thornton, then CEO of the Ottawa Silica Company, was instrumental in having artist involvement in reclaiming 150 acres of his company’s former strip mine, located adjacent to the 34-acre Buffalo Rock State Park on the banks of the Illinois River in north central Illinois. After a failed attempt to get Isamu Noguchi to take on the project, Thornton settled on Michael Heizer to transform the toxic site to a more tranquil work of land art. The artist’s penchant for work on a grand scale and his love of vast sites seemed to make him the perfect candidate to work with the expanse of despoiled land atop a sandstone plateau rising ninety feet above the Illinois River.
Heizer departed slightly from his definitive use of geometric abstraction to create a landscape of five enormous earthen mounds representing animals indigenous to the riverine environment: a water strider, a frog, a turtle, a catfish, and a snake. His idea was to create abstractions through a series of planar, faceted landforms rather than rounded figural forms; prismatic planes that, according to one critic, seem to relate to the crystalline structure of the mineral beneath the surface that was the prize so eagerly sought by the mining company. The artist at once paid homage to the Native American mound builders of the past and the animal species that had at one time inhabited the area. Construction began in spring of 1985 on the first phase of sixty acres that included the first of the effigies, the fourteen feet high, 80 feet wide, and 685 feet long Water Strider. The remaining 90 acres and four effigies were completed by the fall of that same year. The overburden left by the strip mining process disrupted the normal pattern of surface storm water runoff and pools of this water collected within these basins created by the acidic soils. The acid water spilled over into the Illinois River and into local roadway drainage swales at every rainstorm. At the time of the reclamation, the pH of the soil on the site was between 1.0 and 3.0, much too low for most plant growth. By comparison, the pH of vinegar is 2.0 and lemon juice is 1.0. Writer and art critic Erika Doss claims that the soil was so acidic that it actually melted the soles of her shoes when she walked the site.

Reclamation requirements set forth by the Federal Surface Mining Control and Reclamation Act of 1977 were met, including removal of the standing acid water to prevent it from flowing into the river and adjacent roadway drainage swales, prevention of erosion and resultant sedimentation of the same, re-grading the property to its original contour, and re-vegetating the site. These were accomplished even though it took much longer than anticipated to establish complete vegetative cover on the acidic soils. As a result, severe erosion of the landforms plagued the project for several years. An almost annual re-planting of the site with variations on the original seed mix continues, as a series of experiments to find those species hardy enough to survive the incredibly harsh conditions. An unanticipated benefit that illustrates the degree to which this site has finally regenerated is the abundant wildlife that has returned. Deer, turkey, numerous songbirds, coyote, and bald and golden eagles have been observed on the site recently.

Comparison

Similarities

Mill Creek Canyon Earthworks and Effigy Tumuli Sculptures are both internationally recognized works of art in very different settings. Both artists wanted very much for their work to be about experience and not about the art object. The notion of controlling that experience through a series of picturesque “views” was also counter to both artists’ intentions. Rather, they hoped for the freedom of the individual to discover, explore, and interpret their work as each person saw fit. The perception and experience of the user was important while the art as object was less so. Both works of art were conceived through similar formal strategies; the two artists created a series of abstracted landforms that in turn defined the spaces of their landscapes. And finally, both artists paid little attention to the long-term management of their work. Effigy Tumuli Sculptures has, unfortunately, suffered more from this lack of appreciation of landscape maintenance. While Mill Creek Canyon Earthworks has received better maintenance, the other parks and open spaces within Kent’s maintenance budget have suffered because of the greater cost of caring for this artwork.

Differences

Mill Creek Canyon Earthworks was an exemplar of public participation while Effigy Tumuli Sculptures has been called a public art disaster for its utter lack of public input. In
fact, there was considerable public resentment toward not only their lack of inclusion in the decision making but also toward the art itself. By discounting the local people’s previous use of the site and precluding it in the future, the state, the patron, and the artist created an environment of distrust that surely played a role in the project’s painstakingly slow maturation. Heizer was relentless in his disavowal of the connection between his art and land reclamation while Bayer was equally adamant that societal utility in the form of flood control was as much a part of his art as the formal order of his landforms. Other differences include the remote location of Effigy Tumuli Sculptures as compared to Mill Creek Canyon Earthworks, the relatively benign condition of the existing site in Kent in light of the highly toxic condition of the abandoned strip mine, and the intimate scale of Mill Creek Canyon Earthworks when seen alongside the monumental scale of Effigy Tumuli Sculptures. Other differences include the remote location of Effigy Tumuli Sculptures as compared to Mill Creek Canyon Earthworks, the relatively benign condition of the existing site in Kent in light of the highly toxic condition of the abandoned strip mine, and the intimate scale of Mill Creek Canyon Earthworks when seen alongside the monumental scale of Effigy Tumuli Sculptures. Mill Creek Canyon Earthworks was established within two years of its construction and Effigy Tumuli Sculptures is only now, in its eighteenth year, reaching establishment. Perhaps the most striking difference between these two works is that Heizer failed to sell his critically acclaimed idea to those closest to the artwork, while Bayer intentionally worked closely with the public to gain their input and acceptance.

**Table 1**
Sustainable Design Evaluation Checklist (partial list adapted from Steiner and Pijawka et al. 2000)

<table>
<thead>
<tr>
<th>Sustainable</th>
<th>Completely</th>
<th>Partly</th>
<th>Neither</th>
<th>Partly</th>
<th>Completely</th>
<th>Not Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximizes open space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minimizes open space</td>
</tr>
<tr>
<td>Builds on local context</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Disregards local context</td>
</tr>
<tr>
<td>Reduces stress (physical and psychological)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increases stress</td>
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<tr>
<td>Beautiful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destroys beauty</td>
</tr>
<tr>
<td>Remediates natural landscape</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Degrades natural landscape</td>
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<tr>
<td>Creates purer air</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destroys pure air</td>
</tr>
<tr>
<td>Creates purer water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destroys pure water</td>
</tr>
<tr>
<td>Uses rain water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Wastes rain water</td>
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<tr>
<td>Replenishes groundwater</td>
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<td></td>
<td></td>
<td></td>
<td>Depletes groundwater</td>
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<tr>
<td>Creates richer soil</td>
<td></td>
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<td></td>
<td></td>
<td>Destroys rich soil</td>
</tr>
<tr>
<td>Creates silence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destroys silence</td>
</tr>
<tr>
<td>Provides wildlife habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destroys wildlife habitat</td>
</tr>
<tr>
<td>Moderates climate and weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intensifies climate</td>
</tr>
<tr>
<td>Uses local resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Imports resources</td>
</tr>
<tr>
<td>Encourages walking/biking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Encourages automobile use</td>
</tr>
</tbody>
</table>

Sustainability
By utilizing the Steiner and Pijawka approach (Table 1) and assigning at least a designation of “partly sustainable” for all applicable criteria, these two pieces achieve sustainability as shown below.

**Both art works are successful in:**
- Maximizing open space provision
- Building on local context
- Reducing stress (physical and psychological)
- Creating or enhancing Beauty
- Creating purer air
- Creating purer water
- Creating silence
- Providing wildlife habitat
- Moderating climate and weather
- Encouraging walking/biking

**Effigy Tumuli Sculptures is successful in:**
- Remediating the natural landscape
- Replenishing groundwater
- Creating richer soil

Clearly both of these works of environmental art have achieved a significant level of sustainable design with Effigy Tumuli Sculptures meeting thirteen criteria and Mill Creek Canyon Earthworks meeting ten.

**Conclusion**
Intentional or not, these two works have begun the process of landscape regeneration on their respective sites. Both of these highly acclaimed works of environmental art have
achieved a significant level of sustainability, even though sustainability was not a primary goal of their creators.

While *Effigy Tumuli Sculptures* scores higher than *Mill Creek Canyon Earthworks* on the Steiner and Pijawka sustainability checklist, it does not score well as an artwork that is embraced by the community.

If public understanding of and interaction with art or landscape is as important to the long term sustainability of the built work as its ecological health – and I would emphatically suggest that it is -- *Effigy Tumuli Sculptures* seems less likely to be sustained over time. These two examples underscore the importance of the aesthetic value and design quality of a work of environmental art or designed landscape to its sustainability over time and the significance of the ability or desire of the artist or designer to communicate his or her ideas to the public.

If we are to create truly sustainable landscapes in the future it is clear that beauty, sensory pleasure, experience, and public engagement must have equal footing with habitat enhancement, water quality improvement, increased storm water infiltration, and soil erosion abatement.

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**References**


3. For further examination of the definitions of sustainable design and sustainability see Baird, C. Timothy, “Sacred Ground: Must Sustainable Landscapes Mimic the Form and Spatial Organization of Nature?,” in *CELA 2002 Groundwork: Selected Conference Papers*, (Syracuse, NY: Faculty of Landscape Architecture, SUNY College of Environmental Science and Forestry, 2003), 10.

4. Ibid, 11.


7. City of Kent, WA, *Mill Creek Canyon Earthworks*, (publicity brochure by City of Kent, WA, c.1982), 4-5.


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**Notes**

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Multiple Exposures: Reading Landscape Values in Contemporary Mass-media Advertising

Carla I. Corbin

Introduction
Americans are exposed to an estimated daily average of 1,500 advertising appeals. Only about 76 ads out of the total catch our attention, but that multiplies to over 27,000 per year, a mass-media imprinting that communicates many messages in addition to the primary appeal to buy a product, listen to a radio station, or vote for a candidate (West, 269). The mechanism of many visual ads is to link brand-name commodities with social and culturally meaningful images to create ‘commodity signs’ (Goldman and Papson, 81).

The concern of this investigation is one subset of images—landscape, nature, and the built environment (L, N, and B-Env)—and their uses as sales and promotional tools. Which images of place and nature have this power, and what ideological stories they transmit and reinforce should be of interest to landscape architects and educators. People – clients, user groups, voters on bond issues and legislation having to do with public landscapes and conservation – see many landscape images in advertising, possibly more places than are directly experienced in the physical, sensed world. Further, these are powerful images, designed to persuade. The connection between these images and general perceptions of landscape has not been studied, but influences of media on behavior have been sufficiently documented in other contexts to warrant investigation into the commodity-sign roles of L, N, and the B-Env in advertising.

Landscape scholars, notably historians, frequently examine representations as important sources for understanding cultural values, patterns of use, and other dimensions of power and social practices regarding landscape. But less interest has been shown in common representations in the contemporary marketplace of media, with some exceptions in work by historians and sociologists. Significant work has been done in the last decade on place advertising—the presentation of towns, cities and geographic areas to promote settlement, investment, and/or tourism—which, logically, shows destinations. Little has been done, however, on the use of images of place and nature to sell other products.

Focus and Scope
This paper examines the broad cultural meanings and associations attached to place, read through their use in print media advertising. Ads in which pictures of place and nature play an important part of the message, work because these images have power as ‘commodity signs,’ defined by Goldman and Papson as a “meaning system that is summarized in an image” (82). The prevalence and mechanisms of place-images as commodity signs is studied through a transect taken through one month of high-circulation, general-interest magazines: Time, Reader’s Digest, Better Homes and Gardens, Glamour, and Maxim. The investigation of the sample is based on three questions: what proportion of the total advertising in each issue uses images of L, N, and the B-Env, and what is the frequency in each of these three categories; what is the primary meaning system or landscape association represented in each ad; and what products most often use this imagery—where is it most effective? To begin, cultural theory related to advertising will be examined, which supports the validity of advertising as a source of insight on the cultural power of place meanings. The body of the paper is the analysis of the sample, followed by interpretation of the findings. The conclusion discusses significance for perceptions of landscapes in the physical world, and indicates directions for future work.

Context
Advertising mirrors culture. John Berger writes: “Publicity is the culture of the consumer society. It propagates through images that society’s belief in itself” (Berger, 139). More recently Goldman and Papson, scholars of advertising media, agree that “advertising has upheld culturally predominant ways of seeing things” (Goldman and Papson, 95). This mirror has little interest in truth, and is selective, purposeful, and informed, a combination of art and science. The ‘science’ part may be a flattering characterization of the testing that is involved with major advertising campaigns, but most are grounded in “a good statistical foundation” of strategy, design, media planning, and evaluation (Jones, 3). Choices about which images to use and the subtleties of their presentation are intentional and calculated for effective resonance with targeted
audiences. A recent volume, *How Advertising Works: the Role of Research*, describes robust and sophisticated tools used by advertisers and clients at three stages in the process: at the beginning, to determine user preferences; during the development of an ad, to compare effectiveness of alternative versions; and after, to measure success. Not all advertisers employ the full extent of predictive and evaluative testing and measurement that is common with large-scale campaigns, but the visible success or failure of national advertising provides models and sets trends that other advertisers follow.

Approaches to evaluation of advertising design, and analysis of advertising impact on sales are not without controversy about methods and interpretation. Further, most research about testing is product-oriented. Success or ‘likeability’ of ads—the latter a strong predictor for sales—is not analyzed on the basis of separate contributing factors, but rather on the impact of the whole: the product and its marketing and image history, along with other factors such as media, frequency of encounter, graphic composition and style, music, text or verbal messages, and other elements. While it’s not possible to isolate the contribution to the effectiveness of an ad by a particular landscape setting, these images are present in ads in significant frequencies, which provides convincing evidence for the strength of their collective cultural meaning and communication of value. Trends over the last three decades in advertising also indicate that certain landscape images are useful because they are recognized quickly and clearly—translated for iconic content—as advertising messages have become shorter in duration, in the case of television, and “more visual, less wordy, and more like billboards” in print media (Joyce, 16).

**Method, Survey, and Results**

The sample shown in Table 1 was selected according to two criteria: first, for large circulation, and second, for a broad spectrum of readership, the latter based on the author’s perception of the magazines’ audiences. The following were excluded from the tally of individual advertisements: ads smaller than one-third page were not counted because the survey focuses on issues of visual impact, and smaller ads either have insignificant images or are text-only. Ads in which there is a predictable contextual relationship between product and setting—meaning that the product is shown in its intended setting or typical place of production—were not counted because of reduced reliance on appropriated meanings and values from the setting. This affected three subject-areas of ads: food ads showing agricultural settings, or residential kitchens or dining rooms; travel ads showing destinations; and home-related products and furnishings, along with lawn and garden products, shown in residential settings.

Table 2 shows the total numbers of ads in each magazine, the frequency of L, N, and B-Env settings or symbols, and the percentage of the total each represents. Each ad was then reviewed in three ways: first, for the predominant place-type or symbol; second, for the commodity sign value, or cultural meaning; and third,

| TABLE 1 |
| Sample group of magazines; annual circulations based on 2001 figures (Advertising Age). |

<table>
<thead>
<tr>
<th>PUBLICATION</th>
<th>CIRCULATION</th>
<th>AUDIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Magazine</td>
<td>4,189,981</td>
<td>educated readers, both genders, diverse age groups</td>
</tr>
<tr>
<td>Better Homes and Gardens</td>
<td>7,601,377</td>
<td>middle-income readers, primarily female</td>
</tr>
<tr>
<td>Reader’s Digest</td>
<td>12,565,779</td>
<td>middle- and lower-income, both genders</td>
</tr>
<tr>
<td>Maxim</td>
<td>2,553,895</td>
<td>younger males to about age 30</td>
</tr>
<tr>
<td>Glamour</td>
<td>2,201,279</td>
<td>younger women to mid 30s</td>
</tr>
</tbody>
</table>
for the product types that most frequently use place associations.

Place-type Frequency
Most ads are distinct about the type and character of place being depicted, since the setting is both context as well as a source of associative meanings to be attached or transferred to the products. The ‘Landscape’ and ‘Built Environment’ categories were distinguished by the simple criteria of presence or absence of significant built structures. In settings that combine both, a judgment was made of the predominant source of cultural meaning in the ad; thus, a yard or garden with a fragment of residence in the background was categorized as “Landscape.” ‘Nature’ was a more complex presence in ads and messages, appearing as less than a distinct or complete setting, but contributing content to the ‘story’ or message.

Table 2
Frequency of advertisements, one-third page size or larger: feature L, N or B-Env setting or symbol, and percentage representation of the total advertising in the sample magazine issues.

<table>
<thead>
<tr>
<th>PUBLICATION</th>
<th>TOTAL ADS</th>
<th>FREQUENCY OF L, N or B-Env SETTINGS OR SYMBOLS</th>
<th>PERCENT OF TOTAL ADS IN ISSUE WITH L, N or B-Env</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Magazine</td>
<td>45</td>
<td>12</td>
<td>27%</td>
</tr>
<tr>
<td>Better Homes and Gardens</td>
<td>133</td>
<td>27*</td>
<td>20%*</td>
</tr>
<tr>
<td>Reader’s Digest</td>
<td>56</td>
<td>15</td>
<td>27%</td>
</tr>
<tr>
<td>Maxim</td>
<td>89</td>
<td>36</td>
<td>40%</td>
</tr>
<tr>
<td>Glamour</td>
<td>83</td>
<td>23</td>
<td>27%</td>
</tr>
</tbody>
</table>

(*The smaller percentage shown for Better Homes and Gardens reflects exclusions discussed in the text above.)

Table 3
Categories of settings under the primary divisions: numbers of instances with highest frequencies in bold face.

LANDSCAPE (33) = 30%
Suburban settings = 6
garden
house/yard
neighborhood park
Mountains = 5
Active recreation places = 4
ranch/farm
golf course
other
The West/Desert = 4
Beach/water settings = 4
Road/highway = 3
Forest/woods = 3
Exotic place = 2
Other = 2

NATURE (23) = 21%
Outdoors/general = 8
Outdoors/general = 8
Sky/Weather = 6
Flowers/Foliage/
Fruit/Vegetables = 5
Animal/insect = 2
Water = 1
Grass/Soil/Rock/Sand = 1

BUILT ENVIRON(54) = 49%
Residential interiors = 16
Urban exteriors = 10
general urban settings,
streets=social, places, skyline
Architecture exterior = 7
contemporary
historical
monuments
Exercise or physical recreation/
in interiors = 6
Industrial exteriors/interiors = 5
Leisure/social interiors = 4
[restaurants, clubs, etc.]
Workplace interiors = 3
Commercial/shopping interior= 2
Other = 1
by means of an evocative fragment or symbolic
element. Examples include generalized but
non-specific outdoor settings, and ads that use
a part of what would commonly be perceived
as a “natural” context, such as expanse of sky,
a grassy ground plane, or a single prominent
flower (See Figures 1, 2 and 3 for examples of
each of the three main categories.).

The distribution of place-types along the top
line of Table 3 shows a clear predominance of
Built Environment settings, but if the Landscape
and Nature settings are combined—as may be
appropriate in terms of general perception
of what is ‘natural’–the balance between the
‘natural’ and the ‘constructed’ is almost equal,
51% to 49%. Each column below lists the
different sub-types that comprise the full range
of examples found in the 110 ads examined,
with the number of instances encountered. The
most prevalent three in each are in boldface.

Commodity-sign Content of Place Images
Pictorial ads typically communicate more than
one message and may have a number of sub-
texts. In ads that use place images or nature
referents, it is often the common cultural
associations with these settings that supply the
primary subtext. The ads of the sample were
analyzed for the contribution of the setting
or nature symbol to the message of the ad,
and a series of categories was developed to
tabulate and compare frequencies. The highest
percentage occurs with places that convey
messages about social standing, relationships,
and security, followed by those that use images
of nature and the outdoors to communicate
health, purity, and lack of artifice (The category
name and percent of total follows here; the
more complete description of the settings types
and messages is included in the Appendix.).

37% Social connection or standing: home,
relationships, social activity, status

31% Connection with nature and the
outdoors: purity, health, safety; the outdoors as
a general positive context; farms, ranches, or
the West, as representing honesty, directness,
goodness, or ruggedness and durability

11% Active life: places associated with
health and self-improvement, athleticism;
physical freedom and capability

10% Authenticity: settings that convey
toughness, capability, or power, or being real,
honest, or unaffected

9% Drama and excitement: outdoor
settings presented to communicate risk,
drama, and tension, in a mainly positive sense;
others that convey majesty or freedom through
expansive scale

Place-Images as Related to Products
Place and nature images most often were
related to products having to do with how
the individual self is constructed and its
external presentation, and with wellness. The
highest frequencies occurred in the following
categories:

22% Personal care and grooming products
15% Clothing and shoes
14% Cars and related products
13% Medications, prescription and non-
prescription

Figure 1. (L): Example from Better Homes and Gardens,
analyzed as:
Setting = Landscape, Suburban, yard
Association/message = family/friends
Product = Discovery television channel

Analysis, Interpretation, and Discussion
The frequency of place or nature-reference
images in advertisements, averaging one-third
of the sample (shown in Table 2), is significant and demonstrates the cultural power of place-related meanings and values in the creation of commodity-signs. Two of the magazines – Better Homes and Gardens and Maxim -- show significant deviation. In the case of the former, the lower percentage results from the design of the study, which excluded ads that picture products in landscape or built environment settings of typical use, for example a carpet shown in a living room, where there is less reliance on the setting as commodity sign. The higher percentage of L, N, and B-Env ads in Maxim is interesting, as it is consistent with general societal perceptions that younger men engage in outdoor activities more frequently than women or other age groups do, or perhaps desire to think of themselves in this way.

Returning to the study of place types in Table 3, further analysis yields two prevalent clusters: nature, and familiar domestic settings. These emerge by combining related sub-categories from the main three headings.

The first, nature and naturalness, comes from combining the Nature category as a whole with the places under the Landscape heading that have few or no building elements. These include Mountains (5), the West/desert (4), Beach and water settings (4), and Forest/woods (3), which together are 16 instances, or 15% of the sample. Added to the Nature category--23 examples, or 21%--this means that 36% of the ads have images that project ideas about nature and natural or wild landscapes. Examples include abstracted references to nature through the use of images of skies, foliage backgrounds, or lush arrangements of flowers and avocados – the latter in a skincare advertisement that juxtaposes the natural components of the product and Botox. Many of the ads have the aim of naturalizing the product through the influence of cultural messages of the setting, suggesting that if it’s natural, it must be good/safe/pure and thus a better choice for purchase. Others ‘naturalize’ the product through placement of the product in an apparently pristine wilderness, a frequent strategy with SUVs and pickup trucks. The images typically exclude roads and other evidence of buildings or typical built infrastructures, rarely show other vehicles, and never include parking lots—in daily life, the place where our vehicles spend the most time. The splendid isolation in a spectacular setting aims to heighten contrast and counterpoint between the two aesthetics, the heightened natural and the heightened.

Figure 2. (R): Example from Reader’s Digest, analyzed as:
- Setting = B-Env, domestic/residence
- Association/message = home
- Product = Tylenol PM

Figure 3. (L): Example from Glamour, analyzed as:
- Setting = Nature
- Association/message = Natural, connected to the earth, healthy
- Product = cosmetics

Figure 2. (R): Example from Reader’s Digest, analyzed as:
- Setting = B-Env, domestic/residence
- Association/message = home
- Product = Tylenol PM
technological, but with the simultaneous, contradictory message that the truck is natural and in its habitat, as seen in Figure 4. The idealization of place in the presentation of the mountain serves to ennoble the machine, the singular setting implying a parallel uniqueness of the truck, a mass-produced commodity that has little, in reality, to distinguish it from competing brand names.

The second important cluster of place-types, representing home and familiar domestic places, results from a similar combining of related types from categories in Table 3. Taking the Suburban settings (6 instances, or 5%) from the Landscape category, and adding Residential interiors (16 instances, or 15%) from the Built Environment category, results in a logical pairing of exteriors and interiors. This combines for a total of 22 instances, or 20% of the sample. Example images include front and back yards, driveways, living rooms, and kitchens, most being modest, everyday places with only a few shown as being clearly upscale.

Their frequency may result from the sample design, to encompass a broad readership across ages and generally middle-class incomes, whom are believed by advertisers to respond to the iconic places of family and friends. Another reason may be the power of showing products in situ, in domestic settings that help consumers envision their uses and positive impacts on daily life. ‘Home’ is a powerful idea, on a par with nature in richness and complexity, so it is not surprising that advertisers depict versions of it to sell a wide range of products.

Moving from types of place-images to their cultural values and meanings, the discussion returns to the idea of advertising as representative of “society’s belief in itself” (Berger, 139). In the analysis of the contribution of the setting to the message of the ad, two subject-areas had clear dominance: messages about social well-being, at 37%, and messages about nature and the outdoors, with 31%.

First, in this culture—or in its media representations—value is placed on having supportive relationships with family and friends, and making connections with others socially. Images of places that we associate with home and social life resonate with many of today’s consumer products, including those that show home or family as vulnerable to risk and advertise products that provide security and safety. Status is represented in ads set in places that convey messages of wealth or privilege, or imply more leisure opportunities and greater resources to pursue them (Interestingly, the only clearly contemporary built environment settings in the entire survey sample were in the ‘status’ category of associations, two of which showed emphatically modern buildings with commanding views—one of pristine mountains and the other overlooking a vast grid of city lights.).

Second, nature and the outdoors are almost as powerful an idea—and is more fluid—indicating that many of us that are targeted by advertisers believe in nature as good, as an authority for products that address health and well-being, and as a highly desirable context for many of our activities. Connecting with nature, through an herbal shampoo, a prescription medication, or clothing for spending a day at a ranch, is more effective as an advertising tool than cultural meanings conveyed by settings where most of us spend most of our time: the suburbs and cities.

This analysis has been based on classifying and counting, with less focus on detailed decoding of individual ads, which often tells more about the subtleties of graphic design than about how and why a particular image or presentation is effective with its audience. But there is significance in the typical approaches to representing place, which for success as a commodity sign must be instantly recognizable. The ads that achieve a measure of consumer attention do so because the ad as a whole is ‘likeable’—accessible, clear, and appealing. This doesn’t mean that a particular place-type must always be used in the same way, or for the same message. Depending on time and season, color, mood, and other variables, mountains, for example, can communicate different messages, including the triumphant conquering of wild nature, or a risky, threatening environment in which the product offers safety. Most importantly, these are edited gazes, framed views that exclude distracting context with clear cues as to what the ‘story’ is. Images are manipulated to heighten color saturation, create dynamic compositions, and offer engaging placement of the viewer—in intimate proximity or hovering in godlike aerial views. All of this works to build a satisfying, apparent reality, minus the typical inconveniences of getting to and being in actual places, as well as the frequent disorder and visual jumble that is the world of
the everyday landscape. As each generation is more immersed in advertising, with place-images providing a significant component of the message, how much less appealing will the concrete experience of physical places become?

**Closing and Future Directions of Inquiry**

This study represents only five magazines and one month, but as transects are a tool in ecological studies of large-scale landscapes, it gives a detailed view taken through a broad, national readership and national advertising campaigns, which, because of their wide distribution and investment, represent thoughtful, intentional design on the part of ad agencies and marketing departments. The mechanisms of the relationships between the setting in a print or televised ad and the perceptions and actions of consumers—either attitude toward the product, or its purchase—have not been explored, but deserve attention because of the scale of influence advertising has in American life. Again, we need to consider how much of the exposure of the general populace to landscape is direct, and how much is through the vicarious, edited versions of advertising or other media.

Future work to explore these issues might include examining trends over time, taking the same group of magazines and doing a critical analysis of the role of place images in five or ten year increments. Goldman and Papson, and West, have explored two culturally-important and resonant landscapes—rural/agricultural settings and the West—with strategies of examining one type of product advertising in one time period, in the case of the former, and the latter looks at the use of one landscape in advertising in different media over time.

Using one of these approaches with an important landscape concept, such as nature, would be revealing, as would focusing on one product type over time, such as vehicles and how the use of settings has changed. Another approach could trace different ways one particular landscape is represented, such as mountains, as a possible indicator of changing attitudes toward those places, looking for parallel indicators in other aspects of culture that may support or contradict what is shown in advertising. For example, general awareness of the beneficial role of wetlands is fairly recent, and images of such places would probably not be found in earlier advertising. Their use to sell watches in one Timex campaign from several years ago is indicative both of wider knowledge of wetlands, as well as demonstration of their acceptance.

In a recent essay Alan Balfour discussed the commodification of the landscape, sounding a warning for the future and reminding us that “the unprecedented power and private purpose of corporate culture must be recognized. Landscape has always been shaped by the power elite and, given declining support for public programs, corporate dominion will increasingly affect and mold reality in all forms” (278). Advertising is a primary tool of the corporate world, a power elite that holds up a mirror to common beliefs and cultural ideas, and reflects back edited versions shaped as tools of commodity markets.

‘Nature,’ one place-type from this study, is predominantly shown in advertising as pristine, as being of large scale, and as having appealing aesthetics: beauty, prettiness, or drama. From the number of ads using this genre of imagery, it appears that such places exist in great extent. As professionals involved in landscape practice and research we know this is not true, nor are many natural and ecologically-valuable places so appealingly photogenic, and often exist as fragments smaller than the horizon-stretching views of ads. Will that mean less recognition, and lesser value accorded to ‘everyday nature’?

In eighteenth century England the Claude glass became popular among esthetes and educated upper classes as part of the enthusiasm for the paintings of Claude Lorraine (1604-82). The smoky haze of a small mirror was used to reflect landscape views, enhancing Romantic and picturesque qualities in ways that more closely conformed to the quality of his paintings. The view with the Claude glass—atmospheric, slightly obscured, set off by the frame of the mirror—was preferred over the direct gaze and unadulterated reality of the landscapes before them. Advertising may be the modern Claude glass, reflecting the preferred versions of place and nature, with potential to diminish the value of the physical landscapes encountered in daily life.

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**Notes**

1 Two examples that have been explored are rural and agricultural settings (Goldman and Papson, 1983), and the West (West, 1996).
Berger, writing in the early 1970s, consistently used ‘publicity’ rather than today’s more common word ‘advertising’. Since all pictorial examples in Ways of Seeing (1972) that illustrate ‘publicity’ are print media advertising, this suggests the word was particular to Great Britain at that time.

The issue of ‘likeability’ in advertising is discussed in pp. 20-21 of Timothy Joyce’s article (see References), and in a subsequent article by Alexander L. Biel in the same volume.

Most analysis that involves ‘reading’ the subtext messages of visual advertising is based on Judith Williamson’s 1978 book, Decoding Advertisements: Ideology and Meaning in Advertising (London: Marion Boyars Publishers, Ltd.). Also useful is John Berger’s text, Ways of Seeing, particularly Essay 7. Models are also provided in the articles by Goldman and Papson, and by Elliott West, cited in the References.

The disparity in percentages between Table 3, place types, and Table 4, contribution of the setting to the message of the ad, is accounted for in two ways. First, through the numbers of categories in each analysis: Table 3 has three main headings, but 24 different kinds of settings that have been counted, while Table 4 has only six categories of types of place-message. Second, in summarizing the dominant place-types from Table 3, the category of ‘home’ excludes other settings that are about social connections and status, which are included in the summary analysis of Table 4.

References


APPENDIX: Table 4
Commodity-sign content of L, N and B-Env images in the sample advertisements

<table>
<thead>
<tr>
<th>PERCENT OF TOTAL</th>
<th>ASSOCIATION/ PLACE CATEGORY</th>
<th>DESCRIPTION: WHAT THE SETTING CONTRIBUTES TO THE MESSAGE OF THE AD</th>
</tr>
</thead>
</table>
| 37%              | Social                      | 1. Place-images that communicate ‘home,’ and are associated with nurturing relationships, or interactions with family or friends, either domestic interiors/exteriors.  
|                  |                             | 2. Other places that are associated with social activity, such as town streets or commercial entertainment settings.  
|                  |                             | 3. Settings that communicate status through luxury in traditional/very modern settings, or that suggest a materially successful or glamorous life. |
| 31%              | Nature and the outdoors     | 1. ‘Nature’ is a very fluid and often-evoked idea in advertising. Most often it is positive, indicating a connection to the earth; purity or in nocence; cleanliness, health or well-being; or authority, that a product is more beneficial and safe if ‘natural’. Occasionally it is used in a negative sense, as being uncomfortable or inconvenient, or more dramatically, as threatening or dangerous.  
|                  |                             | 2. The ‘outdoors’ is similar to ‘nature’ in ads in that it is positive but is pictured in less specific terms, through general indicators. These typically include out-of-focus backgrounds that suggest ground-plane and greenery, a bright sky, and sunlight.  
|                  |                             | 3. ‘Rusticity’ is a third component of this category, including country settings such as farms or ranches or the West. These are outdoor set tings, but more complete and specific that those described above. Images of ranches, farms and western settings communicate messages about being relaxed or informal – honesty without artifice – in the healthy, open outdoors, sometimes also implying ruggedness or durabil ity. |
| 11%              | The active life             | Indoor settings include exercise rooms (invariably with natural wood floors and tall windows opening to blue skies) and ice skating arenas, and outdoor settings include residential gardens, golf courses and hiking trails. Messages are about health and self-improvement; athleticism, performance and expertise; freedom of movement and physical capability. |
| 10%              | Authenticity                | These settings also include interiors as well as exteriors, and use places like industrial garages and construction sites, and anti-picturesque images of gritty, dry open landscapes. Messages tend to be of two types, either about a product being tough, capable or powerful, or about it being real, honest and unaffected. |
| 9%               | Drama and excitement       | All of the settings in this category picture the outdoors. Some are about play, with bright colors and saturated blue skies and green grass, to convey the freedom of child-like silliness or games. Others are dynamic images to communicate risk and thrills, drama and tension. Generally this is adventure in the positive sense, but in some ads is about dan ger – and products that provide safety. An important subset of the group shows settings of great visual sweep and scale, large views that convey freedom without limits or sublime majesty. Typical images are moun tains or beautiful bridges, the latter presented to edit out other, compet ing built elements. |
| 2%               |                             | Ambiguous; undetermined. |

Corbin
Redefining the Cemetery Landscape: A Multicultural Perspective
Arthi Rao

Introduction
The cemetery as a designed landscape emerged in the early nineteenth century. The designed cemetery as a concept, germinated in nineteenth century medical theories of disease and simultaneously came to represent refreshingly new cultural attitudes to death, mourning and religion among other revolutions on the social front. These attitudes found expression through a new design approach to the cemetery landscape. Mourning and healing from loss became an important priority in the design of these landscapes. Death was transformed from something grotesque to something beautiful.

However, in the United States, this therapeutic ideal was embedded in an Anglo-American aesthetic. The English Landscape School was adopted as the prevailing design style for the design of the cemeteries (Sloane, 1991; Linden-Ward, 1989). There were strict regulations regarding the size and design of the monuments, funeral rituals and other death-related traditions. Early immigrants, predominantly from Europe, were expected to assimilate and conform to this aesthetic (Meyer, 1993).

The rhetoric of assimilation has undergone drastic changes in the twenty-first century. Immigrants come from extremely diverse nationalities compounded by religion (Rosenblatt, Paul C. et al, 1993, p.2). Pluralistic existence has replaced assimilation as a practical solution with the recognition and appreciation of different cultures.

As America moves into a post-ethnic era, new theories are emerging in order to find a solution to this long-standing debate. One among these is Cosmopolitanism. This philosophy is based on recognition, acceptance and eager exploration of diversity. It is more oriented to the individual and encourages religious and cultural affiliations by choice as against

Pluralism which is more community oriented, seeks to promote affiliations on the narrow grounds of shared history and biological legacy and is quicker at drawing boundaries between communities. Pluralism respects inherited boundaries and locates individuals within one or another of a series of ethno-racial groups to be protected and preserved (Hollinger, 1995). However, the more traditional multicultural theories such as Universalism are also in use and were also explored in the course of this study.

The funeral industry is slowly recognizing the demands of a culturally diverse society as well as contributing to the healing process that must succeed a loss. Cemeteries and funeral homes are actively providing bereavement counseling and other support services. Even though multiculturalism impacts the landscape indirectly, multiculturalism as a dominant factor in spatial cemetery design is largely ignored.

In the United States, urban cemeteries continue to be bound by predominantly Anglo-American values. They remain frozen in time due to an adherence to principals of historic preservation and outdated stylistic approaches to design, which seem shallow in contrast to the current needs of cemeteries such as a diversity in spatial design to satisfy an increasingly multicultural customer base (Sloane, 1992).

Different cultures respond differently to death, and there is ineffective accommodation of these responses within the spatial structure of the American cemetery landscape. The cause for such ineffectiveness forms an important focus of this study. Thus, this research investigates contributing factors that allow/disallow the accommodation of multiculturalism. These include political, historical and perceptual factors.

The subjects of multiculturalism and diversity are active areas for research and study in the United States, especially in the social sciences (Conzen, 1994; Hayden, 1995, Hollinger, 1995; McKee, 2000). However, multiculturalism in landscape architecture is used as a buzzword, often disconnected from theoretical discourse in other fields such as sociology and anthropology. Therefore, one of the main objectives of this inquiry is to bridge this gap and develop a structured theoretical understanding of the different ways in which multiculturalism manifests itself in the cemetery landscape.

The mourning process is a cultural sanction as well as a personal need. This paper focuses
primarily on the funeral ritual and mourning process, and investigates how it unfolds in the cemetery landscape. The rationale for choosing mourning is the fact that the freedom to mourn has very important therapeutic benefits (Parkes, 1997; Kalish, 1976; Pine, 1976, Raphael, 1983, Rees, 1997; Romanoff and Terenzio, 1998, Rosenblatt, 1993).

This research envisions therapy as a significant potential benefit for a cemetery environment that successfully supports diverse mourning processes in its spatial design. The link between designed open spaces and therapeutic outcomes has become a very popular area of research (Marcus and Barnes, 1995; Marcus, 1999; Kaufman et al, 1998; Tyson, 1998).

Beyond the boundaries of this research is a new landscape typology, where the need for therapy in cemeteries is critical. In summary, this paper ultimately examines the potential of accommodating multicultural mourning customs in urban cemetery design in an attempt to rejuvenate and enhance its social function and relevance as a therapeutic environment.

Three case studies and key informant interviews were the primary research tools. The views expressed in the interviews are of a limited representation of the funeral industry and may or may not be indicative of the majority. It would be fair to state that this research sees the cemetery landscape through its most powerful managers- cemetery management and funeral directors.

**Case Study I: Forest Hills Cemetery, Boston, MA**

Rapid urbanization in Roxbury coupled with existing theories of disease, prompted the decision to create a new large cemetery designed stylistically similar to other rural cemeteries. Henry A.S. Dearborn consecrated Forest Hills in the summer of 1848 (Wilson, 1998, p.12). Dearborn, in collaboration with Dr. Jacob Bigelow, was also instrumental in establishing Mt.Auburn Cemetery in Cambridge, MA.

**The Beginnings of Multiculturalism in Forest Hills Cemetery**

The main critique of Mt. Auburn was that it was very expensive and elitist. Even though most Roxbury residents were wealthy and lived on fine suburban estates, they complained that Mt. Auburn did not supply the demand of all classes. This sentiment coupled with feelings of benevolence towards the immigrant poor streaming into mid-nineteenth-century America, acted as a catalyst in establishing Forest Hills as a municipally owned cemetery in the picturesque style. “Forest Hills epitomized the American democratic ideal” (Wilson, 1998, p.12).

Due to its non-discriminating philosophy, Forest Hills proved to be a tough competitor to Mt.Auburn. Forest Hills was more economical than Mt. Auburn but provided an equally fitting site for the burial of Boston’s elite as well as its less fortunate population, in this case the immigrants. Some interesting anecdotes that bring out its non-discriminating and democratic ideal are described in the book Garden of Memories: A Guide to Forest Hills authored by Susan Wilson (Wilson, 1998, p.12). These include the sculpting a six-pointed star on its entrance gate proclaiming its non-denominational nature at a time when the Puritans did not condone the Jewish faith. Another noteworthy incident is the burial of two immigrants steeped in controversy.

Today, Forest Hills still continues to maintain and actively promote, in image and action, its acceptance and nurturing of diversity. The activities occurring in this cemetery fit into all levels of contemporary multicultural discourse - Universalism, Pluralism and Cosmopolitanism.

**Art, Sculpture and the Expression of Universalism Today**

Within a few years after its consecration, Forest Hills became a highly acclaimed outdoor museum of art and architecture, exhibiting a
comprehensive array of Victorian-era cemetery sculpture. Memorial art and sculpture were an important part of the nineteenth century Victorian cemetery. It was a reflection of craftsmanship and symbolized attitudes about death, social status, ethnic preferences. With the evolution of the cemetery into the memorial park, and the detachment to death, the memorial fell victim to standardization and mass production.

However, Forest Hills is using the universal cultural appeal of art to draw the public back into the cemetery. It invites artists on a regular basis to exhibit their work on cemetery grounds. Many of these exhibits are sculptural in nature and have become permanent fixtures on the landscape. A formal sculpture trail called the ‘sculpture path’ takes visitors along the journey through these sculptural exhibits. The sculptural exhibits however are based on the themes of death and mortality. These sculptures are meant to encourage visitors to reflect on their attitudes to death and the ways they chose to be memorialized. The sculptures represent universal themes of eternity, spirituality and peace. The cemetery plans to continue developing the sculpture path so that over time it may continue “exhibiting contemporary sculpture which expresses the diverse interests and aesthetics of 21st century Boston”.

Pluralism in the Cemetery

Forest Hills has a set of self-guided tours for visitors. One of the tours that holds special significance for this study is the “The League of Nations” tour. This part of the cemetery was developed since the beginning of the 20th century. It takes visitors on a visual journey of an array of ethnically diverse headstones including Chinese, Vietnamese, Albanian, Muslim, Russian, Ukrainian, Lithuanian, Hispanic, Haitian, Italian, Greek, German, Irish, Scottish, and other nationalities. The formalizing of the existence of multiculturalism into an educational experience reveals the philosophy of this cemetery. Diversity is not only accepted but celebrated. The brochures and other literature used for advertising the cemetery, also actively promote the multicultural image.

Pluralism is one of the schools of thought within multicultural discourse where the community into which an individual is born defines cultural identity (Hollinger, 1995). Pluralistic thought is exemplified by the Chinese community, which currently forms the largest customer base at Forest Hills.

Most interview respondents were of the opinion that people find solace and comfort in viewing cultural symbols of familiarity. The Chinese section of the cemetery provides a demonstration of this. Due to increasing demand for services, Forest Hills allotted a section of the cemetery exclusively for the Chinese. The location of this section was largely determined by the Chinese need for east-facing graves. Individuals from the community insisted on being buried in the same area even after the section was filled. The need to stay close to other community members, in death as in life, is very strong. After buying up most of the east facing plots, the Chinese started occupying the west-facing plots as well, but simply turned the bodies around by ninety degrees during burial.

This physical cohesion to one’s own people reinforces the pluralistic interpretation of multiculturalism. It clearly establishes the theory that people retain their cultural identity and preserve cultural affiliations by maintaining proximity to fellow community members so that they could be “neighbors in life, neighbors in death”.

The respondent also expressed approval regarding the clustering of similar cultural
The Chinese have many rituals that involve leaving offerings on the grave as well as prayers and chants. The Greeks who are buried in close proximity to the Chinese, often complained about disturbance from the Chinese. Hence, confining cultural groups to sections could possibly help control conflicts between those groups.

Cosmopolitanism and the Japanese Lantern Ceremony

Cosmopolitanism, which serves as an active competitor to pluralism in defining multicultural existence, focuses on the individual as the ultimate creator of his own culture. This interpretation of multiculturalism finds meaning and justification at Forest Hills through the Japanese Lantern ceremony that has been conducted for the past three years. Held each July, the annual Lantern Ceremony is a Buddhist-inspired event of remembrance with music and dance, ending with visitors decorating and lighting lanterns to float on the cemetery’s Lake Hibiscus. Japanese artists and calligraphers help make these lanterns that have Japanese icons of love, peace, hope and other such messages of comfort intended for the grieving attendees. What started as an experiment with 300 guests has grown to a tradition attracting 3000 people.

The cosmopolitan nature of this ceremony is evident at many levels. This ritual first intended for Japanese culture is now offered to a culturally diverse public as a symbolic medium to express/explore their grief and emotions. Its apparent popularity and the fact that the actual percentage of Japanese participation is minuscule compared to the Irish and African-Americans is testimony to this. This process seemed to touch all the attendees, irrespective of their cultural backgrounds.

The therapeutic benefit of this tradition is evident as it offers a structured system of remembrance and mourning to the people and ultimately ends with a message of hope. This is very similar to the intentions of funeral ceremonies in most cultures, which are meant to act as rites of passage for the living from a state of grief to a phase of new life and renewed hope.

Apart from the above adaptations, Forest Hills plans to increase the planting of “oriental” tree species (e.g. The Japanese maple). The landscape, once again, becomes a canvas to express multiculturalism.

Forest Hills incorporates the multicultural ideal as an inherent part of its existence and promotion. Some of their adaptations actively advertise multicultural intentions and they are considered revolutionary by the funeral industry. Seen in connection with the existing literature on the important healing benefits of the funeral ritual, the large and small gestures extended by this cemetery to its multicultural
population directly impacts the healing process. Many of these gestures have spatial implications that could possibly indicate the nature of cemetery spaces in future design. For example, the Lake Hibiscus, which was an important element in the picturesque style of landscape design, finds another contemporary use in the Japanese Lantern Ceremony.

Case Study II: Swan Point Cemetery, Providence, RI
Swan Point Cemetery located in Providence, Rhode Island was established in 1847. Its origins are in the rural cemetery movement. The design was similar to other cemeteries of its genre, “with winding avenues, paths and groups of burial lots in such a manner as to capitalize on the natural contours of the land”.9

The non-denominational intent of the cemetery finds its probable inspiration from the fact that the First Unitarian Society was among the earlier purchasers of land in the cemetery. They purchased an oval tract of land, five acres in area. Swan Point is now a two hundred acre landscape, containing graves and memorials reflecting changes in the social and commercial attitudes to death. As of today, Swan Point has a customer base comprising Asians (predominantly Cambodians, Vietnamese, Chinese), Armenians, Africans (Nigerians, Liberians, etc.), Hispanics and various other culturally and ethnically diverse groups.10

Swan Point’s attitude towards multicultural accommodation was revealed during an interview with cemetery management. Swan Point is actively trying to increase its usage by the Muslim community. The cemetery management consulted a Muslim professor teaching at the University of Rhode Island. During their consultations with him, it was revealed that Islam advocates the internment of the body directly in the soil without the use of a coffin. This, however, is against environmental law in the state of Rhode Island. Therefore, despite deliberate attempts to diversify their customer base, Swan Point was unable to achieve its goal. Hence, multicultural accommodation in urban cemeteries is also influenced by political factors outside of the control of the cemetery itself. Environmental law differs greatly from state to state. As a result, the Muslim community may have to seek burial grounds outside of their states of residence depending on their burial preferences.

Other examples of adaptations of the cemetery landscape to multiculturalism become evident in the funeral customs of the Liberians and Cambodians. The funeral ceremony of the Liberians consists of an elaborate procession comprising large numbers of people. Just before cremation, the Cambodians need to toss coins into a body of water, as part of the funeral rituals. The marble fountain and pool present directly in front of the crematorium are used for this purpose. This is another cultural adaptation of a popular landscape element.

Figure 5. Master Plan of Swan Point Cemetery.

Universalism in Swan Point
Universal expression is exhibited by the presence of the Memorial Grove. Memorial Grove is a woodland park where cremated remains can be scattered. It also commemorates those who are not physically buried there but

Figure 6. View of fountain outside the crematorium.
were lost at sea or in battle. The name and date inscribed on a granite ledger and situated in Memorial Grove (for a small fee) provides the only lasting memorial. Disassociation with human culture is represented in the erection of “The Megalith” in the center of Memorial Grove. The visitors’ brochure describes the process of creating the memorial. It states that

When we considered a central feature for this grove of trees, we quickly discounted any style of hand-crafted edifice with the thought that man’s creations would be somewhat incongruent in this otherwise natural setting. Instead, we relied upon Swan Point’s long association with boulders—...and we have selected a natural boulder as our monument.

The megalith is roughly eight feet square at the base and about seventeen feet high and is a universal representation of eternity, hope comfort to the visitors. It connects at a universal level to the natural life-cycle of birth and death. An alternative interpretation of this stone is its emphasis on non-religious connotations reinforced with a description of its representation. The brochure states that “This megalith is reminiscent of the great pre-Christian sarsen stones to be found in various parts of Britain...This all happened about 4,000 years ago, 2,000 years before Christ”.

Even though the intent toward multicultural adaptation is apparent, Swan Point employs a piecemeal approach to the accommodation of diversity within the landscape. Solutions to multicultural diversity are passive and kept secondary to the need for preserving the original historical beauty of the landscape. It does not make multiculturalism one of the main conceptual elements in its planning and promotion. One probable reason for this is the relatively small size of Swan Point in comparison with cemeteries such as Forest Hills.

**Discussion**

In order to supplement the information obtained from interviews with cemetery management, funeral directors were also interviewed. The directors were affiliated to funeral homes from the case study areas. The interviews of two different sets of key informants revealed several related themes. The following paragraphs provide a discussion of the themes with a focus on the role of the key informants (cemetery management and funeral directors) in multicultural accommodation and the potential therapeutic benefits.

**Multicultural Adaptation**

Both funeral homes and cemeteries have been witness to a significant increase in diversity over the last ten years. To a large extent multicultural accommodation in the cemetery takes place through a process of adaptation of the landscape to diverse cultural needs. Cemetery management as well as funeral directors determine the degree of adaptation of funerary practice as well as the landscape. Both of these groups can thus be seen as harboring the role of facilitators of tradition. The gesture taken by cemetery management in the nurturing of tradition covers a wide spectrum from smaller to larger issues. Smaller issues include attempts at truly understanding the needs of different cultural groups and taking affirmative steps in introducing meaningful traditions that help the bereaved in the healing process. An example of this is a direct accommodation to allow people to actively participate in internment or cremation as prescribed by their respective cultures. Larger gestures include the introduction of the traditional Japanese Lantern Ceremony (at Forest Hills cemetery) as a public ceremony of remembrance.

The process of change and adaptation to cultural demographics is illustrated well through the example of one funeral home. This funeral home was established in 1899 to conduct services for Scandinavian immigrants. However, with the changing social trends in immigration, the funeral home is today considered a premier funeral home for conducting Southeast Asian funerals, predominantly Cambodians, Laotians and Chinese. An institution that was born in European culture and tradition has adapted to embrace the multicultural philosophy.

It is important to note that traditional funeral rituals were significant to second and third generation immigrants. This younger generation wanted to be “respectful of the older generations” and wanted to make sure that their final wishes were fulfilled. In situations where there was unfamiliarity with traditions, the funeral directors (Anglo-Americans) stepped in as educators and active facilitators of these customs and organized the entire funeral. The situation demands a deeper examination of issues with regard to the importance of tradition. Second and third generation immigrants might no longer associate with cultural traditions inherited
through birth, indicative of a *Cosmopolitan* or *Assimilative* philosophy. However, the respect for older generations is still strong enough to warrant a re-association with traditional rituals. This could possibly indicate therapeutic benefit to the younger generations as they find comfort in facilitating the ‘proper’ transition of the elders from the world of the living to the world of the dead. Traditional rituals also provide a structured grieving process at a time of chaos. This is suggestive of certain benefits that *Pluralism* can provide.

### The Cemetery as a Stage for the Enactment of Funeral Rituals

Culture as a key determinant in the funeral process acts in both passive and active ways. The active component of the funeral process constitutes the various traditional rituals involved. These are both the immediate rituals following the death and the long-term periodical rituals. The passive component of these rituals includes the cultural/religious symbolism and other such factors that make their appearance over the physical landscape. These cultural signifiers serve a wide variety of functions ranging from the formation of implicit territorial boundaries to psychological benefits to the healing process.

In western cultures, the process of burial and cremation is often carried out by the cemetery or funeral home with minimal involvement of the family. There is also no culturally pre-defined system of extended mourning and remembrance. Visits to the cemetery are more a voluntary action, depending on convenience and other functional factors. However, this is completely the opposite for many other cultural groups (Francis, 2000,)^12^ In most cultures, there are important rituals that have to be performed at the graveside. In the Hispanic and Islamic communities, it is not uncommon to have the families personally dig the graves and intern the caskets. This is also part of the culturally determined rituals that have symbolic meaning in the mourning and healing process. These cultures desire a personal involvement in the internment process and a physical involvement in the cemetery landscape.

Rituals that are particular to the cemetery environment are typical of funerals in Southeast Asian cultures (Cambodians, Laotians and Hmong). Buddhist funeral services are divided between the home of the deceased, the Buddhist temple and the cemetery. These rituals, which are culturally pre-defined, are symbolic gestures designed to help the living resolve issues before saying their final farewell to the dead. This not only aids in grief resolution but also potentially has significant impact on the spatial design of a culturally sensitive environment.

An example of rituals particular to the cemetery is exhibited in the Cambodian funeral. Before the body is surrendered to the fires of the crematorium, the relatives throw coins into a body of water. This is supposed to symbolize the paying of debts to the deceased. Such cemetery-specific rituals, which are common to many Southeast Asian cultures, have significant implications on the design of the exterior spaces around the crematorium. Landscape elements such as water bodies have a second layer of meaning attributed to them. Placing of these landscape elements thus becomes a product of cultural dictates as well as aesthetic ones.

In addition to these culturally pre-defined rituals, the bereaved also develop personal rituals that help them in dealing with their grief. Personal rituals can range anywhere form the simple act of visiting the graveside intermittently to incorporating the dead into the world of the living through inclusion in social activity and functioning. Visits to the graveside took place on special occasions such as birthdays, anniversaries and religious occasions. People who had lost someone integral to their life, still liked to carry on a continuing relationship with the dead by talking to them and spending time at the graveside.^13^

Thus, the cemetery and graveside serve as stages for the enactment of rituals in both the personal as well as the cultural realms. Rituals serve as means to the continued remembrance of the dead sometimes out of genuine affection and sometimes out of feelings of obligation. The graveside becomes a very important space for design considerations. In addition to the memorial that serves as a physical memory of the deceased, the space around the grave serves as the medium for the unfolding of the post-death rituals that enable the living to redefine themselves socially and effectively heal from the loss.^14^

### Bereavement

Through the facilitation of traditional funeral rituals, the cemetery management contributes
to successful grief resolution. Recollecting the example of the annual Japanese Lantern Ceremony at Forest Hills cemetery, the adaptation of a traditional funeral ritual is giving the diverse public, a systematized opportunity to partake of a traditional funeral ritual. Almost all participants found meaning in it and were emotionally touched. It also gave them a consistent opportunity to re-connect and remember those who have passed on by finding personal meaning in cultural symbolism.

In addition to therapeutic acts that unfold on the landscape, the cemetery and funeral home have formalized the process of working through grief. Both of these institutions have professionals, trained as bereavement counselors. In many cases, grief-counseling sessions are held where groups of people talk and share their feelings. With time, people invariably return to the cemetery on a regular basis after they have built a schema to deal with the loss. A key informant mentioned that visiting the grave was highly recommended to continue the “remembrance factor.”

A common view shared by both cemetery management and funeral directors was that the cemetery was important in the healing process because it served as the ultimate resting-place and memorial. An interviewee states, “They always go back to the cemetery. They do not come back to the funeral home”. The cemetery management pride themselves in the long-term relationships with the people they have made with loved ones buried in their cemeteries.

**Cemetery as a Therapeutic Landscape**

The visual qualities of the landscape emerged as an influential factor in the role of the cemetery as a source of comfort to the bereaved. This section provides a discussion of the cemetery aesthetic as promoted by the cemetery management as well as an assessment of cemetery aesthetic by a diverse group of users (as perceived/reported by the key informants). The analysis followed distinct categories as described below:

*Design Style*

Choice of cemetery aesthetic had a strong role to play in the future design decisions made in the cemetery. The cemetery management had direct control over any new design projects or renovations that were taking place in the cemetery. They determined the choice of aesthetic, program and other essentials of the design process that was then communicated to the landscape architect.

These historic landscapes were designed based on the paradigm of the English Landscape School. The aesthetics associated with this design style have become the ideal models of “beauty”, as recognized by cemetery management. The winding roads and associated rolling landform associated with this also represent a historical heritage of ideals passed down from generations of cemetery management. Adjectives such as “calmness”, “serenity”, “repose”, “beauty” were associated with the existing historical landscape and it was considered essential to carry these emotive qualities through all the other design additions and changes. Often, cemetery management picked appealing design solutions from other cemeteries and recommended them to the landscape architects as potential design models.

Even though the newer parts of the cemetery were based more on the grid layout, Forest Hills cemetery tries to continue the curvilinear pattern of roads through them as a link. This brings us to the question of the depth of understanding that the cemetery management has about the spatial qualities and historic background of the English Landscape School. *If the connections to the English Landscape School are purely aesthetic, can a new spatial design vocabulary easily incorporate its stylistic elements?*

**Inadequacies of Cemetery Landscape**

It was important to investigate shortcomings in the cemetery landscape as perceived by the key informants. At a more general level, the key informants expressed the wish for cemeteries to “create more spaces for the living” in order to make them feel welcome. Specific reference was made for the need to create more seating space. In the opinion of the informant, creating more spaces for the living would help them connect to death and help them in acknowledging their loss. This in turn was seen as a benefit to the healing process.

Some members of the Chinese community in a part of Providence, Rhode Island were dissatisfied with the design and management practices of several of the non-sectarian cemeteries. They had disagreements with the way the plots were allocated, and the design of the memorials. In their perception, the cemeteries destroyed the feeling of community
and other important family values. The allowance to purchase single grave plots only meant that there was no control with regard to where one was buried with respect to other family members. To the Chinese, staying close to members of the family and community in life and in death is considered to be of utmost importance. Thus, this was a major point of friction between cemetery management and their potential Chinese customers. This dissent led to the purchase of a separate piece of land to create an exclusive cemetery for the Chinese community where their sentiments would be respected.19

In another instance, there was a comment about how the cemetery structures were considered too elaborate by the Hmong. A specific reference was made to the walls where cremated remains were stored. Apparently, the existing designs of columbaria were too elaborate for the Hmong. The design of simpler wall niches could potentially increase the involvement of the Hmong with the cemetery environment. This is an indicator of a clash between different culturally determined senses of aesthetics.

Several aspects of the cemetery landscape can contribute to the healing process of the bereaved. A spatial design vocabulary that supports personal (for example, seating/interaction/contemplation spaces around the grave) as well as cultural rituals (for example, spaces that support ritual gatherings, landscape elements that become meaningful parts of the ritual, etc.) can be therapeutic. On the other hand, certain aesthetic preferences in the landscape can promote passive healing.

**Conclusion**

Through the example of two urban cemeteries and strategic interviews, an attempt has been made to understand how urban cemeteries are responding to change. An analysis of spatial structures and activities occurring in the cemeteries has been made to connect them to the larger social theories of multiculturalism. This is especially valuable as it demonstrates to designers the different approaches that can be adopted while designing a multicultural landscape.

The funeral industry is taking aggressive steps to rejuvenate the importance of this great social institution. By actively striving to accommodate multicultural diversity and freeing it from the pressure to assimilate, the cemetery management is truly “opening up” the gates to society. However, it becomes essential to ask deeper questions about the events unfolding in the cemetery. What really is multicultural accommodation and how can its effectiveness be evaluated? Is adaptation to diversity merely an allowance for different cultures to use the cemetery or does there need to be a drastic re-evaluation of the cemetery design tradition to express this cultural diversity? What is the design style of a truly multicultural landscape? There is no one answer to these questions.

The changes incorporated by the cemetery management can be viewed with a lot of skepticism. The funeral industry is notorious for its mercenary business sense. Still, the active involvement in the bereavement process possibly indicates a more sensitive side to this profession. Despite business intentions, a multicultural perspective will promote a positive outcome. The approach introduced the concept of active and passive healing within the cemetery landscape. Designers need to realize that there is a great potential to initiate change in the cemetery and bring about its revival. The first roadblock in the process of change, namely the cemetery management, is already accepting of the necessity for change. Thus the design community needs to aggressively tap into this opportunity to re-configure this social institution.

By understanding the different manifestations of multiculturalism, designers can incorporate therapy through multiculturalism in a variety of site conditions. Even though *Cosmopolitanism* might be the most relevant rationale for American society in the future, *Universalism* and *Pluralism* have their own benefits and will never completely disappear. The pressing need for change is imminent and the possibilities are endless. This paper has been an attempt to tap into those possibilities and expand the horizons of traditional cemetery design. The time has come to infuse the valuable social spaces of the cemetery with new meaning and new purpose through reformed spatial design principles. Healing, through the accommodation of multicultural funeral rituals in the cemetery landscape is a real possibility. In essence, this inquiry serves to open up the discussion ‘Can the cemetery of the future be a realm of the living?’

**References**

Berger, Arthur et al (ed.), *Perspectives on Death, Culture* 33


Linden-Ward, Blanche, Silent City on a Hill: Landscapes of Memory and Boston’s Mount Auburn Cemetery, Ohio State University Press, Columbus, 1989.


Marcus, Clare Cooper, Healing gardens: therapeutic benefits and design recommendations, 1999.


Rosenblatt, Paul C. et al., Grief and Mourning in


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**Notes**

1 The Italians are a good example of immigrants that were subject to this assimilative philosophy due to the misinterpretation of their cultural beliefs. Religious reform transformed the cemetery into a beautifully designed landscape that facilitated emotional reconciliation. However, this reconciliation was achieved by subduing the memory of the individual and the grief associated with their loss. (Meyer, 1993, p.15-17).

2 The cremation of ‘Red Scare’ martyrs Nicola Sacco (1891-1927) and Bartolomeo Vanzetti (1888-1927) who were unfairly convicted of murder Wilson, 1998, p.16).

3 Forest Hills is trying to revive the 19th century perspective of seeing a funeral monument as a piece of art. This perspective has changed due to social, economic and other factors that have also had a considerable impact on attitudes to death. The gravestone has become a mass produced, standardized commodity lacking individuality and creativity. Getting the public to re-think the way they would like to be memorialized, also aims at reviving the cemetery as a place of reflection and contemplation. Key informant interview, Forest Hills Cemetery, November 2001.

4 *The Sculpture Path: Contemporary Art at historic Forest Hills Cemetery*, brochure created by the Forest Hills Educational Trust.

5 These tours are theme based. For example, the ‘united we fall tour’ links graves of soldiers, firemen and other civilians who gave up their lives to protect ‘the lives, liberties or souls of fellow Americans’. Wilson, p.40 - 137.

6 Key informant interview, Forest Hills Cemetery, November 2001.

7 Key informant interview, Forest Hills Cemetery, November 2001.

8 Key informant interview, Forest Hills Cemetery, November 2001.

9 Key informant interview, Swan Point Cemetery, August 2001.

10 Key informant interview- Forest Hills, A Cemetery is Forever.

11 Key informant interview, March 2002.

12 Key informant interview, February 2002.

13 Key informant interview, February 2002.

14 Key informant interview, March 2002.

15 Key informant interview, March 2002.

16 Key informant interview, March 2002.

17 Key informant interview, August 2001.

18 Key informant interview, Feb 2002.

19 Key informant interview, March 2002.
History

Stewarding Nature: 
A Natural History of Cathedral Pines
Paul Kelsh

Imprint of a Blues Stained Landscape
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Landscape and Social Relations: 
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Power as Reflected in the Cultural Landscape: 
Sailors’ Snug Harbor, Staten Island, New York (1845-1900)
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The Phoenix Indian School Park: 
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Stewarding Nature: A Natural History of Cathedral Pines

Paul Kelsh

Introduction

On a hot July afternoon in 1989, two tornadoes converged on the small town of Cornwall, Connecticut, turning the charming New England village into a mess of downed trees and limbs. The most significant casualty of the storm was Cathedral Pines, a much-loved stand of old growth white pines and hemlocks growing on a hillside immediately southeast of town, which for many years was thought to be a remnant of the pre-colonial forest. By most accounts the stand was strikingly beautiful, with 150-foot high trees soaring above a thick, sound dampening bed of pine needles. Many people were devastated by its demise (Figs. 1 and 2).

Figure 1. Cathedral Pines, 1911

Great controversy followed in the wake of the storm. The Nature Conservancy, which owns the property, wanted to leave it untouched and allow nature to take its course, but many townspeople wanted to salvage the timber, thereby clearing the mess and protecting against fire. Some even wished to replant pines so that future generations could experience a similarly beautiful forest. In his essay “The Idea of a Garden,” Michael Pollan brought the controversy to a national audience, illustrating what he sees as the failings of wilderness ideology as the model for our understanding of nature. Wilderness, he argues, with its emphasis on a nature free of human impact, is an artificial construct, and serves to alienate people from nature more than connect us to it.

Figure 2. After the Storm

In this paper I build on the idea that nature is culturally constructed, showing that it is defined largely in historical and geographical contexts. I tell a “natural history” of Cathedral Pines, weaving together changes in the physical forest, changes in how people thought about nature, and changes in how the stand was used, imagined, and stewarded into the iconic Cathedral Pines. In telling a history of such a “natural” landscape, I argue that human imprint is not only inevitable, but often makes a positive contribution to the environment. It is through such imprints that a stand of pine trees established, grew, and became meaningfully experienced as Cathedral Pines. Indeed such imprints are a way of leaving a mark on the physical world, making it our...
own, and cultivating greater concern for the environment. As geographer David Lowenthal puts it:

To be properly cared for, the environment must feel truly our own, not as a disposable commodity but as a locale integral to everyday life. As did our forebears, we make it our own by adding to it our own stamp, now creative, now corrosive. The environment is never merely conserved or protected; to use Marsh’s word, it is modified—both enhanced and degraded—by each generation in turn. We should form the habit of lauding, not lamenting, our own creative contributions to milieus we inhabit. By striving to praise, we are more apt to make changes that we and our heirs feel worthy of praise.²

With this intent I tell this natural history of Cathedral Pines.

The Origins of the Pines
How suddenly, after all, pines seem to shoot up and fill the pastures! I wonder that the farmers do not earlier encourage their growth. To-day, perchance, as I go through some run-out pasture, I observe many young white pines dotting the field, where last year I had noticed only blackberry vines; but I see that many are already destroyed or injured by the cows which have dived into them to scratch their heads or for sport…. A year or two later, as I pass through the same field, I am surprised to find myself in a flourishing young wood-lot, from which the cows are now carefully fenced out, though there are many open spaces, and I perceive how much further advanced it would have been if the farmer had been more provident and had begun to abet nature a few years earlier. – Henry David Thoreau, May 19, 1857.³

Although the origins of the pines had been a mystery for many years, since the storm it is generally agreed that the trees had seeded into a pasture cleared sometime after Cornwall was settled in 1739. The trees themselves veiled their past. Although of similar size and appearance, they were not all the same age. Most had established in a period between about 1770 and 1800, but others established fifty to seventy years later, and a few were significantly older than the rest of the stand.⁴ A field being colonized by pines is not particularly mysterious, nor for that matter, even very interesting to most people. As Thoreau’s observation suggests, it was a very common event, especially in New England in the mid-1800s. But Cathedral Pines established more than half a century before other fields were abandoned, and thus was at the forefront of the transformation of the New England landscape from agriculture to forest. That transformation is depicted in a series of remarkably detailed dioramas at Harvard Forest. In the diorama “Height of Agriculture,” a couple of remnant, older pines are left standing next to a field in the mostly cleared landscape (Fig. 3). They suggest that the oldest trees at Cathedral Pines were also remnants from the pre-colonial forest and were left standing when the rest of the site was cleared. They probably were the seed source for the next generation of trees (Fig. 4).

Figure 3. “Height of Agriculture”

Figure 4. “Farm Abandonment”

The First One Hundred Years of Growth
Minott tells me that his and his sister’s wood-lot together contains about
ten acres and has, with a very slight exception at one time, supplied all their fuel for thirty years, and he thinks would constantly continue to do so.... He knows his wood-lot and what grows in it as well as an ordinary farmer does his cornfield, ... knows the history of every stump on it and the age of every sapling; ... It is more economical, as well as more poetical, to have a wood-lot and cut and get out your own wood from year to year than to buy it at your door.... How many sweet passages there must have been in his life there, chopping all alone in the short winter days! How many rabbits, partridges, foxes he saw! A rill runs through the lot, where he quenched his thirst, and several times he has laid it bare. – Henry David Thoreau, December 11, 1856

Few people today would consider laying a rill bare several times to be good stewardship of a forest, yet Thoreau sees it not only as good, sustainable management, but as poetry! His journal entry shows just how much the idea of stewardship is related to the time and situation of the forest.

Very little is known about the growth and use of the pines in their early years. Local tradition relates that two early owners, Seth Pierce and Fred Kellogg “cut trees very sparingly, using the woodlot as an occasional source of home-needed lumber and fuel with some surplus for local sales.” I suspect that they, like Thoreau’s neighbor, Minott, cut the trees more heavily than was later assumed. The trees themselves paint a somewhat different picture.

The pines, quite slender for their great height, apparently grew dense and tall, competing for sunlight and probably supporting very little understory. Surprisingly, however, two other generations of trees established amidst the older ones in the 1920s and 1940s, just as the older trees were large enough to be useful. I suspect that Pierce and Kellogg cut more of the forest than local tradition conveyed, and that, in doing so, they created large enough openings for new pines to establish. Although this seems like a minor issue, it points to differences in what people considered “sparing” use of a forest or woodlot. In the early 1800s, when most land was cleared for agriculture and the remaining woodlots were used for fuel wood and lumber, sparing use may have implied heavier cutting than we might imagine today, although with greater care for long-term yield.

Pierce and Kellogg may not have seen their own use of the pines in Thoreau’s poetic terms, but their sparing use may have included some significant cutting, enough at least to allow the next generation of pines to establish as a sustainable, future supply of wood.

Cathedral Pines

The [Mariposa] sequoias seemed to vindicate the American national intuition that colossal grandeur spoke to the soul. It was precisely because the red columns of this sublimely American temple had not been constructed that they seemed providentially sited, growing inexorably ever more awesome until God’s new Chosen People would discover them in the heart of the Promised West. Simon Schama, Landscape and Memory.

Though exploited as freaks of nature when they were first discovered in 1852, the Mariposa sequoias quickly were sanctified as a natural temple dating back to the time of Christ. Sydney Andrews, a correspondent of the Boston Daily Advertiser, for example, waxed theological in his description of one old giant: “What lengths of days are here! His years are the years of the Christian era; perhaps in the hour when the angels saw the Star of Bethlehem standing in the East, this germ broke through the tender sod and came out into the air of the Upper World.”

As Simon Schama describes it, the consecration of the Mariposa Grove was not an isolated instance but another chapter in a long tradition linking forests and cathedrals. It takes quite a leap of imagination, though, to see a forest as a cathedral. Not only is Christianity not rooted in forests, but forests themselves do not look very much like churches. The association had to be cultivated.

The most obvious link is gothic architecture, with its groves of columns rising and branching into a vaulted canopy. Caspar David Friedrich made some of the most graphic connections a few decades before the discovery of the Mariposa grove. In his paintings, Friedrich often paired trees with crosses and churches, not just to give the architecture vegetal roots, but to draw upon pagan, religious traditions that had been incorporated into Christian beliefs. He was explicit in his use of symbols, using evergreens, for example, to signify the hope of Christian resurrection, even in the bleakness of winter. But spruces and firs present a
particular problem when compared with gothic architecture. Unlike deciduous trees, they do not branch out into an overarching canopy reminiscent of gothic vaults. To overcome this, Friedrich poses them with the exteriors of gothic churches and draws parallels between the spires of the churches and the spire-like forms of the spruces and firs in order to construct a forest cathedral (Fig. 5).

Friedrich and other Europeans rooted Gothic architecture in nature in order to give it greater authority in architectural debates. American painters, however, turned their eyes to the forests themselves, drawing out their architectural qualities and elevating their status to that of ancient architecture. In Albert Bierstadt’s, *The Great Trees, Mariposa Grove*, for example, a clearly defined nave is marked by a giant sequoia in the foreground, acting both as spire and cross, echoed in the distance by a similar giant to unite the foreground and background into one architectural whole (Fig. 6).

In 1883, three decades after the discovery of the sequoias, Cathedral Pines were about a hundred years old and approaching their final height, when John Calhoun purchased the forest to protect it from logging. It is unlikely that Calhoun compared his pines to the Mariposa sequoias when he purchased them, at least not in a direct way. As Schama makes very plain, such associations are not usually on the surface; they operate on a deeper level. If Calhoun had a direct source of inspiration, it is more likely to have been George Perkins Marsh’s *Man and Nature.* Based on observation and evidence from wide-ranging sources, Marsh convincingly argued that deforestation led to rapid run-off, downstream flooding, and other hydrologic problems. Marsh did not depict human agency as inherently malicious, nor, for that matter, nature as inherently good. Nature was mute in his eyes; it possessed neither conscious will nor moral purpose. Humans, however, did have both will and moral purpose and could work to improve nature, stewarding it toward constructive change. Although much of human impact had been destructive, the devastating effects of deforestation were not willful in his eyes, but merely neglectful. He remained optimistic, therefore, that much of the devastation could be reversed through a concerted program of conservation and preservation. The optimism in his message and the call to stewardship resulted in widespread acceptance of his argument, even if many of his proposals were not actually adopted.
As a fellow Yankee witnessing the gradual reforestation of the New England landscape, Calhoun may have felt kinship with Marsh as well as a desire to steward the landscape back to a forested condition. Protecting the pines from any future logging would have been a small but important part of that overall process. Whatever the reason, his small act of stewardship was remarkable in a national context of forest preservation. In 1883, Yosemite Valley and the Mariposa sequoias had been protected as a park for nearly twenty years, and Yellowstone for just over ten. But Calhoun’s act preceded the creation of the Adirondack Forest Preserve by two years and all subsequent preservation efforts.

The Scientific Forest

In many respects the attitude of the forester toward a forest is radically opposed to that of the ecologist. To the former it represents merely the means to an end, to the latter it is the end in itself. The fundamental idea—the keynote, as it were—in the forester’s treatment of the forest is utility. He estimates the value of a tract of woodland in board feet. His chief ambition is to secure a maximum yield per acre of the most desirable lumber. ... The ecologist, on the other hand, sees in such a group of trees the glorious consummation of long centuries of slow upbuilding on the part of Mother Nature. They represent the survivors of that keen competition and relentless struggle for existence to which their less fit comrades of earlier years have long since succumbed. To precipitate their downfall with the axe seems little short of desecration. Although forced to admit the economic necessity for the objective point of the forester, the viewpoint of the ecologist is mainly subjective. [Italics added] – George Nichols, “The Vegetation of Connecticut”

As Cathedral Pines matured, the evidence of its history must have become so faint that it came to be seen as a virgin stand. Scientific interest in the forest grew along with it, especially as an example of long-term succession. In 1967 John Calhoun’s heirs deeded Cathedral Pines to the Nature Conservancy, which sponsored a thorough, scientific study of the stand as the basis for its management. Surveying all typical and unique habitats, student ecologists identified four major plant communities based on shrub and ground vegetation (Fig. 7). Pines and hemlocks dominated each of these communities, along with scattered hardwoods, depending on the amount of available moisture. For the first time, the succession of the forest was quantified. Hemlocks and hardwoods were poised to succeed the pines, but since a few pines were still establishing on drier sites, the students concluded that the forest would eventually succeed to a hemlock-hardwood stand with some conspicuous white pines.

Since most succession theory is hypothesized by observing different forests at different successional stages and then extrapolating from them to predict a single temporal sequence at a given location, Cathedral Pines afforded scientists a rare opportunity to observe and quantify the succession of an old pine stand to a climax hemlock/hardwood forest. Though it probably would have taken well over a hundred more years to complete the process, the long-term records of the stand provided a special opportunity to document it. From this standpoint it is easy to understand the scientific interest in the forest.

Figure 7. “Forest Profile of Cathedral Pines”, Ecological Inventory of Cathedral Pines Preserve

Although George Nichols had admitted that his interest in the successional processes of the forest was a subjective aesthetic, by the 1970s that aesthetic had become the norm in scientific interpretation of the forest. But now it came with its own cultural baggage in the form of disdain for human agency, evidenced in The Nature Conservancy’s “Stewardship Plan for
“Cathedral Pines,” which opposed any efforts to maintain the pines or salvage storm damaged trees. "Planting of white pine in combination with cutting hardwoods would maintain the pine stand," the report read, "but would require considerable expense and effort. The result would be nothing more than a pine plantation, far different from the unique natural forest that exists today." This analogy to a pine plantation seems particularly inappropriate. Pines in plantations are planted all at the same time in a grid, whereas creating openings in the canopy large enough for pines to regenerate is similar to what Pierce and Kellogg did back in the early 1800s (though for very different reasons). Seemingly the mere fact of human agency provoked the analogy to a plantation.

More pressing than maintaining the pines was the issue of salvaging fallen trees. Although Calhoun had salvaged trees for decades, The Nature Conservancy had no intention of continuing that practice: "Because Cathedral Pines is a living laboratory in which vegetational development can be observed and studied, the removal of fallen trees will not be permitted." The scientific aesthetic that George Nichols had described was now the basis for the official stewardship of the forest. This is a significant shift in the aesthetic values placed on it. Its impact can be seen in two photos taken by George Bellerose in the early 1980s (Figs. 8 and 9). Whereas Calhoun’s salvaging of fallen trees had maintained the open understory and contributed to its cathedral-like imagery, the new management cultivated a different type of forest, one where human intervention was considered detrimental to its natural qualities.

### Conclusion
This brief natural history leaves out many small but significant events and traditions—a 1945 experimental thinning to rejuvenate the pines, the careful felling of select trees for use in the construction of the Tappan Zee Bridge, the wedding of Cara Perkins and Mike Jacobouis captured in a National Geographic book about the Appalachian Trail, local school children who monitored its use, and decades of study by Yale forestry students. All of this history points to the level of attachment that people had to the forest. These various attachments surfaced in the controversy over what to do with the site in the wake of the storm. As an outsider viewing the controversy from a distance of some ten to fifteen years, it seems to me that the controversy stemmed from the fact that The Nature Conservancy’s management, with its application of a scientific aesthetic, failed to account for these other attachments built up through the forest’s long history.

Like the other acts of stewardship before it, The Nature Conservancy’s management was founded on a set of historically situated beliefs about nature as well as on the actual conditions of the forest at the time. The scientific interest...
in the stand was genuine, however the disdain for human agency that came with it was, in my opinion, misplaced. Changes in the forest may have been inevitable as the giant pines aged and died, but it was not inevitable that human agency had to be hidden or denied.

My point in telling this natural history is to show just how much Cathedral Pines bore the imprints of its various owners and users, and to show that these imprints were integral to its biology and to its status as nature. Indeed, as David Lowenthal argues, it is those imprints that made the forest meaningful to people as the natural icon Cathedral Pines. Not only were those imprints evidence of stewardship, but they also encouraged further care, because they continued the development of the forest and its associations to people. My point is not merely to make an argument for cultivating such imprints, but to give credibility to previous acts of stewardship and beliefs about nature.

Earlier this year a student challenged me to name one good thing that we humans had done to the planet. I wish in hindsight that I had responded with the cultivation, preservation, and imagination of Cathedral Pines. Such misanthropic sentiments sadden me, regardless of whether or not they are correctly attributed to wilderness ideology, as Michael Pollan argues. Not only is it inevitable that we have an impact on the world, but the ways that we leave an imprint are precisely what give it meaning and value to us. Though it would be just as naïve to suggest that all human imprints are good, it is important to recognize the relationship between the physical world, our imagination of nature, and our actions upon it. Only then can we evaluate our actions in an attempt to determine which are better than others.

References


3 David Foster, Thoreau’s Country: Journey through a Transformed Landscape (Cambridge, MA: Harvard University Press, 1999), 141.


5 Foster, Thoreau’s Country, 95.


8 Schama, Landscape and Memory, 188-201.


10 Schama, Landscape and Memory, 226.

11 Schama, Landscape and Memory, 238.


21 To be fair The Nature Conservancy did compromise. They allowed a local cabinet maker to make commemorative tables from some of the downed trees, Mystic Seaport Museum acquired masts for use in restoration of historical sailing vessels, and a fire buffer was created along the History 43
Imprint of a Blues Stained Landscape
Michael Robinson

Introduction
The Mississippi River is a remarkable geographic feature on the North American continent. Its watershed drains approximately 41 percent of the continental United States, crossing more than thirty states. Mark Twain describes the Mississippi as the longest river in the world, and, by measuring the Missouri as its main branch, he approximates that it is “four thousand three hundred miles long” (Twain 1). He also speculates that “it is the crookedest river in the world, since in one part of its journey it uses up one thousand three hundred miles to cover the same ground that the crow would fly over in six hundred seventy five miles” (Twain, 1).

Figure 1. The Mississippi River circa 2500 BC

The lower basin of the Mississippi, below Cairo, Illinois, has three distinct deltas: the Yazoo-Mississippi Delta, the Arkansas Delta, and the Louisiana Delta. The Yazoo-Mississippi Delta (Delta) is an elongated, lanceolate, leaf-shaped area formed by the shifting channels of the Mississippi and Ohio Rivers over the last ten thousand years. The Delta begins just south of the Memphis Bluff and runs southward approximately 200 miles to just north of the Vicksburg Plateau. It is bounded by the Mississippi and Yazoo Rivers. At the half-way point in its length, the Delta is at its widest, just over 70 miles across, spanning from Greenville to Greenwood through Leland, Indianola, Moorhead, and Ita Bena. Bounded by levees on the west and the bluffs of Mississippi Hill Country on the east, the Delta comprises almost 7000 square miles of alluvial plain, bayous, and backwater swamps.

Until just after the Civil War, the Delta was a formidable and forbidding region with a primeval quality. As a cypress/tupelo hardwood, bottomland swamp, the Delta was considered to have been one of the world’s most diverse and productive ecosystems. Its vegetative cover was so dense that it was almost impossible to penetrate, leaving the Delta as the “last wilderness east of the Mississippi River.”

Figure 2. The Yazoo Mississippi Delta Alluvial Plain

With its dense cane breaks and thick canopy of vines, in 1865 the Delta was still, in fact, a howling wilderness - a landscape defined more by its water than by its land. The few inhabitants of the Delta clung to the banks of its streams, bayous, and rivers. These precarious perches, however, provided claims of rich soils and abundant wildlife that attracted so many to the Delta during the Reconstruction era.

Reclaiming the Delta
During Reconstruction, a virtual army of ex-slaves and immigrants cleared the bottomland forest and dredged and drained the swamps to make way for cultivation of the most productive agricultural land in the nation. Hundreds of thousands of African Americans turned out of slavery and off plantations, sought a fresh start and access to work in the Delta. They transformed this dense forested ecosystem into cotton plantations, using only the crudest of tools and techniques. Muleskinners, axe gangs, sharecroppers, and railroad crews utilized centuries old work traditions, transplanted from African agricultural traditions, to harness...
their collective strengths and overcome the stifling heat and torrential rains, creating a synchronized and energized work force.

The Delta evolved from a hardwood swamp to a fertile plain, over almost a century of back-breaking toil. The large trees, approximately three to six feet in diameter, were taken out first by lumber companies. The land then had to be drained through ditching, dredging, and channelization. Farmers were then left to clear the land for agriculture. In addition, roads had to be laid, levees constructed, railroads built, towns founded, plantations assembled, and penitentiaries raised. Most of this work took place in the sixty years between 1870 and 1930.

This work was produced under a system of servitude that was only slightly more humane than slavery. Sharecropping, forced labor camps, and itinerate labor jobs were difficult and dangerous, particularly under the Black Code and on the wrong side of the Jim Crow line. In the Delta, a mule was more valuable than a man, and gun law prevailed. Freedom offered ex-slaves few securities when they served under the boot heel of “Mister Cholly (Charley),” the ubiquitous field boss of every work gang or crew.

This gentile white southerner’s description of the system of sharecropping almost made the planter class out to be the model of southern generosity. Many today, however, would characterize the “partnership” that Ms. Hemphill describes, struck between the sharecropper and planter, as a surrogate form of slavery, for this system of tenant farming was more virulent than benevolent.

The system of sharecropping provides the most vivid picture of the morally bankrupt labor system employed between 1865 and 1930 in the Delta. Since less than ten percent of all farmers in the Delta owned their own land, most farmers worked their farms as sharecroppers. Mary Hemphill, in her recounting of the history of Sunflower County Mississippi, recalls that

The sharecropping system of farming had developed after the Civil War as the only possible means of solving the dilemma in which the South found itself during these lean years. The farmers had the land but no labor to cultivate it, and the former slaves had nothing but the strength to work. A partnership was effected whereby the landowner used his land, paid the taxes, furnished the mules, tools, and the seed, and provided the laborer and his family with a house space to raise vegetables, hogs, and chickens, and a “furnish” for store-bought necessities, and medical services. At the end of the crop year (Settlement Day) the profit was divided equally, and from his share the tenant repaid the owner for the “furnish” that had been issued to him through the year.

The tenet farmer was usually provided between forty and seventy acres of land to farm, depending upon the size of family and their work capacity. A house, mule, seed, and “furnishings” were also provided. However, on Settlement Day (the annual day of accounting for the crops and expenses), the planter paid the sharecropper whatever he wanted to pay him. Theoretically the tenant farmer was paid half the value of the crops produced, less the costs of the “furnishings.” However, the
planter never told the sharecropper what the cost of the seed or “furnishings” for the year was, nor did he disclose the amount or value of the crop that was delivered by the tenant farmer. The planter’s books were completely closed to the sharecropper and no questions were ever asked.

At the end of the year, many, and in actual fact most, sharecroppers found that their net earnings were actually net losses, adding each year to an accumulated debt owed to the landlord. To protest the planter’s accounting or request a presentation of the books was tantamount to requesting a death sentence or, at the very least, immediate banishment from the plantation.

And while all farmers are certain that next year’s crop will be better than the current year, the sharecropper was constantly and hopelessly drowning in a flood of red ink that was beyond his control. Since the sharecropper had no voice in the plantation system, the only escape from this form of indentured servitude was for the male head of the household to run away, leaving his family on the farm to start anew with the landlord. This fracturing of the social cohesion of the African American community provided the planter with greater control and authority, and added greatly to the general despair of the black community.

Alan Lomax, an ethnomusicologist and archeologist sent in 1930 by the Library of Congress to record indigenous music of the South, describes the plantation system in this way:

[Landlords] have squads that go around at night and beat up on the ones they call “impudent.” The function of shooting such as these is to intimidate all colored farm workers in the area to the point where they will not object, either as an individual or as a group, to the economic and caste domination of the white landlords (97).

Lomax, an east Texan by birth, lived all of his childhood and most of his early adult life in the South. He provides this first person account of the white southerner’s view of the African American situation:

Like every southerner, I had been raised to believe that blacks were contented with their lot. We had been taught not to think about the bad housing, the poor schools, the exclusion from restaurants, the Jim Crow rules about bathrooms and drinking fountains, the beatings, the police brutality, even the lynching. We had all gotten used to the convenience of a black under caste that would do all the hot, dirty jobs for whatever we paid them and thank us for giving them a chance. We were used to the smiling and servient black, because the southern police customarily arrested any black who even wore a sullen look (61).

This highly policed form of subjugation created that “low down dirty feeling” that was often referred to as the blues. Many members of the African American community felt the “aching chill” of this stifling, oppressive system of control on a daily basis. Since African Americans were highly scrutinized in public, it was only indirectly in their communal work songs and more directly in their church meetings on Sunday that they could express their true feelings and profound sense of indignation. Lomax derides the pre-Civil Rights period by saying:

The experience of the Southern working-class blacks, who created the blues in the post slavery period, was in some ways more bitter than slavery itself. Promised equal rights and opportunities, blacks were, by and large, denied both. They put their hands to the plow, to the railroad hammer, to the lines of the mule team and, in effect, built the South – for subsistence wages, Faulkner’s decadent planter class knew how to exploit them and, when they felt it necessary, resorted to the most savage exemplary violence to
keep these vigorous and ambitious people in line (xv).

Work, however, whether on a steamboat landing or in the levee construction, provided the daily possibility of the release of tensions through the symbolic and circumlocutious lyrics of communal work song. Each general vocation had specialized jobs, and each job had a set of work songs that set forth an appropriate working rhythm and lyrical calls that made the day go easily in spite of the heat. As examples, levee construction camps had rooster callers, borrowers, hoppers, mule skinners, working slips, and wheelers; railroad construction camps had hammermen, spikers, tampers, steel gangs, gandy dancers, tie totters, and track callers; and cotton plantations had plowmen, hoe gangs, picking crews, and wagon drivers.

Not only did this river of communal singing seem to improve the spirits of the workers, it also synchronized the work and the workers into efficient machines. Each crew or gang had a song leader who set the pace of the work through the rhythm of the songs he sang. By coordinating the energies and activities of each work force, incredible tasks were accomplished quickly, often competitively with other crews, and usually in good humor. Lomax saw communal singing as

a flood tide of supportive African sociability, eroticism, and life-giving laughter; welling up in the black family and community life, [which] endowed black life with a certain invulnerability in the face of sharp adversity. It could be argued that the new song styles of the Delta symbolized the dynamic continuation of African social and creative process as a technique of adaptation in the New World (Lomax xiv).

Evolution of the Blues

There is little debate about the claim that the Delta is the home of archaic country blues, also known as the Delta blues. The blues is the progenitor of other 19th and early 20th Century musical forms such as archaic jazz; jug, tub, and washboard bands; street and marching bands; and country brass bands. Other genres to spring from this form of folk blues were boogie-woogie, ragtime, gospel blues, rock and roll, soul, funk, and rap (Highlights of the Jazz Story). Lomax attributes the longevity and widespread distribution of the Blues around the world to the modern psychological syndrome of uncanny inhabitation:

All of us are beginning to experience the melancholy dissatisfaction that weighed so heavily upon the hearts of the black people of the [Yazoo] Mississippi Delta, the land where blues began. Feelings of anomie and alienation, of orphaning and rootlessness – the sense of being a commodity rather than a person, the loss of love and of family and of place – this modern syndrome was the norm of the cotton [tenant] farmers and transient laborers of the deep south one hundred years ago (Lomax, ix).

The Blues sprang out of the Yazoo-Mississippi Delta somewhere around 1890. They echoed across the flat alluvial fields of cotton plantations, gathering at dusty crossroads in jook joints, railroad depots, and steamboat landings; rifling through the barrelhouses and bulk breaks; rolling through levee, railroad, and turpentine camps; and stopping, if ever so briefly, at plantation house parties.

The Blues evolved out of a number of West African and West Central Sudanic Belt traditions, both traditions of music, agriculture, and work. One of these traditions was embodied in the “griots,” or tribal historians, who recounted the history of their culture in the free verse of poetic songs. These chantefables were sung in solo by the griot and responded to by the audience. Another African tradition was that of communal work songs, where “the dash and rhythms … of black Africa, turned the heavy, hot work of the tropics into community jollifications” (Lomax, 69).

These sons and daughters of slaves and sharecroppers weaved work hollers, gandy dancing, field arhoolies, prison chants, shack rooster’s calls, spirituals, yodels, moans, jailhouse groans, track calls, chanted prayers, lullabies, children’s game songs, gospels, ring shouts, and church jubilatings into a spontaneous bending, blueing, sliding, thumping, pounding, and beating sound that meanders around the simple musical form of twelve bars and a vocal pattern of a double call and a single response.

Folk Blues Form

A typical Delta blues song has some stylistic traits from African musical cultures. They are usually “stringed-instrumental-accompanied
vocal music” sung in the first person (Kubik, 99). However, the musical grammar of the AAB stanza pattern (a textual statement (A), followed by a repetition of the first textual statement (A), and concluded by a different text line (B), often followed by a musical response) seems to have no precedent in African or European musical traditions. Robert Kubik, a cultural anthropologist and ethnomusicologist, in *Africa and the Blues*, traces the musical traits that came from Africa and transmuted into the blues. He suggests, however, that this poetic form is an African American development (Kubik, 33). An example of this grammar can be seen in Robert Johnson’s famous *Crossroads Blues*:

**Figure 6. Notations of Robert Johnson Blues Songs**

*I went down to the cross roads – fell down on my knee.*
*I went down to the crossroads – fell down on my knee.*
*I asked the Lord above, “Have mercy – Save poor Bob, if you please.”*

*Standin’ at the cross road – I tried to flag a ride.*
*Standin’ at the cross road – I tried to flag a ride.*
*Didn’t no one seem to know me – everybody pass me by.*

*The sun goin’ down boy – dark gon’ catch me here.*
*The sun goin’ down boy – dark gon’ catch me here.*
*I haven’t got no lovin’ sweet woman that – love and feel my care.*

*You can run – you can run – tell my friend-boy, Willie Brown.*
*You can run – tell my friend-boy, Willie Brown.*

*Lord, that I’m standin’ at the cross road, babe – I believe I’m sinkin’ down*

(Ainslie, 52)

**Figure 3. Mississippi Delta Sharecroppers**

### The Blues Begins

The first notation of Delta blues music was made by an archeologist from Harvard University, Charles Peabody, in 1903. Professor Peabody hired a digging crew to assist him with an archeological excavation near Stovall, Mississippi. These workmen sang field chants as they worked and Peabody put them into a classical musical signature or notational system. In that same year, W. C. Handy, an African American from Florence, Alabama, came upon a musician sitting at the Tutwiler depot, a Delta town near Clarksdale. The man sang and played a guitar using a knife to slide along the strings. Handy recorded the lyric “Where the Southern crosses the Dog,” which the itinerate musician sang. Handy moved to Clarksdale and then Memphis to commercially promote this style of music. He later incorporated the lyric into a song he made popular called the *Memphis Blues*.

The first blues sheet music was published in 1912, and the first gramophone recording of the blues was distributed in 1920. This indigenous art form has now not only spread to all corners of the earth, it is still influencing popular music across the globe.

In their compelling book, *Mississippi Floods*, Anaratha Mathur and Dilip da Cunha describe the Delta Blues:

*The blues give the twisted, turns, and quavers, swooping dips and sudden*
climbs, the attack and release of notes, and spontaneous embellishment that make the music so elusive, they also give it an emergent, ordinary everydayness. There are high-water blues, boll-weevil blues, cotton field blues, dirt-road blues, penal-farm blues, turtle-dove blues, and today, despite pressure from tourists to the Yazoo Delta who want to hear the blues of a past era of cotton picking, there are drug blues, talking-back blues, cyberspace blues (Mathur, 34).

Blues songs were pure expressions of the soul that were intended to uplift and reinvigorate the spirit, usually in the face of endless toil for little pay or forced labor at the butt of a gun, the wrong end of a club, or the lash of a bull-whip. The subjects of the blues were the emergent and everyday events of love and loss, work and play, life and death, floods and droughts, that punctuated the dawn ‘til dusk work and play patterns of sharecroppers, loggers, flood fighters, roustabouts, and a multitude of other laborers doing menial jobs given over predominately to African Americans in the post Civil War era.

Conclusion
The distinct geographical formation of the Yazoo-Mississippi Delta has given rise to an acoustic geography born of the rhymes and rhythms of the great Mississippi River and the African traditions of the workforce that converted the Delta wilderness into a garden. These African American farmers and laborers used many of the tools, techniques, and art forms that were employed in agriculture in their homelands in Africa.

The Delta has always been characterized by rich land and poor people. Life was often rough and the people had to be tough. Floods, droughts, hurricanes, tornados, and even earthquakes set the pattern of alluvial time that influenced daily existence in the Delta. These powerful conflicting forces created a burning, churning cauldron of despair and hope, disenfranchisement and empowerment, poverty and richness, and enslavement and freedom that forged the blues. These competing forces set forth a highly charged brew of creative alchemy that was ripe for invention. Add the oral and musical traditions of pan-African culture as a catalyst and what emerged was a distinct musical form known as the Delta Blues, with all of its whoopin’, hollerin’, wailin’and cryin’; all of its circumlocution, improvisation, and melismas; and all of its jumpin’, rattlin’, swoopin’, dippin’, and shakin’. An acoustic geography was created in the Yazoo-Mississippi Delta out of the admixture of ecology, economy, and cultural conflicts that imprinted American musical traditions. The Delta is truly a blues stained landscape, stained with the sweat and blood of a dynamic, resilient, creative, and ambitious under caste of people, whose creative impulses and vivacious gregariousness made them seemingly invulnerable to the unspeakable cruelties of an inhumane system of forced labor.

References

Hemphill, Mary M. Fevers, floods, and faith: A history of Sunflower county, Mississippi, 1844-1976. Indianola, MS.


Highlights of the Jazz Story in the USA, the New Millennium Edition.. 1989. Hamburg: Peter von Bartkowski.
Landscape and Social Relations: Charleston Townhouse Sites (1770-1850)

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Archaeological research in Charleston, South Carolina has, for the past decade, focused on the evolution of the urban landscape as expressed in the townhouses of wealthy planters and merchants, built during the late 18th and 19th centuries and still prominent features of the urban landscape. Visible elements of the elite landscape include large townhouses and formal gardens (Cothran 1995; McInnis 1999). These properties were also occupied by a sizable population of enslaved African Americans who lived and worked in the service buildings and work yards. The interdependence of these diverse occupants, their daily affairs, and the landscape elements under their purview have been revealed in the research of scholars from a host of disciplines, including archaeology (Cothran 1995; Herman 1999; McInnis 1999; Zierden 1999).

The urban landscape is more than just an amalgamation of individual landscapes of the elite, middling, and poor, slave and free. It also possesses a unique and definable character of its own, simultaneously collective and contradictory; as such, it requires a broader level of study, beyond that of individual sites, for an urban center was, as Dell Upton has suggested, “a product of large social and economic forces, a pattern reflecting collective action” (1992, 51). A material culture study of the city moves beyond individual sites and individual actions to an investigation of reciprocal relationships among selves and human alterations of the physical world.

The issues of landscape and social relations were recently examined in detail through an extensive archaeological project at the Simmons Edwards house, number 14 Legare Street. This townhouse was built by planter Francis Simmons, in 1800, and renovated by George Edwards in 1818. The interdisciplinary research was generated by the current owners, involved in an extensive, museum-quality restoration of the house and grounds. Exploration and mitigation also touched on the work yard, an area segregated from the formal garden and the domain of the servants. The site adjoins the Miles Brewton property at 27 King Street, subject of intensive archaeological research a decade earlier, and described by Spencer-Wood (2002) and Baugher and De Cunzo (2002) previously in this journal. Archaeological research on the garden was conducted in consultation with garden historian C. Allan Brown, restoration architect Glenn Keyes, restoration specialist Richard Marks, and historical architects Willie Graham and Orlando Ridout. Allan Brown is responsible for interpretation of the formal garden (Brown 2001).

At the time of excavation, no documentary data concerning gardens or gardening at 14 Legare Street had been discovered. In fact, there was no documentation whatsoever for the existence of an associated garden. The placement and maintenance of a formal garden by the antebellum owners was presumed from the construction and style of the front walls and gates, and the internal wall running the length of the driveway. That the front gates and wall were the product of George Edwards is clearly demonstrated by his initials in the wrought iron entryway. Historical architects presumed that the fence would have surrounded some landscape element of equal grandeur.

The property currently known as 14 Legare Street fronts this late 18th century thoroughfare on a double lot 100’ wide and 270’ deep. A significant neoclassical townhouse in the single house style occupies the northern half of the property. The three-storey, brick main house is followed by two substantial, original outbuildings, a kitchen/slave quarter, and a carriage house. A small brick building to
the rear was determined to be a privy. The buildings and adjacent work yard and driveway were surrounded to the south and rear by an L-shaped garden and lawn area.

When Simmons acquired the property in 1800 he purchased two adjoining lots, each with its own ownership history. The lot to the south, 12 Legare, contained a modest single house, presumably with appropriate outbuildings, which Simmons rented out. It evidently sat back from the street, for, after his house was built, he instructed his tenants not to build anything in front of the house, lest it block his view and his breezes. When Beaufort planter George Edwards acquired the property in 1818, he either demolished or, according to unconfirmed local legend, moved the house and made 12 Legare Street his garden. Edwards then constructed elaborate gates with his initials and, according to our data, a garden. The garden remained intact until the 1880s, when the landscape was altered (Stockton 1990).

Figure 2. 12 Legare Street Garden

Work began with an 8-unit testing project and concluded with the excavation of 154 5-foot units, including a 40’ by 90’ block in the front of the garden area. The project was conducted in five phases from July 1998 through June 2000. The units were placed to retrieve data deemed important, but also to mitigate areas to be destroyed by the restoration project.

The initial testing revealed a site of remarkable clarity and integrity. Each unit across the site exhibited a basic stratigraphy of zones 1-3, datable to the 20th century, late 19th century, and early 19th century, respectively. Zone 1 was a modern (last fifty years) layer of topsoil, and was virtually sterile. Zone 2 was dark, loamy sand that contained far more artifacts, including a range of distinct Victorian items. This is associated with an 1880s renovation of the landscape. Zone 3, distinguished by its lighter brown color, contains artifacts from the first half of the 19th century. Further, the zones and their associated features exhibited a remarkable degree of horizontal variability across the various site areas, making it possible to accurately interpret a range of site activity and use areas, based on artifact and ecofact content, density, and stratigraphic complexity. A series of features in zone 3, particularly areas of crushed shell, appeared to be evidence of an antebellum garden. An area of shell in a definable curve with regular bottom and sides indicated an unexpected style, with curved paths rather than rectangular beds. Two phases of block excavation surrounding this one revealed the complete pattern of the formal garden.

The front 90’ of the lawn was the formal garden, in a bold pattern defined by the shell paths. The center, or highlight, of the pattern is a curving diamond, or bowed lozenge, turning to 8 (four double) circles, each of the double lobes terminating in a rounded node, which Allan Brown suggests were locations of statuary or ornaments. The resulting garden style is know as a “rosary,” designed to look like a flower when viewed from above, and to be filled with roses. From the central axis of the rosary, diagonal paths diverge to the east and west, terminating near the front wall and the E60 line, respectively. Here, more ephemeral deposits suggest the placement, and later removal, of a hexagonal summer house.

Beyond this was the area known as the middle garden. This contained only the border walks. The zone 3 deposits were homogenous with sparse shell flecking, no individual plant features, and relatively little evidence of ongoing disturbance. This area has been tentatively interpreted as an orchard area, one with small trees and little turnover in the soil.

The rear garden, or foot of the ell, occupied by a 1950s formal garden, was again different. The zone 3 soil here was relatively deep and full of debris, particularly brick and mortar rubble. The artifacts span the first half of the 19th century, again suggesting regular additions to the soil. The depth has been interpreted as evidence for use of this area as a vegetable garden, containing large beds that were plowed or deeply hoed on a regular basis. One
unit contained a deep lense of finely crushed shell, evidently intended for special plantings; asparagus has been suggested. The archaeology revealed that the front third of the lawn area was, by 1820, the formal garden. The pattern of this rather bold design was defined by the series of shell paths. Another element of the formal garden was the consistent presence of fragments of red and yellow clay roof tiles in the garden deposits. The suggestion that they might have served as edging for the beds was supported by the discovery of these in situ, along the edge of shell paths, in two locations.

The surrounding medium brown soil proved to be the beds of the antebellum garden. The zone initially appeared to be homogenous in color, but closer inspection under the right light conditions revealed a dappled, swirled soil, reflecting a series of planting episodes. While a few of these were excavated, most were left intact.

Evidence for content of the garden was much more ephemeral. Pollen analysis by John Jones provided a partial list of possible plants, including samples of Liliaceae (lily family), Rosacea (rose family), and Cornus florida (or the flowering dogwood). The most reliable data came from two lead plant tags recovered from the zone 3 deposits. Each of these tiny tags features a hand-inscribed common name on the front of the tag and a latin name on the back. The more common is Dianthus chinensis, or India Pink. The other, more obscure plant, read “Common Eternal Flower,” or Xeranthemum annum. Garden scholar Ann Leighton (1987) lists this species as “purple everlasting.” These tags appear to be one-of-a-kind archaeological discoveries.

We also retrieved data on fertilization from a variety of sources. First was soil chemistry analysis, which revealed significant amounts of potassium and phosphorous in the front garden, moderate amounts in the rear garden, and relatively little in the paths themselves. The pollen, phytolith, chemistry, and zooarchaeological studies also informed on the maintenance and attention paid to the garden in the form of fertilizing. The phytolith analysis, conducted by Lisa Kealhofer, revealed decayed plant and wood material, while Karl Reinhard’s parasite analysis revealed a host of fungal spores, indicating a rich aerobic decomposer community. These data suggest that composted plant material was one source of fertilizer. Another appears to have been bone meal. The bone was relatively dense in the front garden, in contrast to the cultural materials. In addition, the front garden assemblage was dominated by fragmentary mammal bone. It is possible that the animal remains were composted with the plant remains, or the two were added to the garden separately.

Maintenance of townhouse and garden fell to Edwards’ slaves. They lived and worked in the small work yard adjoining the outbuildings, shielded from the view of garden guests by the Tuscan-columned fence. The “servants” occupied the small rooms in the second story of the kitchen building. While the main house showed a formal facade, the work yard housed the facilities for the affairs of daily life, in a range of decreasing order and increasing dirtiness (Zierden and Herman 1996; Herman, forthcoming). These included kitchen and wash house, slave quarters, stables, carriage house, livestock sheds, privy, well, cistern, and drainage system. The work yard area also contained stratigraphic evidence for extensive reorganization of the soil deposits, and the addition of refuse. Artifact and bone density increased in the work yard, compared to the garden, again supporting the idea of a dirty, noisy space.

The well, drain, and drive features discovered here contributed to the efficiency of the work yard and ultimately to the health of site residents. The deliberate placement of specialized service buildings, separation of work yards and gardens, and specific locations for refuse disposal were conscious attempts to mold an urban landscape suitable to the social values, as well as physical needs, of urban residents. The needs and values of Charleston’s citizens changed as the 19th century progressed. Archaeology has not only outlined the basic features of an 18th century compound, it has also documented changes in these features for the next century.

Many of the visible changes to the compound were attempts to improve sanitation and prevent the spread of disease in an increasingly crowded city (Rosengarten et al. 1987). A large part of maintaining a healthy and sanitary site was managing the animals that lived on that site. Zooarchaeologist Elizabeth Reitz has recently summarized the animals that would have lived alongside the human residents of a townhouse property such as Legare Street (Lucas and Reitz 2001). The archaeological
record, and to a lesser extent the documentary record, suggests that the work yard was filled with cows, pigs, and assorted fowl, maintained for milk and eggs and ultimately destined for the dinner table. Also present were work animals and pets. The maintenance of these animals, their feed, other food stocks, and the resulting refuse, attracted unwanted animals. These practices were common in the 18th and early 19th centuries, and they persisted in some form into the 20th century (Reitz 2000). Further, the character of this animal maintenance changed through time, as urban sanitation and public health became an increasing problem, and an increasing concern, as the 19th century proceeded. Reitz further suggests a large part of garden maintenance, as well as overall site maintenance, involved “keeping chickens and pigs out of the garden, cats out of the well, and rats out of the larder” (Reitz 2000).

Most of these tasks were the responsibility of the enslaved residents of the work yard. In addition, they were likely responsible for the installation and maintenance of the formal garden, which occupied the majority of the available yard space. This included filling of the low-lying, swampy area to the rear of the property that, in the 18th century, adjoined the Miles Brewton lot (see Zierden 2001b). While the work of the African residents is preserved in the ground, evidence of their own affairs is less tangible. On crowded urban lots, the refuse of owner and slave are mixed in the soil deposits. While the work yard was the domain of the servants, the refuse there is the product of the entire household. Physically separating the lives of these people in archaeological deposits has not yet been possible.

Charleston is, after all, a living archaeological site, an urban landscape still evolving to suit the needs of its occupants. Restoration of the 14 Legare lot reflects the needs of current occupants, as well as the historical features of the property. The garden revealed by archaeology has been restored under the direction of Allan Brown. Beds were filled with topsoil. The new tile edging was installed by Jack Ackerman. The paths were then filled with crushed oyster shell, and the remainder of the yard mulched or sodded. The middle garden contains orange trees, and espaliered fig along the walls. The rosary in front has been planted in period box. Trellises support roses and other espaliered bushes. The beds have been planted in bulbs, and annual and perennial flowers will follow. Allan Brown continues to research the appearance of the rear garden, and our evidence for that portion of the site is still spotty. The most dramatic change to the visual arrangement of the site was the reconstruction of the garden wall, complete with the Tuscan columns and relatively transparent picket. The summer house again divides the front garden visually from the middle garden, completing the bold and elaborate design first installed by George Edwards. The work yard area, though, is simply lawn. It is no longer needed for the maintenance and butchering of livestock, the removal of refuse and wastewater, and the storage of carriages and horses.

References


Slave Landscapes of the Carolina Low Country: What the Documents Reveal

Elizabeth Brabec

Introduction

Although much has been written about slave life in the antebellum south, comparatively little is understood about the physical settings of slave communities and the structures and spaces that alternately constrained and supported day-to-day life. This is due to two primary factors: first, until relatively recently, the focus of southern history and historical landscapes remained on the plantation house, and second, the documentation of the physical setting of slave life is much more difficult to compile than that of plantation owners or even indentured servants. Common historical documents such as diaries, letters, sketches, drawings and paintings that focused on the slave community are relatively rare. Those existing documents that do provide written and visual descriptions were produced primarily by the planter class or white visitors to the region, and must be interpreted through the lens of the cultural and social biases of the observer rather than the participant. As Vlach (2002) has noted in his recent book on the meaning and documentary value of southern paintings, slaves and the settings of their lives were almost entirely ignored in the sketches and paintings of both visitors and the planter class. Where they do appear, slaves are often marginalized in the depiction of plantation life.

Many discussions of plantation landscapes have identified a pan-Southern tradition, and although there are commonalities between plantation landscapes of the South in general, regional differences in landscape form and spatial organization are significant. The existence of these regional differences have had only preliminarily exploration in a number of writings, including Conzen (1990), Morgan (1998), Joyner (1985) and Vlach (1993, 2002). In fact Brown (1996) cites the lack of comprehensive regional analyses as a major flaw in southern plantation research. Regional differences result largely from the type of crop grown and the production system designed to manage it, but also from the topography, climate, and cultural background of the original settlers—white or African—and the practices they incorporated in the emerging society. To examine the physical landscape of the slave community without the muddying effects of regional differences, this paper will focus on a specific region that can provide a common base of comparison - the rice plantations of the low country of South Carolina. The discussion focuses on the development of the methodological approach to analyzing the documentary evidence as a way of clearly identifying the common trends of landscape settings. Using this approach, a representative sample of the results is presented and applied to the development of a broader view of the landscape of slavery.

Approach

Historical analysis is generally concerned with making sense of an array of historical documentation, fashioning a narrative from documents describing the aspect of history under concern and placing it in the larger context of the period. Landscape history is part of that tradition. However, the identification and understanding of spatial form and landscape organization is more closely aligned with the history of material culture since it deals with the physical dimensions and features that support and constrain people’s everyday lives (Leone 1988). As a type of material culture, the goal in historical analysis of landscape form is to identify the character defining features of a landscape, comparing it with others in the same genre to clarify regional, temporal or cultural trends.

In many studies of landscapes, including slave landscapes of the plantation south, the most pervasive problem in identifying these trends has been the lack of a focus on the importance of sample size and its impact on the validity of conclusions. While valid conclusions can be drawn from a single case or a small number of comparative cases (Rueschemeyer 2003), statements of societal and temporal trends must also be supported by systematic analyses of larger sample sizes to minimize the potential for bias produced by atypical cases.

This historical analysis was designed to test the impact of a larger sample size on the validity of existing hypotheses in the literature, drawn from a single or small number of cases. In order to assess the impact of a wide range of traditional sources, several types of historic resources and documentation were consulted: plantation plats; extant plantation sites, their
historic fabric and archaeological findings; writings by plantation owners, including diaries and plantation record books; travel accounts; slave narratives; census records; and visual representations including paintings, sketches, and Civil War era photographs. Each resource presented both strengths and weaknesses in creating a clear image of the physical reality of the slave community. However, an overriding reality affecting the available documentation in the Carolina low country was the substantial loss of documents and extant historic fabric incurred during the Civil War.

**Plantation plats**

Land records form the basis of the historical documentation available for the purposes of this study. Land records can typically be found for all land holdings in a region, and as such provide the opportunity to, at least in theory, select an unbiased sample. The plantation plats that form the basis for this study were obtained from an exhaustive review of extant records in the Charleston Historical Society, Charleston County Register of Mesne Conveyance (McCrady Collection), the South Carolina Department of Archives and History, the Caroliniana Library at the University of South Carolina, and several plats from private collections. While there are undoubtedly additional records that were not included in this analysis, the largest public collections of plats were thoroughly reviewed. Over 10,000 land records were observed, yielding a total of 343 records that included information beyond the typical boundary lines of land plats, to show details of the structures, field patterns, vegetation, and spatial development of the plantation lands.

The 343 records documented 306 individual plantation sites (the remaining 37 provided multiple dates for several sites) spanning the period between 1764 and 1860. These 306 plantation sites were analyzed and categorized according to a series of 42 characteristics including date; ownership; regional location; size; type of crops; characteristics of the main house, if present; characteristics of the slave communities; existence and size of features such as gardens, orchards and cemeteries; distances between the main house and slave communities; and landscape relationships. Original plats were scaled in order to derive the distance and areal results. The data was analyzed to identify spatial patterns and correlated by date (decade beginning in 1760) and sub-region (parish and district) to detect sub-regional and temporal variation.

**Extant Sites and Archaeological Findings**

Several sites with extant historic fabric (Boone Hall, Drayton Hall, Friendfield, Middleton Place, Middleburg, McLeod Plantation) and 22 archaeological reports were reviewed. Many existing sites have not retained their slave quarters, and those that have (e.g. Boone Hall) have retained only those quarters in close proximity to the main house. Eight of the archaeological reports did some level of archaeological analysis on the slave settlements of the site. Archaeology was helpful in confirming locations of slave communities, and some features of their landscapes, particularly middens and cellar pits. Archaeological finds were most important in identifying architectural practices, types of food eaten and crops grown.

**Plantation Writings and Travel Accounts**

Although 306 plantations were identified and included in the research, it is rare to find corroborating writings or accounts for any given plantation, particularly writings which describe the slave settlements. This lack of congruence makes it difficult to confirm features identified on plats. In this study, historical writings were used to expand the results obtained from the broad analysis of the plats, providing a level of detail unavailable on drawings with a typical scale of 10 chains per inch (660 feet per inch). Writings were broken down into their component features, and correlated with features identified in slave narratives and photographs.

**Slave Narratives**

There are a large number of slave narratives and 1930’s era Works Process Administration interviews (Rawick 1972) recorded for South Carolina. However, few indicated any landscape forms or features. Slave narratives, written by freed or escaped slaves, were often edited by abolitionist editors, leading some researchers to call into question their authenticity (Blassingame 1975). Although these are narratives of first hand experiences in slavery, as a group they contain few descriptions of life on the plantations. On the other hand, the weakness of the WPA interviews are that they were recorded approximately 60 years after slavery was abolished: the individuals giving accounts were children during the time of slavery (Woodward 1974). In addition, the interviews were biased by the intent, reactions,
and questions (none of which focused on physical setting) of the interviewers, and the answers they solicited. As a group, they also record few physical features of slave communities and the spaces of plantation life.

Visual Representation
Collections of paintings - watercolors and oils - principally by Thomas Coram and Charles Fraser, provide the most comprehensive images of plantation landscapes in the Carolina low country circa 1800. These depictions, in addition to Civil War era photographs archived at the Library of Congress and the New York Historical Society, among others, provide the largest collections of visual representations of two eras of plantation form. Paintings and photographs were also systematically analyzed according to visible features and correlated with findings from the other documentary sources.

Findings
A wealth of information is available from plantation plats in the low country, particularly those completed by the surveyors Joseph Purell and Goddard and Sturgess. Although landscape features are identified, particularly on plats of more detailed scales, their greatest contribution is in defining the spatial organization of the plantation and the distances between features. Features commonly identified on plats include the size and location of slave communities, and the existence and location of graveyards, gardens, fencing and overseer’s quarters. While some researchers have commented that the slave quarters may have been identified using symbols, and do not represent actual placement or dimensions (Lesser 2001), the notations and level of detail and accuracy exhibited by both the in-office sketch plats and the final display plats argue against this.

The spatial organization and dimensions gleaned from the plantation plats are augmented by the ground level details available in narratives and images of slave life. Selected highlights of the findings follow, with an emphasis on divergence in results from other published research.

Spatial Organization
Low country plantations were designed primarily on the English model of early Georgian architecture and landscape. This plantation form endured, even through the changing fashions of the 19th century, primarily because it was a form that explicitly communicated the mastery and dominance of the plantation owner. While dominance was key, there was also a subtle dance of power that was enacted in the landscape, between frequently absent owners and the slave populations that vastly outnumbered them.

During the period of this analysis, 1770 to 1860, slaves were housed in two ways: either in outbuildings or main house flanks (characteristic of house slaves) or in groupings of cabins termed slave settlements or communities. One of the most pervasive theories of the location of slave communities in the literature, is the hypothesis that slave quarters were kept within sight of the main house to provide control over the slaves (Adams 1987 in Affleck 1983, 12; Prunty 1955). Slave narratives recorded during the 1930’s Writer’s Project cited this perception: “...Our house had one window jest big enough to stick you head out of, and one door, and this one door faced the Big House which was your master’s house. This was so you couldn’t git out ‘less somebody seen you” (Joyner 1991, 87).

While some slave quarters were located close enough to the main house for surveillance, the average distance of 429 feet to the closest slave community indicated by the plats was too distant for the type of close monitoring indicated by the former slave’s description. In addition, intervening vegetation, outbuildings and topography created effective barriers to surveillance. In 60% of the plats that exhibited sufficient detail to identify landscape features, physical barriers were located in the view between the quarters and the main house. These included stands of trees, gardens, fences, and topography. Of the remaining 40% of the plats, the fields and roads that intervened between the main house and the quarters could also provide visual barriers with tall crops or trees located along the field and road edges.

While placement of the quarters in close proximity to the plantation house would tend to suggest a watchful presence on the part of the plantation owner, this potential for overt control was tempered by the fact that the owner was not in residence for long periods of time. Health reasons dictated that white plantation owners vacate their plantations between March and November to escape the mosquito-borne diseases. While slave laws required at least the presence of a white overseer, an analysis of census records between 1790 and
1850 indicates that between 15 and 25% of plantations were left without a white presence (owner or overseer).

While some researchers have suggested that both owner absence and distance from the plantation house led to a more “African” expression of community form (Vlach 1993; Babson 1987; Twining and Baird 1991), this is not strongly supported by the existing plantation plats. Slave communities exhibiting an irregular form were extremely rare in the plantation plats of the low country, even on those plantations without a main house or overseers house. This finding indicates that plantation owners maintained strict control over plantation layout and community design, rarely allowing the slave communities a level of expression in the physical layout of their community.

Location of the plantation quarters took a number of forms that can be grouped and ranked into four general approaches, from the most to least common:

1. located at a distance from the plantation house
2. located in close proximity to the main house creating the form of a community centered on the plantation main house;
   a. in a row situated on either side of the avenue to showcase the quarters;
   b. in a few cases at the center of an active village, with the plantation house dominating the physical center.

These various approaches to physical design had significant effects on the hierarchy of space available to the slave communities. In most cases, the slave communities, the majority of which were in a street or grid pattern, did not have a plantation road leading through them. Thus the settlement could function as a community with defensible space and a hierarchy of private, semi-private and community space in the “streets” between the rows of houses. It is in this space that most of the photographic records of the quarters reflect an active community life. Conversely, the result of the placement of the slave quarters on either side of the avenue was a loss of community space. Instead of creating defensible space, with a perceptual community boundary, the street became public space, frequented by visitors to the plantation. Thus the sense of community, coherence and the freedom of the inhabitants to engage in social interaction was curtailed.

**Landscape Details**

Plantation plats can provide information about the volumes and spatial relationships the slave lived within - the physical setting of slave life - however, they contain few details about the view at eye level. These details can be gleaned from various sources such as traveler’s accounts, slave narratives, the infrequent visual representations of slave quarters in paintings and sketches, and views of slave quarters taken at the beginning of the civil war by photographers in the northern army. Olmsted (1854) provides the clearest word picture of the slave quarters available in travel narratives:

> After a ride of several miles through the woods, in the rear of the plantations we came to his largest negro-settlement. There was a street, or common, two hundred feet wide, on which the cabins of the negroes fronted. Each cabin was a framed building, the walls boardered and whitewashed on the outside, lathed and plastered within, the roof shingled; forty-two feet long, twenty-one feet wide, divided into two family tenements... Each tenement is occupied, on an average, by five persons... Each cabin stood two hundred feet from the next, and the street in front of them being two hundred feet wide, they were just that distance apart each way.... Between each tenement and the next house, is a small piece of ground, inclosed with palings, in which are coops of fowl with chickens, hovels for nests, and for sows with pig. There were a great many fowl in the street. The negroes’ swine are allowed to run in the woods, each owner having his own distinguished by a particular mark. In the rear of the yards were gardens - a half-acre to each family. (49-50)

Private and semi-private space was in some instances reinforced by the use of fencing between and behind the quarters. While this reference appears commonly in written accounts (Bremer 1853; Olmsted 1856) and Civil War era images (for example those made by Timothy O’Sullivan and housed in the Library of Congress), it is not commonly depicted in the plantation plats, appearing in only 15 of the reviewed documents. However, the insubstantial paling fences visible in the
photographs were likely deemed a marginal asset for the plantation and too ephemeral to record on plantation plats.

Judging from the available Civil War era photographs and written accounts, the immediate landscape around the slave quarters was largely functional and austere to white sensibilities (figure 4). The yards surrounding the quarters were swept, hard packed soil, a continuing contemporary practice documented by Westmacott (1998) in many rural communities in Georgia. As stated previously, slave narratives reveal very few details of the landscape, and when they do, focus on descriptions of field and crop practices. The ornamental use of plants appears to have been rare: they do not appear in any of the visual images, while a single WPA interviewee mentioned a recollection of morning glory vines climbing up porch posts

Us live in a log house wid a little porch in front and de mornin’ glory vines use to climb ’bout it. When they bloom, de bees would come a hummin’ round and suck de honey out de blue blees on de vines. (Rawick 1972, 173-174)

In many ways the slave communities took ownership of the larger plantation landscape. Although illegal and subject to severe penalties, it is well documented in the literature that slaves ranged far and wide even off their home plantations (Vlach 1993; Morgan 1998; Joyner 1985). The few archaeological reports that contain faunal analyses support the hypothesis that the slaves gleaned food and medicine from the natural landscape, foraging in the rivers, swamps, and forests (Trinkley 1993; Joyner, 1985; Blassingame 1972). The most significant claim to ownership of the plantation landscape on the part of the slaves were the plots of land allocated to each family for their own cultivation. Identified by other researchers through plantation accounts and other writings (Morgan 1983), their location, form, and to some extent size are largely undocumented. This study found one plantation plat that identified the size and location of slave fields. These plots were not a part of the larger landscape of rectangular fields, but were located on marginal sites, on the edges of larger fields and swamps. The produce from these plots were widely sold in local markets, and led to an accumulation of physical property and wealth by some slaves.

Although written documents indicate that slave land allocations were institutionalized in the low country task system of agriculture, the general lack of plat recording emphasizes the ultimate control of the plantation owner over the use and allocation of the land.

**Conclusion**

Although rather limited, the available documentation of the landscape of slavery does provide an intimate view into the life of the low country slave community. By comparing attributes of the landscapes across documentary sources in a structured, analytical method, both commonalities and unusual organization and features can be identified. This type of quantitative analysis of landscape variables provides a sound basis for proving or disproving hypotheses of the development and functioning of slave communities, and allows for the testing of hypotheses regarding their social and cultural development.

As the plantation plats demonstrate, much of slave community life took place far from the plantation house. This has been a drawback in the adequate interpretation of archaeological reports, which have focused largely on the main house complex and slave quarters in close proximity. In addition, due to the ephemeral nature of much of the slave landscape, and the inferior building materials used in their constructions, most of the above ground physical landscape features have been lost. By delving into the existing documentary and archaeological evidence, a more complete image of these communities as active living spaces can be formed.

**References**


Lesser, Dr. Charles. 2001. Personal communication. South Carolina Department of Archives and History.


Power Dynamics
Imprinted at Turn-of-the-Century: Reform Women’s Institutions and Boston’s Public Landscape

Suzanne M. Spencer-Wood

Introduction
Traditional urban histories that focus on landscapes created by men (e.g. Warner 1978) can be corrected with evidence of reform women’s significant impacts on urban cultural landscapes. In 1915 Beard’s *History of Women in Municipalities* described how women’s organizations created urban green spaces, including roadside plantings, parks, children’s playgrounds and gardens (Spencer-Wood 1994a). Women’s organizations were also leaders in the city beautiful movement and instigated some cities to hire male landscape architects for urban planning (Isenberg 1999). Feminists have shown that women’s organizations founded a wide variety of institutions in public, urban landscapes that had been identified as male domains (Spencer-Wood 1987, 1991, 1994b).

Since 1981 my research has identified and mapped 120 women’s institutions that challenged male dominance in Boston’s public urban landscape ca.1875-1925. Middle-class reform women manipulated the dominant gender ideology to make it acceptable for women to have public professions and institutions. They conflated and combined woman’s domestic sphere with man’s public sphere by transforming household chores into women’s public professions and institutions.

Reformers drew on women’s religious communitarian values to create cooperative housekeeping enterprises where domestic chores were removed from individual private households and performed by women cooperatively working together in public institutions. Some of the most popular types of cooperatives were founded by and for middle-class women, such as dining clubs and cooked-food delivery services that cooperatively cooked meals for a number of families. American kindergartens were initially founded in the 1850s and 60s for middle-class white children. Men’s high status scientific technology was applied to cooking in classes and schools of domestic science both for middle-class and working-class women (Spencer-Wood 1987, 1994b, 1999).

Figure 1. Map of domestic reform sites in Boston. Playgrounds are circled. Working women’s cooperative homes, predominantly in South Boston, including sites numbered: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 45, 58, 59, 62, 64, 65. Cooperative hotels where reformers lived include sites numbered: 1, 2, 3, 4, 5, 6. Schools and classes for women’s higher education include sites numbered: 22, 23, 28, 33, 35, 36. Women’s schools for domestic professions include sites numbered: 24, 25, 27, 34, 46, 60. Social settlements include sites numbered: 37, 42, 43, 44, 50, 52, 55, 56, 61, 63. Day nurseries and kindergartens include sites numbered: 38, 39, 41, 49, 51. Public kitchens include sites numbered: 29, 30, 31, 32 (Spencer-Wood 1994b, pp. 184-5).

Most cooperatives were founded by middle-class reformers to assist working women and their families. Childcare was socialized in charitable day nurseries and kindergartens. In public kitchens reformers offered inexpensive, scientifically cooked food to the working classes. Ellen S. Richards, the first female student and faculty member at MIT (1873), founded American public kitchens, where the scientific fields of dietetics and nutrition were developed. Women’s home health care roles...
were transformed into the fields of nursing and public health. Some reformers lived cooperatively together in social settlements, where they offered childcare and educational programs to people in surrounding poor communities, many of whom were immigrants. Many social settlements created children’s playgrounds or gardens in their backyards, roofs, or in nearby vacant lots donated by male landowners (Spencer-Wood 1987, 1991, 1994a, b).

The survey showed how locations of reform women’s institutions on the Boston’s public landscape were related to the locations of people that the institutions were meant to serve. Cooperative homes for working women—the most numerous type of institution—were founded in Boston’s working-class South End neighborhood, where many boarding houses were located to be close to places of employment in downtown Boston. Cooperative homes for working women were established to prevent the exploitation of women in mixed-gender boardinghouses that were viewed as immoral. Classes founded by middle-class reformers for working-class women were located between the South End and the Back Bay, where many reformers lived in cooperative hotels (where servants cooperatively performed housework so that women had time for reform activities). Most reform institutions, including day nurseries, public kitchens, and social settlements, were located in neighborhoods where they served the poor the immigrant working classes (Spencer-Wood 1994b).

The locations of reform women’s institutions could also be related to ethnic communities on Boston’s landscape. Many institutions founded by Anglo-American middle-class reformers remained in the same buildings for extended periods as the ethnic composition of the surrounding community changed with massive immigration (1880-1920). Parallel institutions founded by African-American women and by Jewish women were found to move over the landscape with the African-American and Jewish communities, respectively (Spencer-Wood 1994b).

Historic map data and field survey revealed that many women’s institutions were and still are the largest or tallest buildings in the neighborhood. Women’s institutions visually dominated many areas of the supposedly male-dominated public urban landscape. The large number and size of women’s institutions increased the public visibility of women and challenged male dominance in public landscapes (Spencer-Wood 1994b).
Women’s institutions in many cases demonstrated that women could contribute as citizens to the public good long before women were granted suffrage. In the municipal housekeeping movement women argued that they were the cleaners and beautifiers of the public household of the community and the wider world. In the city beautiful movement women’s civic organizations planted trees and flowerbeds in public spaces and held competitions for the most beautiful houses, lawns, and gardens (Spencer-Wood 1994a, 1994b).

As part of municipal housekeeping in large cities, reformers in social settlements and other institutions organized children to clean up the debris that collected on poor neighborhood landscapes that did not have municipal trash or garbage collection. Further, reform women gained appointments by male government officials to positions as street inspectors, garbage inspectors, and factory inspectors. Reform women created women’s trade unions and lobbied for passage of the Pure Food and Drug Act of 1906, as well as laws for a minimum wage and against child labor (Spencer-Wood 1994a, 2001).

The rest of this paper focuses on children’s playgrounds, gardens and parks created by reform women in Boston and other American cities. The reformers who created these urban green landscapes connected women’s religiously sanctioned, supposedly innate, piety with the closeness of women’s domestic sphere to God’s nature. Domestic women were considered morally superior because they were separated from men’s public, capitalistic practices of usury or price gouging, which were sins in the Bible and had been considered criminal behavior in the theocratic colonial state of Massachusetts. Reformers thought that contact with God’s nature would reform men’s “sinful cities of stone” that tempted children into gambling and delinquency. The physical dirt in poor neighborhood streets and tenements was viewed as immoral and corrupting, especially for children (Spencer-Wood 2003).

Historical information about American women’s organizations that created playgrounds corrects the neglect of women’s roles in the American playground movement by modern histories of the playground movement (e.g. Cavallo 1981, Macleod 1998, p. 66). Cavallo created an exclusively male lineage of leaders of the playground movement and claimed that early “sand gardens” created by women’s organizations were “irrelevant” to the later development of boys’ sports. Cavallo privileged the accounts of Henry S. Curtis, Luther H. Gulick, and Joseph Lee, who were early leaders in the playground movement. However, women who were leaders in the movement were not included in his account, which was uncritically perpetuated by Macleod (1998).

Feminist historians have researched how 19th century women raised their social status by elaborating their family roles, particularly women’s childrearing roles as mothers of tomorrow’s leaders, in what was called the Cult of Republican Motherhood (Spencer-Wood 1999). Reform women transformed childrearing from an innate task into a learned complex behavior that required training. Playgrounds were cultural landscapes expressing a major shift in cultural conceptions of childhood—from a view of children as miniature workers apprenticed at the age of 6 or 7, to a developmental view of childhood as progressing through set stages of growth. The idea that children required play to develop properly into adults was revolutionary (Spencer-Wood 2003).

Figure 3. Early Boston sand garden (Rainwater 1922, pp. 22-3).

Contrary to Cavallo(1981), Beard (1915) and Rainwater (1922) provided evidence that women’s organizations created the first supervised playgrounds both for young children and for older boys, leading to the development of the American playground movement. The first American supervised playground was a sand garden (large sandbox) founded in 1885 and operated in Boston’s Parmenter Street.
chapel yard by women of the Massachusetts Emergency and Hygiene Association. Dr. Maria Zakrzewska inspired the creation of a number of Association sand gardens in Boston missions following a trip to Berlin where she observed covered sand gardens (Spencer-Wood 1994a, 2003).

Following this first success the number of playgrounds grew, and in 1899 the Association conducted 21 playgrounds that included sand gardens, games, and “occupation work.” Total attendance and the days of operation had increased. The locations of playgrounds had shifted from predominantly mission, settlement, and tenement yards, to school yards, public parks, and a few indoor facilities. A photo of a Boston schoolyard “model playground” includes a patriotic march with a US flag on the left, fences to keep out so-called “disorderly elements,” some of who stood atop the fence to the rear of the building (Rainwater 1922, Spencer-Wood 1994a).

Donations of playground materials and equipment were replaced with a budget that grew to over $4,300 by 1899, $3,000 of which was appropriated to the Massachusetts Emergency and Hygiene Association by Boston’s School Committee. Volunteer women play supervisors were replaced with 66 paid women kindergartners under a female superintendent of all playgrounds. The Association also worked with the Boston City Park Department, which, in 1889, appropriated $1000 to grade and grass a playground to be managed by the Association (Rainwater 1922, Spencer-Wood 1994a).

In response to an appeal by the Association’s playground committee, the Boston Park Department hired the Olmsted Brothers to design the prototype “small park” of Charlesbank Outdoor Gymnasium, which was opened to boys and men in 1889. This was the first American park board facility to be designed primarily for play. Charlesbank was also the first American playground to be professionally landscaped. Areas for women and girls, supervised by the Association, were opened in 1891. The women’s area included a green lawn surrounded by a small track, sand gardens for small children, swings, seesaws, and wading, rowing, and bathing facilities. The men’s larger area included not only these features, but also a metal exercise apparatus. Trees, shrubbery, and a lawn separated play spaces for women and men. This park was copied in a number of other cities (Rainwater 1922, pp. 19-29, 72-3; Spencer-Wood 2003).

Other outgrowths of the Massachusetts Emergency and Hygiene Association playgrounds included the 1893 plan of Boston’s Metropolitan Park Commission to provide numerous small squares, playgrounds, and parks in densely populated areas of 11 cities and 25 towns. This plan included buying Franklin Field in 1894, and land for the Brighton playground in 1895 (Rainwater 1922, Spencer-Wood 1994a).

The Massachusetts Emergency and Hygiene Association’s playgrounds and methods were so successful that in the summer of 1898 the Mayor of Boston opened 20 schoolyard playgrounds. However, they discontinued the playground supervision by kindergarten teachers, which resulted in the desertion of the playgrounds “within a fortnight.” As
one boy complained, “there was nothin’ to do and no discipline.” So, in the summer of 1899, the city returned to providing funding to the Massachusetts Emergency and Hygiene Association to run the playgrounds by hiring kindergarten teachers (Rainwater 1922, pp. 31-2, Spencer-Wood 2003).

In 1901, Boston’s School Committee successfully made schoolyard playgrounds a part of the municipal education program, because they adopted the Association’s methods of supervision by kindergarten teachers (Rainwater 1922, pp. 31-35). This evidence shows how male governmental officials initially held views on operating playgrounds that were opposed to the views of women reformers. Further, this case shows how these male officials had to change their views and adopt the reformers’ methods of supervision in order to provide children with playgrounds that met their need for supervised play (Spencer-Wood 2003).

Historical evidence shows that Cavallo (1981, p. 23) was inaccurate in dismissing women’s sand gardens as predecessors “irrelevant” to the subsequent development of team sports for boys. In fact, aside from the Charlesbank men’s playground instigated by the Association, the earliest “model playground” to admit older boys was created in 1894, in Chicago, by Jane Addams’ Hull House settlement. And in 1897 the women of the Providence Free Kindergarten Association opened two playgrounds for older boys. In Boston in 1899, the women of the Massachusetts Emergency and Hygiene Association created the first three playgrounds for boys aged 12-15, and hired young male physical education instructors to supervise the boys’ games. On these playgrounds men worked for women, inverting normative gender relations in the public landscape. And according to Cavallo, team games were intended to teach children to integrate “feminine” values of cooperation, intuition, and public morality with “masculine” values of rationalism and individual competition (Cavallo 1981, pp.110-14).

The success of this experiment was apparent from its repetition the following year and subsequent adoption by the Boston school committee (Rainwater 1922, pp. 36, 56, 59, 194). In addition, the private Massachusetts Civic League founded by Joseph Lee established a playground in 1901 modeled on the example of the Association (Rainwater 1922, pp.31-35). This was not the first playground for older boys as claimed by Cavallo.

Contrary to claims by authors such as Cavallo (1981) and Curtis (cited in Rainwater 1922:19) that the latter individual man started the American playground movement, historic documents record that the pioneering women of the Massachusetts Emergency and Hygiene Association not only initiated the playground movement in Boston, but they also were consulted and used as a model by people starting playgrounds in the largest cities throughout the Eastern U.S. and in Manchester, England (Rainwater 1922, pp. 29-44). In the 1890’s, women’s clubs opened the first playgrounds from South Carolina to California (Beard 1915).

By 1895 sand gardens were common in school yards and women’s settlement houses across the country, usually supervised by female kindergarten teachers (Cavallo 1981: 23). In Boston and Cambridge playgrounds were established and equipped by most settlement houses (Spencer-Wood, 2003). Women’s organizations, particularly settlements, physically shaped the urban landscape by creating children’s playgrounds and gardens on vacant lots and schoolyards in cities across the U.S. (Woods and Kennedy 1911, Beard 1915, pp. 23-4, 133-9).

Women’s organizations persuaded men to donate land, materials and landscaping for their children’s gardens and playgrounds. For instance, in Boston, vacant land was donated and fenced by Edwin Ginn in 1908 so that the Elizabeth Peabody House settlement could create a large garden with 220 individual children’s plots. The children raised vegetables...
for their families and sold the surplus. (EPH 1911, pp.11, 16-17).
The Hawthorne Club of Boston, which was founded in 1900 for girls aged 5-10, but also included boys by 1910, gained permission from the owners of a block-length property to the rear of the club, to clear it of trash and garbage and equip it with swings, sand boxes, tilts (seesaws), and other equipment for a children’s playground, until the land was sold. The street commissioner reinforced the ground with gravel, and the park commissioner had shrubs planted around the border. In her book about the Hawthorne Club, Robinson (1937, pp. 11-13) noted that “As to the ethics of this cooperation I’m not quite sure as I look back on it, but my conscience does not trouble me greatly. Both city departments were moved by a sincere desire to help the children...” The Hawthorne Club and its playground closed in 1937.

Although it is not mentioned in any primary written documents that I found, photographs show that playgrounds and gardens were often integrated, reflecting the ethnic composition of the neighborhood. Some photos show supervised games in which the children were integrated in a circle or in rows representing teams jumping over a high rope. Other photos of children playing on swings and seesaws show that white children dominated and controlled the desirable playground equipment. Other photos show unsupervised play by African-Americans without equipment. Taken as a whole the playground photos suggest that reform women organized and supervised integrated games by children whose unsupervised play reflected white dominance and racism in the society at large (Spencer-Wood 2003).

Figure 7. Integrated organized game at Pine Street Playground, founded 1903 in Cambridge, Massachusetts (Brooks n.d.b. courtesy of the Arthur and Elizabeth Schlesinger Library of the History of Women in America, Radcliffe Institute, Harvard University.

Figure 8. Segregated free play showing white children monopolizing the see-saws at Pine Street Playground, founded 1903 in Cambridge, Massachusetts (Brooks n.d.b. courtesy of the Arthur and Elizabeth Schlesinger Library of the History of Women in America, Radcliffe Institute, Harvard University.

Figure 9. Segregated free play showing African-American children at the periphery of the Pine Street Playground, founded 1903 in Cambridge, Massachusetts (Brooks n.d.b. courtesy of the Arthur and Elizabeth Schlesinger Library of the History of Women in America, Radcliffe Institute, Harvard University.

Women also sometimes created citywide playground plans. For instance, in Hartford, Mary Graham Jones, renowned for her sixteen years of settlement work to improve the quality of life for city children and neighborhoods, submitted a citywide playground plan in 1914. The juvenile commission implemented the plan by leasing a dozen or more vacant lots from the city at nominal rent and preparing them...
as playgrounds under the supervision of the superintendent of parks (Beard 1915, p. 133). In Chicago, women’s clubs created a string of playgrounds across the city (Tuason 1999).

Beard stated that “Women have everywhere been largely instrumental in initiating the playground work, they have followed it in many cases by service on appointed commissions and as paid city playground employees, and in other cases they have held positions on state recreation commissions” (Beard 1915: 134). For instance, Lillian Wald created a playground in the yard of her Henry Street settlement in New York, became secretary of the Parks and Playground Association of New York, and was one of the settlement leaders who founded the Playground Association of America.

Wald’s small playground behind Henry Street settlement was enclosed with a high fence with overhanging trees and ivy climbing up the right wall. In the farthest corner there was a covered area with a hammock. Against the right wall was a small raised garden. Just left of the garden was a long narrow sand garden that is partly covered by an awning on a wooden tower. To the left of that are two swings, with a girl in a feathered hat in the right one and two girls on the left one (all white). And to the left of that is another hammock.

Children with TB were often placed in hammocks in settlement yards because fresh air was considered a productive treatment for TB. In the front of the yard is a piece of exercise equipment. Against the back wall is a raised sand garden with a number of children playing in it. This is one of the photos that showed that playgrounds founded by women’s organizations were integrated. An African-American girl is sitting in the chair on the left and an African-American boy is to her right just in front of the swing set. A few other African-Americans stood on the other side of the swings (Spencer-Wood 1994a)

**Conclusion**

Contrary to the claims of some historians, this research has revealed that the American playground movement originated in early Boston playgrounds, created by women’s organizations starting in 1885. Further, women’s organizations created and supervised the first organized playgrounds for older boys and girls in the 1890’s. Women who created playgrounds not only physically altered urban landscapes, they also subverted normative social geography, as women held positions of public authority over both men and women who were paid playground supervisors. In Boston and Cambridge a woman was superintendent of all playgrounds. In this way women broke into the male-dominated school administration hierarchy.

Through playgrounds women’s reform organizations empowered themselves both by creating new professional positions for women, and by increasing the number of female controlled public landscapes. Playgrounds and programs created by women’s organizations were so popular that older children often asked to be admitted to playgrounds considered too small to accommodate them.

In creating playgrounds, parks and other green spaces, women’s organizations used the domestic reform argument that women’s higher morality, closeness to nature, and domestic values of community and cooperation were needed to physically re-form men’s immoral, capitalist, urban landscapes of unnatural stone. Because women were perceived as innately superior designers of moral cities, women’s organizations instigated “green” urban designs and negotiated men’s cooperation to implement them.

The reformers financed their city plans, parks, and playgrounds with a combination of private and government donations of money, land, materials, and labor. They informally
negotiated government support and alliances with moral suasion, demonstrations of ability, and sometimes with public pressure through town meetings and referenda. In many towns and cities reformers successfully sought to have playgrounds permanently administered, maintained, and funded by municipal governments. Further, women were often appointed by men to formal government positions, such as Supervisor of Playgrounds, and as members of city planning commissions and playground commissions, although usually in fewer numbers than men.

Playgrounds and children’s gardens have been researched as female-created and -controlled landscapes that materially implemented one aspect of domestic reform. This research found that reform women’s organizations impacted urban public landscapes in Boston and other cities at many levels, from instigating the design of individual buildings, playgrounds, children’s gardens, and parks, to the design of small cities with green spaces.

Through a wide variety of reform activities, women’s organizations transformed urban landscapes and American culture by redefining the meaning of Victorian gender ideology to make it acceptable for women to have public professions. By increasing women’s presence in public landscapes and in government, the reformers demonstrated that women were effective citizens before they attained suffrage.

Public awareness of domestic reform has been increased through inclusion of a number of reform women’s institutions and landscapes on Boston’s Women’s Heritage Trails. The research described in this paper contributed 12 sites, starting with the first trail pamphlet by Polly Kaufman in 1991, followed by the five-trail book in 1998. The trails preserve the significant imprints of historic women’s institutions and landscapes on Boston’s public landscape and may help preserve surviving buildings. Commemorating women’s public sites is important in showing that historic women imprinted public as well as private landscapes.

The modern footprints of people walking Boston’s Women’s Heritage trails follow in the paths of historic women’s footprints as they walked across the public cultural landscape to women’s institutions. Modern women can see the increased visibility of women on public urban landscapes and observe how surviving buildings of women’s institutions visually dominate community landscapes. Modern women can be re-enfranchised of American women’s powerful past by learning how historic women created public built environments and landscapes that challenged male dominance on public urban landscapes.

References


------1991. Toward a historical archaeology of domestic reform. In The Archaeology of Inequality,


Power as Reflected in the Cultural Landscape: Sailors’ Snug Harbor, Staten Island, New York (1845-1900)

Sherene Baugher

Introduction
Sailors’ Snug Harbor (1831-1976), on the northern shore of Staten Island, was the first charitable institution and “home” built specifically for retired seamen in the United States. Robert Richard Randall, a successful New York merchant, died a bachelor. His will stated that his fortune and lands be used to establish “Sailors’ Snug Harbor,” a model institution to house and care for aged and injured sailors (Shepherd 1979, 15). Randall’s Snug Harbor provided a home for sailors from all ranks and classes. The buildings were grand and its grounds were park-like (Harlow 1976, 187). Each year, between six hundred and eight hundred retired seamen lived at Snug Harbor, supported by a staff of administrators, cooks, carpenters, gardeners, farmers, seamstresses, and washerwomen. In 1976, the institution moved to a new facility in North Carolina. Today the landscape is being transformed from a nineteenth century charitable institution to a twentieth-first century cultural institution.

Detailed documentary records kept throughout the history of the institution contain data on all aspects of life at the Harbor. At Snug Harbor, the retired seamen were all males, known throughout the institution’s history as “the Snugs.” Male and female employees also lived at Snug Harbor. While a few women lived in nearby towns, other women permanently resided in a building on the grounds called the “Matrons’ Cottage.” Archaeological materials also provide a valuable source of data on cultural landscapes (Baugher and DeCunzo 2003). The archaeological excavations at Snug Harbor reveal details of the everyday lives of the inmates and employees, as well as their uses of and alterations to the landscape (Baugher and Baragli 1987). This cultural landscape article discusses 19th century class, status, and power dynamics expressed in the buildings, artifacts, and landscape design.

Methodology
In 1985, I became involved with this site while I was the director of the City Archaeology Program at the New York City Landmarks Preservation Commission. Snug Harbor was being transformed by the city into the Snug Harbor Cultural Center, to include a botanical garden, a performing arts center, museums, and a park. In order to evaluate the archaeological resources at Snug Harbor, my colleagues and I researched and prepared a cultural landscape study and an archaeological predictive model (Baugher, Baragli, DeCesare, and Venables 1985). This predictive model identified those sections of the Harbor that had the highest probability of containing significant archaeological resources. In 1985, the construction of two new parking lots, storm sewer holding tanks, and an underground

Figure 1. Historic Buildings at Snug Harbor Cultural Center. Photo: Carl Forster.

Figure 2. Sailors’ Snug Harbor 1907. E. Robinson. Plate 2. From Atlas of the Borough of Richmond, City of New York. Map Collection, Staten Island Institute of Arts and Sciences.
electrical conduit line enabled the staff at the City Archaeology Program to examine the property impacted by the new construction. We tested in numerous locations, including the lawn in front of the main buildings, the yard areas of the Governor’s mansion, the Physician’s house, the Chaplain’s house (these were three top officials of the institution), yard areas associated with the sailors’ residences, and the yard of the female employees at the Matron’s Cottage. The artifacts, architecture, and landscape design, coupled with information from the documentary records, enabled us to interpret the consumer behavior of people who lived at these sites, as well as the power struggles within Snug Harbor.

**Power Struggles and Hierarchy**

Sailors’ Snug Harbor, like other 19th century charitable institutions, operated in a paternalistic manner. The Harbor was an enclosed community, which was emphasized by the fences and walls that separated it from the surrounding community of New Brighton. Within the institution, there was a clearly defined hierarchy, starting with the Governor (the director), the Physician, the Steward (assistant director), and the Chaplain, followed by minor officials, support staff, and ending with the seamen at the bottom. This hierarchy recreated on land the very strictly ranked society that existed onboard a ship.

Power struggles and hierarchy

Melville was the major transformer of this cultural landscape. He worked with leading architects, artists, and designers. To the original three elegant 1830s Greek Rival buildings, Melville added four dormitories, two gatehouses, extended the iron fence to enclose the property, had the main hall redecorated, and got paintings donated to the institution (Shepard 1979, 23-25). The built environment expressed the prestige and wealth of the benefactor, Robert Randall. The landscape visually conveyed that Snug Harbor was a model charitable institution at a time when many “charitable” institutions for the poor were simply very inexpensive workhouses. Architectural historian Barnett Shepherd (1970, 28) notes that “with its magnificent buildings surrounded by graveled walks and flower-

Figure 3. Bird’s-eye View of Sailors’ Snug Harbor, 1898. Postcard Collection, Staten Island Institute of Arts and Sciences.

The built environment of Snug Harbor reflects this hierarchy. There were two equally imposing identical homes built on opposite sides of the front of the property. These homes housed the two highest-ranking people at the Harbor, the Governor and the Physician. However, the Governor’s house was in a more prominent position than the Physician’s home, which was set back and aligned along a second “street” within Snug Harbor. In between the two homes and also facing the front terrace were the primary institutional buildings. These main buildings connected to the dormitories for the sailors. The support buildings (homes and work spaces) for the other employees (including the women) formed the center of the property, followed by farm buildings, pasture, and farm fields.

The documented rivalries between the Governor (Director) and the Physician reached intense levels between 1867 and 1884 when the Governor was Thomas Melville, brother of author Herman Melville. These rivalries were evident in their homes and yards. For example, each time improvements were made to one house, such as new paint or wallpaper, or the addition of a bay window, the other rival had similar improvements made to his house (Shepard 1979, 62). Because Melville, as Director, was in charge of the grounds, he was able to enhance the appearance of his property. For example, Melville added a fenced-in orchard of apples, pears, peaches, and grapes for his family, but no orchard was added for the physician (Shepherd 1979, 24). Melville had pathways, a circular drive for carriages, a small garden, and a pond added to his property, but the physician’s home lacked these amenities. Finally, Melville had Augustus Saint-Gaudens create a heroic statue of Randall for the front lawn (Shepard 1979); however, Melville conveniently had the statue placed near his home.

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bordered lawns it (Snug Harbor) presented the atmosphere of a grand resort.”

Melville was successful in doubling the enrollment to eight hundred sailors. The trustees appreciated his accomplishments and Melville was rewarded with steady increases in salary, privileges, and power that further separated him from the Physician, as well as from the other staff members.

![Figure 4. A nineteenth century drawing of the sailors at Sailors’ Snug Harbor. 1977. Cover drawing for Barnett Shepherd’s Sailors’ Snug Harbor, 1801-1976. New York: Publishing Center for Cultural Resources.](image)

Matron and Female Employees
The Governor, Steward, Physician, and Chaplain were officers of the institution, but the Matron was lower in the hierarchy. She directed the female staff, but she had to be literate, because her responsibilities involved keeping an inventory of all laundry supplies, bedding supplies for the inmates, and household supplies used by the female employees. There were marked differences in the salaries of the employees. For example, in 1889, the Steward received $166.66 per month, and the Matron was paid $50 per month. In addition to the differences in responsibilities and pay, there were other noticeable differences in the status of the Steward and the Matron. The Steward (Assistant Director), for example, always had larger and more spacious living quarters than the matron, who had to live with the female staff.

Archaeological Evidence
Melville required the inmates to work five hours per day for at least three days a week on the farm, garden, or grounds of Snug Harbor (Shepherd 1979, 23). Some of the inmates picked up litter, removed garbage, and “groomed” the grounds. The archaeological record shows that this work was concentrated on the lawn in front of the main buildings and on the grounds surrounding the homes of the Governor, Physician, and Chaplain. As a result of Melville’s required clean up, we found almost no artifacts from the period 1870-1900 in these areas. Melville sought to improve the grounds and undertook major grading operations along the front and western side of the property, and then added extensive plantings of trees, scrubs, and flowerbeds (Governor’s Quarterly Reports 1871). The archaeological data confirms these improvements with evidence of the plantings and garden paths.

![Figure 5. The Assistant Governor’s House at Snug Harbor. Photo: Sherene Baugher.](image)

![Figure 6. The restored 19th century Neptune Fountain at Snug Harbor. Photo: Sherene Baugher.](image)

The elegant grounds contrasted with the unadorned functional space (Spencer-Wood 2002, 178). Kitchen debris was found in the inner courtyards next to the inmates’ dormitories and in the yard of the low status.
female employees at the Matron’s Cottage. However, there was a noticeable difference in the diet of the seamen and the female employees. The women ate very inexpensive cuts of meat, mainly mutton, while the sailors had a varied diet of beef, pork, chicken, and fish, and various priced meats.

The archaeological assemblage reflects the known economic differences between the Steward (assistant director) and the female employees. Not surprisingly, the Steward and his wife could afford and did indeed have more expensive wares and a more varied diet than the much lower paid female employees. The Steward could purchase whatever goods he wished and could afford. The Matron and the female employees were given their household goods and their food by the institution. Because of a major salary differential, it is not surprising that the household of these low ranking female employees would have had less variety than the higher status household of the Steward. The archaeological record shows that there was great similarity in the material goods associated with the seamen/residents and the low ranking female employees.

Conclusion
Sailors’ Snug Harbor perpetuated on land the male hierarchy, power dynamics, and strictly ranked society that had existed onboard ships at sea. In turn, this charitable institution is also a reflection of the class roles that were at the foundation of nineteenth century American industrial society. The men and women were afforded a “safe snug harbor” in which to live and work. But within that same Snug Harbor, inmates, staff, and supervisors faced the economic and social limitations of their genders, classes, and occupations.

Today the buildings and the eighty acres surrounding them are being developed as a cultural center, but there is no agreed upon Master Plan. The various attempts at master plans have been highly contested by the leaders of the diverse cultural institutions residing at the harbor. Currently the site is being developed piecemeal with the contemporary institutions concealing the historic landscape. For example, open lawns and an outdoor stage are located on the grounds of the former hospital. The Staten Island Botanical Garden opened an elegant Chinese garden in 2001, although there was no ethnic or historical connection to the 19th century Euro-American sailors at Snug Harbor. The only 19th century landscape features that remain are: Randall’s Statue, the pond near former Governor Melville’s home, and the Neptune Fountain on the front lawn near the main buildings.

As designers attempt, yet again, to develop a master plan for Snug Harbor, they need to take a closer look at the site’s landscape history. It is important for any researchers undertaking a cultural landscape study to check the accuracy of the written documentation against the realities of the physical site, and archaeology provides a means to do that. Through excavation, archaeologists can uncover tangible, three-dimensional remnants of the past. These artifacts and landscape features can serve as visuals links between the past and the present. Archaeological interpretations and perspectives on Snug Harbor’s past should be incorporated into any master plan for the site. Many of the 19th century buildings have been adapted to 21st century needs, while the historic landscape has been almost obliterated. Lastly, the design challenge for Snug Harbor is to develop a new landscape master plan that can meet contemporary user needs and yet reveal this richly powered and gendered landscape.

References


Foster, Carl. Historic Buildings at Snug Harbor Cultural Center. Photo.

Governor’s Quarterly Reports. 1867-1881. Quarterly reports of Governor Melville, Director of Sailors’ Snug Harbor, archives of the New York Maritime College, Bronx, New York.


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Introduction
The creation of the Steele Indian School Park, a roughly seventyfive acre public space set in the heart of the City of Phoenix, is the result of a persistent and long-term public commitment to the concept by various actors in the public and private realms. The park was recently inaugurated and opened for public use and is a culmination of some fifteen years of mobilization and master planning effort initiated by various agencies of the City of Phoenix. The fifteen-acre entry garden to the park, designed by Stantec, (prime consultants) and Ten Eyck landscape architects (sub consultants), builds on themes developed over several years in city-initiated planning and visioning exercises. The park and its evocative entry garden have been acclaimed a success by the media and public. The park is thus the concrete manifestation of a cooperative and long-sustained effort by numerous public sector entities and the creativity of a committed landscape design team. Their efforts have resulted in making possible a public space replete with meaning, history, ambiance and, most importantly providing a democratic, public space, of high utility.

This is a significant achievement given that the site for this park is one of complex history as a former boarding school for Native American children. Described as a school for “assimilationist education to solve what was perceived as The Indian problem” the school was a product of the cultural framework of the decades between 1890 and the 1930’s. Memory and association to place and site are derived from this sometimes-painful history.

Francis and Hester in their book The Meaning of Gardens: Ideas, Place, and Action make the case that gardens, particularly public, urban gardens must serve multiple users and allow for the vesting of multiple, and layered meanings. Their typology of meanings vested in gardens includes - faith, power, ordering, cultural expression, personal expression and healing. Francis and Hester posit that gardens are spaces of ideas, of place, and of action. Observations and interviews of users of the Steele Indian School Park, particularly its entry garden, described later, corroborate this. The Steele Indian School Park appears indeed to have become a public park and urban garden, proximate to a variety of users, and successful in evoking multiple and layered meaning and utility.

In the execution of this project the City of Phoenix faced a responsibility to create a park, which respected the site’s conflicted history but also provided a public amenity accessible and welcoming to all. The complex history of associations with Native American communities was to be acknowledged and respected. But, as a public park, the needs of users oblivious to this past were also to be met. The City of Phoenix and the Stantec/Ten Eyck design team partnered to produce a significant public space, which has been critically acclaimed. Two aspects of this project are investigated in this paper:

1)The nature of the collaboration between public entities (with claims and constraints on the design and development) and the landscape design team.

2)The perception and experience of the finished product, a public park, by users of the park.

These serve to illustrate that the design and implementation/maintenance of great public spaces results from sustained effort by multiple entities and actors who commit to, and invest in, the acts of place making. The designer’s role is essential, transforming the rational, logical, pragmatic and mundane needs to blend with the aesthetic, mythical, and conceptual so as to create evocative, aesthetic space. But in public place making it is insufficient without sustained planning and community commitment. What one learns from the making of the Indian School Park is that when these two ways of committing to the ideal of creating a democratic, historically responsive space come together they underpin and enable creation of an evocative and functionally responsive public space.

Making the Park: A Collaborative Venture
The Land: The Phoenix Indian School was founded in 1891 on land which was then outside the city limits, and is now considered central Phoenix located as it is just 2.5 miles north of downtown. It is among Phoenix’s most significant historic and cultural properties.
At one time there were approximately 100 buildings on the site. In 1990 the federal government officially closed the school selling most of the land to a private developer but designating a twenty-acre parcel within the school property for use as a city park. In December 1991 Phoenix City Council executed a Development and Disposition Agreement (DDA) with this developer trading 7.5 acres of city-owned downtown land for 54 acres of Indian School property, thereby making available 75-acres for a public park at the Indian School site.

As a member of the city team and on the Phoenix Indian School Task Force, James Burke, Deputy Director, City of Phoenix, Parks, Recreation and Library Department has been involved with this project since 1986. He has followed it through from discussions of the potential of the site, through the land acquisition, master planning process involving significant input of publics to the conceptual design. He has worked with the project through design and construction phases, and now, as components near completion he provides oversight and support essential in resolving issues of continuing park maintenance and protection. He thus has a unique overview and understanding of what makes for success. In this he identifies a highlight of the process noting that during the master planning stage a number of tribal entities came together and created the concept of six tribal regions in Arizona – Navajo, Hopi, Apache, Desert, River and Pia. They recognized that the Indian School Site was neutral ground to most tribal members since they had a common experience there. This was the first time that all the tribes got together in this fashion and the idea was incorporated into the garden design with six spiral gardens off the main entry garden.

The Master Plan Task Force defined the park’s mission as four fold – recognizing the cultural historical character of the site; creating a scenic and pastoral park for a modern urban setting; enhancing the quality of life for Phoenix residents with an accessible, safe, diverse setting for recreation, leisure and cultural enrichment; and, providing access to all. The mission was adopted in March of 1992. This led to the Phoenix Community Alliance committing to raise $7 million in private donations for the park. The Steele Foundation, the creation of native Arizonan Horace Steele, donated $2.5 million and the park bears his name. The Task Force report describes an intense effort, which followed: completing a site inventory; analyzing the assets of the site; and, obtaining public involvement in program elements. A preliminary master plan was developed which guided and gave direction to the design of the landscape architect team of Stantec (prime consultant) and their design sub consultant Ten Eyck Landscape Architects.

This Preliminary Master Plan (Fig. 1) located the main approaches to the site and identified the practical and utilitarian needs, which were to be served by the park. The search for symbols with which to reflect the past are conceptualized and an effort made “to balance Native American traditions with modern park planning ... providing meaningful amenities to the surrounding neighborhoods and the other residents of Phoenix.” Towards this end four plan areas were delineated: Entry Gardens, Circle of Life, Neighborhood Park, and Phoenix Green. Three access points to the site were defined, water elements were established as critical and integral to the plan, and three buildings of the former Indian school (the dining hall, the band building, and the Memorial Hall with a war memorial) were identified for preservation.

The Stantec/Ten Eyck team of Landscape Architects built on this base of information and analysis. Elements of the preliminary master plan were refined to create an evocative, and sophisticated design in which is embedded...
the sensitivity to the past, and the spirituality to also break with this past to posit a healing present and future. The design allows for an optimistic future. It cherishes the past, seeks to educate about it, and yet embraces the needs and culture of the present. This embrace includes a heightened sensibility about conserving resources and respecting the regional and indigenous in the landscape.

Figure 2. Conceptual Master Plan.

Asked to reflect on her approach to working with social factors in the design of the garden Ten Eyck notes that she is acutely aware that public work such as this garden touches many lives. Also, that the site is one to which Indian children some as young as five were brought here, taken from their families by force, their traditional clothing replaced with military uniforms, and, flying in the face of their traditions and taboos their hair was cut. The school was the instrument with which Indian children were to be taught to break with their pasts, so that “the sward gave way to the spelling book.” The Ten Eyck design sought to recognize this past, to honor it, quietly and with reserve, in keeping with the demeanor and traditions of the tribes. This is most particularly manifest in the 15 acre Native American entry garden south of the site approached from Indian School Road. Ten Eyck states: “The entry garden design was inspired by comments from the tribes that they would like to be enveloped by the earth and surrounded by their native plants. We designed a half-mile trail that spirals gently down into the earth. The retaining wall that forms the spiral was built out of the broken slabs and foundations of the 100 buildings that constituted the Indian school and the walkways that connected them which were all over the site.”

The design offered an innovative solution to disposing of vast amounts of demolition concrete and symbolic value. Thus the connection to the past was consolidated literally, in concrete, in the retaining walls of the new garden.

Reflecting on the design Ten Eyck states,

*We were very inspired by the words of the Native Americans who had participated in the community workshops. We took these words, and the poetry of the tribes, and sandblasted them into the concrete slabs and columns throughout the entry garden and the circle of life.*

One of the most memorable statements came from the Navajo Nation Design Team involved in the general master plan. They provided the ethos for the design in the thoughts of an ancient Indian Spirit as follows:

*I have visited this place often. In my dreams. It is a place filled with magic and power. It is here that the past and the future can be bridged. It is here we can find ourselves.*

and further:

*Without our past, we have no future. The future springs from the past and makes a bridge. The bridge is education. Only through knowing our past can we plan for our future...*

The design development by Ten Eyck has graphic clarity and vision. A soft but clear axiality is imposed. The planting, pathway patterns, entry ways, and water elements speak in plan to the inter-connectivity of the park, and articulate the different zones and their characteristics: the neighborhood park accessed through the west entrance; the Phoenix Green, symbolically cut by a water channel which connects the Grand Canal to the “Bird Pond.”
The overall design is integral yet allowing multiple, diverse zones offering various and different spaces for “ideas, place, and action.” The neighborhood park includes space for organized activities: basketball, volleyball, tot lot and playground with an interpretive canal system. The Phoenix Green offers more than 30-acre grassy, tree-shaded terrain with ramadas for picnics and quiet respite. The Conservatory/Amphitheater for special events related to the marketplace and festival areas. A circular sidewalk, the four cardinal points marked with ramadas that emphasize the sacred directions, circumscribes the Historic Core of three buildings. Delineating the circle of life the pathway provides a sacred closure within which 28 custom designed interpretive columns (which have won a national interpretive award) speak of the history of the school.

A design focus is the entry park. It is approached from the North over a bridge symbolically and literally allowing a crossing from the “military” historic school area over a small lake to the “wild” native, sunken entry garden. The garden is traversed by way of an east entry spiral path (taken from the migration symbol in Native American rock art) sloping gently down (wheel chair accessible) allowing the garden to touch the earth. Six regional gardens for the tribal groups, yet to be built, are spirals that work off this each with an east entry. At the heart of the garden, at the end of the spiral is a baptismal-like cistern gently overlapping water at its edge (Fig. 3). The plantings, yet to mature, of indigenous plants of the Phoenix hinterland region, change as one moves down into the earth. The upper spiral is edged with plants from the high desert, gradually giving way to those from the low desert and ending at the cistern in a bosk of water-loving trees to be found in riparian areas in the region.

Figure 3. View from the South of the Entry Garden.

A thread of connecting water from the fountain at the top (Fig. 4) to the Ramada Figure (Fig. 5) to the cistern at the spiral’s center (Fig. 6) provides an integral visual and symbolic link. Water connects the elements of the park from the Grand Canal running to the north of the site, which has historically made viable the contemporary Phoenix settlement, to the heart of the entry garden with its symbolic representation of the Native American sensibility and cosmic view.

Figure 4. Fountain.

Yet, as the view from the Circle of Life looking to downtown Phoenix (Fig. 7) indicates, the park and the garden are connected to and an integral part of the city fabric. It illustrates how the park functions as an oasis and a respite from the big city reality of high-rise towers, traffic, and the hard scape of streets and footpaths.
An oasis has been created which adds to the quality of life in the heart of Phoenix.

Walking through the park with Ten Eyck her commitment to the entry garden design is palpable. She tightens wires and stakes to plants as she guides students down the spiral and explains the design concept. She brushes rocks and gravel on to either side of an imaginary curved line which is in her minds eye and on the conceptual design, runs her hand over the chipped edge of the cistern which a vandal’s hand has damaged, as though to heal and mend. It is vividly clear and easy to understand, as one watches her, that a great symbolic space and public art such as this is created and survives with the unstinting commitment and support of many, and diverse, hands. The success of this project and other in a similar democratic and public domain, in the long term, rest on a significant number of stakeholders who must buy into the premise of the design, cherish it, maintain and protect it. In this particular space they include: the diverse public who uses the park; the parks department that cultivates and maintains it; and, the authorities that will approve or deny continuing improvements and amenities. Even this abbreviated history of the evolution of this park has surfaced the give-and take involved in forging the collaborations that have resulted in this evocative design and will play a significant role in its future successes.


How do users of this new public space experience it? This question was asked by senior Landscape Architecture students in the Social Factors in Landscape Architecture course at Arizona State University. They were challenged to gauge the impact on park users of the designer’s intentions, particular those embedded in the entry garden’s symbolism. Students interviewed some fifty park users on weekdays and weekends, at different times of day during September 2002. The interviews were “opportunistic”; of park users who were ready and willing to converse. They do not constitute a representative or systematically drawn sample or cross section of park users. They do however reveal that the park and the entry garden successfully provide multiple meanings and afford different opportunities to the various constituencies who claim and use this new facility. Of the fifty or so interviewees, some 24 were women and 26 were men. Those interviewed varied in age from teenagers and young adults to senior citizens. Users of the park who were interviewed included residents of a nearby senior center and the patients in the Veterans Hospital to the East of the site. They constitute a significantly vulnerable group who are being served by the park.

The Shadow of Past History: Experiencing the connection of the garden with the past was most apparent, as one might expect, in interviews of a group of three Native Americans, two
women and a man, who were visitors from the San Carlos Indian Reservation east of Phoenix near the town of Globe. They were visiting the park to relax after the man had sold two of his kachina dolls to a store in Scottsdale, a city to the north east of the park. The interview revealed that one of them, an Apache woman in her forties, had been a student at the Indian School from 1974-78. She remembered the school fondly and likes to visit the garden whenever she can. Her favorite area of the garden was where she was sitting with her feet in the water when the student interviewer spoke with her, in the shaded area around the cistern at the core of the spiral. Her responses indicated that she was obviously very aware of the history of the site, aware of the park’s name which held tremendous meaning for her, and very proud of the park. She said she thought it was a beautiful place. Her major complaint was that there were no barbecue grills where they could cook food, eat and relax. Her male friend, who claimed to be a well-known Native American potter, also visits the park on his visits to the city to sell his artistic products. He made few comments about the design except to say that he too wished there were barbecues to cook on. This anecdote serves to underscore the fact that a public park, albeit one heavy with symbolism, history, and association, must also function, even for those for whom these associations are immediate and personal, for action and for use in the more mundane activities of recreation and relaxation. Designer Ten Eyck and Park Director Burke on reading these comments have pointed out that now, a year later, the park is replete with barbeques. Their immediate observation underscores their ongoing investment in making this a responsive space. Also that this is a work-in-progress wherein many of the users wishes, such as for instance “more shade” will also in due time be addressed.

Another Native American couple in their late twenties was interviewed by another student who learned that they were visiting the park and entry garden for the first time. The couple was from Flagstaff and had heard and read about the park and come to see it first hand. The history of the site was a significant part of their interest and experience of the site and they enjoyed the play of water through the park. However, they did not like the feeling of the three remaining school buildings, which have been slated, for renovation and preservation. They expressed discomfort with what the buildings represented from the past and wished they would “just be torn down.” For the above five Native Americans the park was a space of ideas. However most of the park users interviewed had little direct relationship to, or significant awareness of, the history of the site. They came to the park for the different opportunities to recreate, exercise and relax that it offered. For example:

- Those with younger children visited the neighborhood park in the North West corner of the site. Some of these users never walked to other parts of the park and some were oblivious to the history of the site. What they enjoyed was the safety, the lack of crowds, the new play structures and the fact that the children could play in or near a body of water. Some had noticed the inscriptions on the concrete columns in the Circle of Life others knew that this was a site of a former Indian School but they paid little or no attention to this fact. For them the park was merely a space of action.

- Health workers at the adjacent Veterans Hospital care facilities and business people from adjacent offices came to the entry garden’s cistern to have their lunch or to take a mental and spiritual break from their jobs. The park afforded a physical, healing respite from the pressures of their job. For them the park was a space of healing.

- In the early morning and in the evening residents from a one or two mile radius came to the park to run, roller blade or walk their dogs. The park afforded them open space, greenery and shade. The joggers knew that the spiral path measured a half-mile and could track their effort. The water on the site offered a cooling element in which to rest tired feet or cool a flushed face. For them the park was a space of action.

- Patients who came to the Veterans hospital found the park to provide a tranquil and refreshing break from the work of physical recovery. Veterans, especially those in wheel chairs, appreciated the fact that the park, including the spiral down to the cistern, was accessible. They came to it to escape from the confinement of their health care facilities. For them the garden was a healing force.
Two teenagers came here after high school, recognizing it as a safe place to spend an hour or so before their parents, who worked in the area, could pick them up and drive them home. A man who was thrown out of his home came to the park to wait out the time and think through what he would do next. Several student interviewers commented on the fact that homeless people appeared to be at the park at different times. For all of them the park was a space of refuge and security.

A senior woman, a nurse in her sixties who took a walk in the park everyday and two of her friends met once a week to pick up dog poop in the garden and clean up the park. With this involvement they appropriated and claimed the park as their own and contributed effort to sustain and maintain it. For them the park was a physical space of action and appropriation.

Most of these park users indicated little awareness of the past and the history of the site. Some had read the text on the concrete pillars and the concrete pavements of the entry garden. Thus the park had served to educate and sensitize. But predominantly for them the park functioned effectively as a place that responded to, and celebrated, the immediate needs of place and action for current enjoyment.

Frances and Hester (1990) argue that one cannot understand the meaning of gardens without recognizing that they represent an interplay of place as idea, as physical space, and as action.

The interviews of the Steele Indian School Park users reveal each of these aspects. As an idea the park and the garden are conceived so as to symbolize the historical experience of Native American and white colonial beliefs and values and to speak to reconciliation and recognition. As a physical space the users expound on the experience they have of open space, and hope for bigger trees and more shade. As a place of action they speak to the park as a place to bring children to fish, to climb, to bring the dog for a run and tire him out, to jog and do exercises, to interact in groups, to celebrate as a community and, to find a place to rest and to recreate. People who were interviewed experienced the park in some or all of these dimensions. The multi-function Indian School Park with its discrete and different zones was perceived and experienced as a multi-meaning place, reflecting culture, memory, but also squarely situated to respond to present and future needs. This brief rendition of the processes and actions that have resulted in this fortunate result serves to underscore that partnerships and collaboration of various constituencies, over more than fifteen years, were essential in this success. They have made possible the addition of an evocative, significant, public space to the heart of the City of Phoenix. The Phoenix Indian School Park case corroborates a central thesis of this paper, that long-term, sustained planning and design effort, involving partnerships, participation and trade-offs between various constituencies who are stakeholders in a city entity, is an essential ingredient to the creation of democratic, communal space that can sustain and reliably provide private meaning and public amenity.

Notes
1 The various agencies associated with developing a master plan for the park include City Council members, the Phoenix City Parks and Recreation Board, the Mayors Office, the City Managers Office, the Navajo Nation, the Phoenix Indian School Task Force (consisting of twenty three prominent city leaders and professionals and citizens), the Parks, Recreation and Library Department, and City Planners and Staff. The names of those involved are noted on page i of the Phoenix Indian School Park Master Plan Task Force Report, January 1993, where it is also noted that the Task Force report builds on and draws from the Phoenix Indian School Specific Plan 1992 prepared by the City of Phoenix Planning Department.

2 The Steele Indian School Park received a good deal of attention as it has been the site of major public gatherings such as the September 11 memorial events in 2002, the fourth of July gatherings in 2002 and 2003. It has received support, sometimes qualified, from Native American leadership. See for example, David Schwartz, “Tribal leaders give park a chance” The Dallas Morning News, Texas and Southwest, Thursday February 7, 2003, pg. 23A.


By 1900 the second largest Indian school in the nation the Phoenix Indian school played an instrumental role in the emergence and maturation of the federal government’s Native American education policies in the 20th Century. Students came to the school from throughout the country, but a majority was from Arizona. In 1935, at the height of its growth, there were 900 students attending the school. It was at this time that the curriculum changed from vocational training to traditional academics. The school’s most popular features were a marching band (the building for which still stands and will be preserved and rehabilitated as funds become available) and athletic program.

The land was sold to Barron Collier Companies, in exchange for more than 100,000 acres in the Florida Everglades and a $35 million cash payment to the Arizona Indian Education Trust Fund.

See Phoenix Indian School Park Master Plan Task Force Report January 1993, City of Phoenix, pg. 7 for details of the complex negotiations and land transaction which were needed to acquire this property and assemble this significant parcel of land for the park.

As a member of the Parks department staff involved in the project, Burke describes the Phoenix Indian School Task Force as a broad based, highly influential and politically powerful group that was committed and contributed to the Master Planning process. Personal Interview with James Burke, March 10, 2003, City of Phoenix, Parks, Recreation and Library Department. Page i of the Master Plan lists the following groups who are involved: Mayor and City Council, Past City Council members, Phoenix Parks and Recreation Board, Mayor’s and City Manager’s Offices, Navajo Nation, Phoenix Indian School Task Force (consisting of 23 prominent and influential citizens including landscape architect Steve Martino), Phoenix Parks, Recreation and Library Department and City of Phoenix Planning and Historic Preservation Staff.

Four concept plans were developed through various public forums. Three of these were produced by the City of Phoenix Parks department and one by the Phoenix Indian School Coalition in conjunction with the Navajo Nation Design and Engineering Service and the Tribal Architect. The themes of the four plans were – Romantic Park; Cultural Center Park; Museum Park; and Native American Conference Center. The preliminary master plan was developed to respond to a combination of these concepts.
Design with Nature: The South’s Evangel
Sarah Georgia Harrison

Introduction
Industrialism and land development in the South lagged behind that of the rest of the nation for the period following the Civil War until the latter part of the twentieth century. The poverty that left the region out of step with the national pace of growth also fostered the preservation of a culture, an agrarian way of life and a spiritual connection to the land. Because of these conditions the land was largely unspoiled by development. It was the vision of Robert E. Marvin to help the South learn to capitalize on this distinction, by teaching and practicing an attitude of land stewardship and development that he hoped could inspire the South to avoid many of the mistakes perpetrated by other regions of the nation. Inspired by early modernists practicing two thousand miles away, Marvin applied the social, environmental, and design objectives of modernism to the South, and adapted these ideas uniquely to the region.

Early Years
Robert Marvin (1920-2001) was born in isolated, agrarian Colleton County of the South Carolina lowcountry. Grandson of a rice plantation farmer and an only child, Marvin explored the native swamps and forests throughout his early years, developing an affinity for the land and the natural environment. Observing the work of Innocenti & Webel at the Bonnie Doone Plantation, where his father was overseer, Marvin acquired an understanding of landscape architecture at an early age. Following a degree in horticulture from Clemson University, time in the Pacific theater in World War II, and graduate studies in landscape architecture at the University of Georgia, he established a practice in 1947 in the small town of Walterboro, in the heart of his native county.

In the rural culture that dominated everyday life for the Marvins, elements of gentility and grace were commonplace. Anna Lou Carrington Marvin describes with poignancy how her future husband Robert won her heart with the presentation of a single camellia flower, freshly cut from his father’s nursery. A day’s trip in the car would not be undertaken without a lunch of roast beef sandwiches and deviled eggs packed by Grandmother. A visit never passed without the entreaty, “Please stay for supper.” Lemonade, fried chicken livers and blackberry cobbler were readily shared with friends and acquaintances alike. Southern folkways emanated from the kitchen, but filled the community as surely as the Spanish moss dripped off the trees.

Well-rooted in these social traditions, Marvin opened his practice with the support and connections of his family and friends. His first commissions involved work on nearby plantations. Guided by traditional plantation texts such as Plantations of the Carolina Low Country, Prince Williams’ Parish and Plantations, and Historic Houses of Early America, Marvin’s early designs were reflective of the traditional conservatism of Southern landscape design, using the vocabulary of Renaissance, baroque, and American neoclassical traditions (Howett 2002, “After the “Other” War: Landscapes of Home, North and South” p.166). Formal gardens were located close to the house, surrounded by a grove of trees, or forest, and an asymmetrical arrangement of the lawn.

By 1964, when Marvin worked on Orange Grove, a historic rice plantation near Beaufort, his method was quite different. He approached the client with ideas of revitalizing the architecture, “exploding the box” by revealing views to the marsh from inside the house and making powerful connections to the landscape. A prolific reader, Marvin was aware of the designs of his contemporaries in architecture and landscape architecture and was refining his own ideology as his work progressed. There is evidence indicating that he was especially...
influenced by the work of landscape architects Garrett Eckbo and James Rose, as well as architect Frank Lloyd Wright.

**Design Development**

His design exploration was perhaps first expressed in the redesign of his own house in the early 1950s. Within the context of an avenue of white-columned colonial relics, Marvin redesigned his small, traditional house to focus on the walled garden of the backyard, fronting the street with a low-profile façade, painting it brown, and putting granite screenings for parking in front. In keeping with the modernist ideas of his California School contemporaries, he integrated the house and garden by constructing a glass wall to stretch the length of the house, designing pavement and planters to align with the mullions of the glass panels, and bringing the floor patterning inside. His play on the notion of free space between inside and outside was driven by his love for nature and expressed with the optimal orientation of the angles of the house at fifteen degrees east of south and the shadow patterns of one specimen tree.

Additionally, Marvin’s early explorations of the lowcountry swamps instilled a deep attachment to the natural environment. He readily incorporated ideas from the environmental movement of the 1960s and 1970s into his own design philosophy. His office, designed in the 1970s, was the classic example of his ideology in action. Built as a demonstration of his philosophy for his clients to see upon their arrival, the office was designed by Marvin and his associates to “knock the walls down and let nature in again. The environmental movement proves that man needs to get out of his box that technology has created. He needs to wrap his arms around nature” (Marvin in Thompson 2001, “Robert Marvin, FASLA, 1920-2001.” p.13).

The private residence of James Rose bears striking similarities to Marvin’s, including the floor pattern, spatial definition, plate glass window, and pergola. The design of Marvin’s garden is reminiscent of a design by Thomas Church, with the angular beds played opposite the curvilinear, the screen fence, and the placement of the specimen tree. While there is no direct evidence that Marvin emulated the Rose house or the Church garden, it is clear that contemporary modernist thought pervaded his design.

Additionally, Marvin’s early explorations of the...
Nature engulfs the visitor to his office. The one-lane sandy entrance drive through the swamp forest separates the visitor from the outside world, and leaves him wondering if he is going to the right place. Upon arrival there is an even greater surprise. Rather than set on the high ground, the building is suspended over the low, boggy woodland. The swamps penetrate the structure, and it is set amongst the trees like the nest of some native species. While some plants were selectively removed, no new plantings were added. A post and beam structure with no foundation, the architecture was designed by Marvin and members of his staff because he could not find an architect that would do what he wanted (Beach 2003).

While it is not an architectural masterpiece, the simple structure is effective because of its integration of architecture and the landscape. The friction piers are the only place the building touches the earth. Marvin’s design approach for his office was clearly adapted from the organic architecture of Frank Lloyd Wright, who attempted to achieve a “noble expression of nature,” wherein the building cannot be conceived separately from the site. From the Prairie houses to Taliesin West, Wright “sought to discover the essential character of the regional landscape in order to generate an appropriate architectural style” (Howett 1993, “Modernism and American Landscape Architecture” p. 23). In achieving a careful integration of building and site, Marvin infused a sense of the Southern region into his work, and with its rich narrative content he conveyed a clear sense of the value of building with nature.

This design philosophy was implemented at Jones Bridge Headquarters of the Simmons Company in Atlanta in the mid 1970’s. The headquarters was sensitively sited in the fragile woodland environment of the Chattahoochee River. In an example of the modernist “less is more” minimalism in detailing, Marvin’s low impact treatment of the parking lots emulated National Park standards with a sinuous design around existing trees and no curbing. Another classic example of his Southern regional approach was demonstrated at Southern Progress Corporation in Birmingham, Alabama. This corporate headquarters was...
inserted into a steep, woodland site, spanning a ravine. Recirculating water features were added to enhance the sense of one’s immersion into the forest. Monarch at Sea Pines pulls the visitor away from the traffic and overcrowding of Hilton Head to another world, where, despite the density, one can feel immersed in the natural scene.

In the conversion of Brays Island Plantation to a residential community, Marvin selected the house sites to best suit the land and views of Port Royal Sound, then drew a one acre circle around each site to form the lot. The roads were constructed to connect the lots together, instead of the more common approach of laying out the roads to accommodate the maximum number of marketable lots. Marvin was clearly influenced by Wright, whose land planning for “The Acres” and “Usonia II” utilized the notion of the one acre circle optimal lots (Aguar 2002, pp. 252-257).

His own house at Brays Island again shows his design philosophy of the integration of man and nature. While today’s wetlands laws would not permit building so close to the water, Marvin’s use of post and beam construction with friction piers is evidence of the dramatic effect that can be accomplished on fragile sites with minimal impact.

**Ideology**

While these ideas may not have been new to the nation, they were new to the South, whose resistance to modernist designs was rooted in conservative traditions and appreciation of the historic styles. The most acceptable modernist designs in the South were houses in natural woodland settings, because they evoked a cabin-like feel, reminiscent of vacation cottages. Derived from ideas of Frank Lloyd Wright’s organicism, as opposed to the dictum of the International Style of Europe, separating architecture from nature, the house in the deep woods was, for Southern sensibilities, an acceptable variation on the notion of the grove of trees set against the lawn (Howett 2002, “After the ‘Other’ War: Landscapes of Home, North and South” p.176).

With his practice located in such a remote place, Marvin could easily have insulated himself from contemporary movements in the design professions, but he was a voracious reader, always hungry for new knowledge. According to Ed Pinckney, FASLA, his longtime friend and professional peer, Marvin was on a relentless pursuit of expanding his knowledge on man and the environment. In many ways, Robert was in transition between two extremes: the very practical and scientific requirements of growing plants and constructing designs and the furthest intellectual reaches of environmental planning and design. He was interested in how all of this knowledge and these applications could “allow each human being to be all that he or she was meant to be.”

Marvin was a profound example and living proof of how much one person could learn, accomplish, and influence others. While coming from a very simple, agrarian, small, Southern town, his influence was largely because of his tremendous curiosity for what constitutes truth and beauty and how these truths, once understood, could be used to benefit mankind (Pinckney 2003).
A seminal moment in his life came during attendance at the Aspen International Design Conference on “Man’s Environment” in the 1960s, when he heard psychiatrist Dr. Karl Menninger speak on mental health and the environment. After this experience, he and wife Anna Lou wrote his philosophy: “The dominant reason for the existence of Robert E. Marvin and Associates shall be to create and design an environment in which each individual can grow and develop to be a full human being as God intended him to be.” (Alta Mae Marvin 2003).

He further developed his ideology through the many lectures delivered to garden clubs, community groups and landscape architecture programs. He wrote,

> Man is influenced by and is the result of only two things: his genetic inheritance and the total environment in which he lives.... The home and yard should then be designed to stimulate sound physical growth, emotional growth, intellectual growth, and spiritual growth.... A place to live is more than just a place to eat, sleep and wash – it is a reflection of the whole state of civilization and culture. It is a place to grow [physically], spiritually, intellectually and emotionally; it is a place of regeneration. The landscape architect provides the necessary link between the complex needs the role of the home environment creates and the limitations set by man and nature toward the accomplishment of the all-important task of building a safe, pleasurable home for living. (Marvin, “Landscape Architecture Is Not Just Planting Azaleas, pp.1, 4)

These words are similar to those of Eckbo in Landscape for Living, in which he espoused ideals of design as a “democratic discipline.” Eckbo wrote, “The product of [the designer’s] efforts and inspiration is not, finally, magnificent space and beautiful enclosure, but the people who expand and grow and develop within it” (Eckbo 1950, p.254).

In a 1976 South Carolina Public Television interview, Marvin described how the Heritage Club Villas at Sea Pines Plantation were designed to address man’s physical, spiritual, intellectual, and emotional needs, and how a project of such complexity required the efforts of multiple disciplines. Again reminiscent of Eckbo, Marvin preached the team approach, suggesting that civic leaders, artists, sociologists, ecologists, engineers, architects and land planners were all required to design “the total environment” for man’s needs, always emphasizing that the landscape architect was the one professional best suited to lead that team (Rainey 1993, p. 201).

According to his partner Howell Beach, his design process was thorough, including exhaustive studies of site conditions, client personalities and preferences, numerous conceptual studies, and frequent client brainstorming sessions. His ability to sell an idea to a client was a catalyst for much of the powerfully innovative work he was able to accomplish (Beach 2003).

Like other modernists, he found the inspiration for many of his designs in forms found in nature, such as the use of nautilus and butterfly forms at the Cecil B. Day Butterfly Center at Callaway Gardens. On the other hand, his designs were not exclusively “naturalistic.” In fact, any suggestion that he had a “style” would have distressed him. He believed that each site, program and client was distinct and there was only “one right solution, even though there might be two or three good ones” (Beach 2003). Even though he felt that “the land tells you what to do” (Marvin in Thompson 1997, “Southern Savior,” p.76), many of his designs contained formal elements, demonstrating his lack of desire to totally reject historicism and Southern conservative design traditions.
Glencairn Gardens, in Rock Hill, South Carolina, and the Sibley Horticultural Center, at Callaway Gardens in Georgia, are both examples of his more formalistic designs.

5. He applied the concept of free space, by integrating house and garden, and by allowing the woods to sweep into the structures, such as at Southern Progress Corporation, where one looks through glass onto undisturbed wooded slopes and the existing ravine passes uninterrupted under the building. These projects illustrate strong narrative content, by engaging the user with powerful images of regional landscapes.

6. Dan Kiley has said that “man is nature” (Johnson 1991, p. 122). Marvin immersed man in settings that would feed his physical, emotional, intellectual and spiritual needs, believing that “man’s happiness and success may be more determined by his emotional response to his environment than by his physical response.”

In his 54 years of practice, Marvin completed numerous projects of great variety and range. The national and regional awards that he received include the 2001 ASLA Gold Medal Award, FASLA, South Carolina Hall of Fame, South Carolina Order of the Palmetto, 12 National Landscape Awards (presented by 5 First Ladies), 5 national ASLA awards, many regional and state ASLA awards, AIA awards and other industry awards.

Marvin’s work paralleled that of many of the defining modernist thinkers in landscape architecture. In keeping with the California School, his work was well adapted to the landscape of the region in which he worked. As one of the first and most significant Southern modernists, he was also an innovator within his context, preaching his philosophy and the benefits of land planning tirelessly, not only in lectures, but also to anyone who came into contact with him. Forward-thinking in a region that was behind the times, he deserves a place of recognition among the second wave of landscape architectural modernists. A true regionalist, his zeal for protecting the landscape of the South was only matched by his desire to
educate about the benefits of designing healthy environments. Marvin’s most important legacy is described by Pinckney thus:

It’s very difficult for us to understand where Robert started 60+ years ago, or shortly after World War II. It’s almost impossible to put yourself at the bottom of the mountain he helped all of us climb. Many or most of the planning and design principles we take for granted today were not even thought about in the 40s and 50s. In the Southeast, landscape architecture was virtually an unknown profession…. And when you did run across someone familiar with the term landscape architecture, their understanding was limited to their ability to design planting plans. Robert didn’t let the limited understanding of landscape architecture discourage him at all; in fact, he used this limitation to motivate his entire career. Robert became an evangelical speaker and educator, blazing the trail for the rest of us. Landscape architecture in the Southeast is at least 20 years ahead of where it would be had Robert chosen a different profession. It makes one wonder, what profession is 20 years behind today because Robert chose landscape architecture instead. (Pinckney 2003)

References


Marvin, Robert E. undated. Landscape architecture is not just planting azaleas.


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Sprawl. Nicesprawl or Multi-modal Hydrourbia
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A Dialogue for Sustainability: People, Place and Water

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Introduction
The word “sustainable,” some would argue, has been over-used and misappropriated to the point where its meaning has become too malleable, and its use as a fundamental concept of making places in responsible and intelligent ways has been compromised. This paper describes infrastructure and urban sustainability as a true multi-dimensional process that assimilates social, technological, political, environmental, and economic elements, and finds a dynamic balance among these. The case study in which this is explored is set within a context of ideas concerning the relationship between infrastructure, landscape, environment, and the social empowerment of citizen participation.

Infrastructure and sustainable design
The development of technologies and their applications in the late nineteenth and early twentieth centuries held out the promise of a healthier, happier, and more perfect existence that, until then, had only been imagined. The landscapes of technology, the machines, artifacts, spaces of technological production, and critical services were held in awe and reverence. These were landscapes of the technological sublime (Nye 1995) and were painted, photographed, written about, and celebrated within the popular culture. The great era of public works in America from the late 19th century until the 1930’s saw bridges, roads, dams, canals, stone viaducts, reservoirs, and lighthouses as landmarks of human achievement and progress, and control over human destiny (Ellul 1980, Leiss 1990). Among the most significant of public works achievements were the Civilian Conservation Core (CCC) and the many projects that this program carried out throughout the US under FDR’s New Deal agenda.

As populations and technological complexity increased, the criteria of efficiency and optimization became dominant in the design of urban environments. In the period following World War II, the social celebration of a technologically enhanced environment faded with the proliferation of utilitarian systems that operated increasingly out of sight and out of mind. Somewhere during that time the term ‘public works’ shifted to the more technocratic term ‘infrastructure’ (Bruegmann 1993), with ‘infra’ the Latin word meaning ‘below.’ Energy, water supply, land drainage, and waste management were conceived as separate, isolated, and arguably unsustainable systems in the urban environment (Strang 1996; Lyndon 1996). While these systems have become the standard in many developed regions, they lack both ecological and humanistic perspective.

Strang (1996) stressed the potential for infrastructure to add to the urban experience and to shape urban form. He suggested that the biggest gains could be made in re-thinking single purpose infrastructure systems, and promoting multi-use systems that incorporate both social and ecological functions. Dunham-Jones (1994) pointed out that reducing infrastructure to purely functional criteria does not allow for the possibilities of systems that recognize humans and their cultural expression. This idea was reinforced by Morrish and Brown (1995), who called for infrastructure that also plays a role in the urban landscape, providing collective identity and urban legibility. The notion that infrastructure can contribute to the quality of life beyond the functionality that it provides is expressed by Thayer (1995), who argued that when we edit out the essential systems that support our daily lives we are left with facade and illusion, and we lose the sense of the interconnectedness between natural, social, and technological systems. In concert with this shift in the perceived role of infrastructure, Steiner (1996) stated that putting place back into infrastructure cannot be a superficial endeavor, but must make connections to the “deep structure” of a region: that is, to the full range of natural, cultural, spatial, and temporal characteristics that make the region what it is. Ultimately, “To affect the form of our cities, landscape architects, planners, engineers and allied designers must grasp the intrinsic value of infrastructure and the theories and history of public works” (Wenk 2002, 179).

There is a consistent thread through all of these writings of missed opportunity, ill conceived notions of efficiency, and the profound social, cultural, and ecological possibilities in reconstructing infrastructure as a part of
a complex, interconnected, urban network. Well-conceived urban systems including energy, transportation, waste treatment, water delivery, storm water, and flood control, all hold the possibility for becoming multifunctional components of a landscape that embodies social, cultural, environmental, and economic sustainability.

Public participation
There are also missed opportunities when infrastructure is designed without full consideration of its impact on the landscape and on communities. Infrastructure development, whose origins address health and safety needs, is not only key to community and economic development, but transforms the meaning of place. “It is both the seminal role that public works play in social formation and their ubiquitous influence in our everyday lives, that make an understanding of public infrastructure policy important” (Perry 1995, 2). Roads, drainage ponds, and water and sewer systems, for example, can be built in ways that either enhance or destroy a community, and public participation has the potential to be the difference in how a public works project transforms the landscape. The politics of infrastructure development, therefore, involve questions that extend beyond engineering or fiscal considerations.

Public participation at a neighborhood scale has been the subject of theorists interested in how social movements shape urban space (Castells 1983; Kling and Posner 1990). While not every neighborhood mobilization may constitute a social movement, the concept of community “is a powerful one that draws on deep human desires and commitments” (Kling and Posner 1990, 30). These values are often in contradiction to the logic that pushes through infrastructure projects focused solely on engineering and economic factors. Public participation raises the ante, so to speak, for what is possible in infrastructure design, including establishing a dialogue that reflects engineering standards, economic factors, environmental systems, and community values.

The Study
Urban systems such as circulation, water, waste, energy, and communications have a powerful impact on urban form, function, ecology, and aesthetics. However, the separation of technological, social, and environmental processes, as exemplified in the discussions above, is the primary issue in trying to address the principle of sustainable urban infrastructure. The knowledge of how to design an environmentally friendly infrastructure is largely in place. It is, however, more difficult to achieve buy-in on the part of authorities for alternative design strategies that fall outside generally accepted approaches and techniques. The case study presented here for land drainage in a southwest community with deep cultural and historical roots, provided an opportunity to test a multi-dimensional process for sustainable urban infrastructure.

Background: Isleta Boulevard improvement project
The South Valley of the Rio Grande in Albuquerque, New Mexico, has a rich history, dating back to the settlement by the Tiwa Pueblos around 1200 AD. and Spanish settlement in 1598. A major north-south route that allowed trade between indigenous peoples was named the Camino Real (Royal Highway) by Spanish settlers. Later named Isleta Boulevard, the road was also an early segment of Route 66. Today, the road still serves as an important transportation route into the South Valley and south to Isleta Pueblo.

Current land use patterns and the architectural character along and surrounding the Isleta Boulevard corridor reflect rich and distinct historical periods and cultural practices, creating the corridor’s uniqueness. Land uses along this section of Isleta Boulevard include residential, commercial, community services, schools, and vacant property. Isleta Boulevard continues to serve as an economic corridor for the South Valley and surrounding communities.

Planned road improvements to the roadway include minor realignments, surface reconstruction, curb-and-gutter profile, and a drainage system to manage floodwater on Isleta and in surrounding neighborhoods. The drainage plan includes a fourteen-acre (6.4 hectare) detention basin at a County-owned site, formerly known as Sanchez Farm, located approximately seven hundred feet (245 meters) from Isleta, and a number of surge ponds to be located along the Isleta route.

The South Valley has an active citizenry that took great interest in how both the road and the drainage system were to be designed and built, and how they would affect the landscape of their community. Residents are interested
in enhancing economic activities, historical character, and quality of life in the South Valley neighborhoods, and were adamant that these goals be met with respect to both the road improvement and the drainage system.

The Bernalillo County Public Works Department and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), managers and sponsors of the project were aware, that based on preliminary engineering drawings, residents were concerned that the detention basins would become “big holes” in the neighborhood. In order to address these concerns and to implement a process in which the neighborhood residents participated in the outcome of the drainage project, the County contracted with the Resource Center for Raza Planning (RCRP), a Center in the School of Architecture and Planning at the University of New Mexico. RCRP, along with the Landscape Architecture Program in the School, agreed to facilitate a community visioning process and develop design strategies for both Sanchez Farm and for one of the surge pond sites along Isleta Boulevard. The mandate given by the County was that these designs acknowledge the desires of the residents while meeting the engineering needs and constraints set out in the drainage plan.

**Project team method**

The project team began its research by working simultaneously on three areas of investigation. One thrust was to understand fully the drainage strategy and engineering specifications, and the economic/legal/political context in which the project was being carried out. The project managers and their engineering consultants provided the researchers detailed information on the drainage plan design, as well as legal requirements of water distribution in the arid New Mexico environment. Meetings were held with other actual and potential stakeholders in the project, such as the residents whose land was adjacent to affected sites and community-based organizations that could ultimately be caretakers of the large Sanchez site.

The second thrust was to study the Sanchez and surge pond sites. In addition to site visits the researchers collected information on soils, topography, vegetation, and surrounding land uses. Maps, air photos, and other relevant documentation were analyzed.

The third thrust, essential to the success of this project, was a visioning process carried out with the community. If the drainage sites were to be more than unsightly holes, we needed to determine the potential function and meaning of the sites to neighborhood residents. The facilitators created a scenario ten years into the future and asked a series of questions to elicit participants’ comments regarding how they ideally saw their community evolving. We then asked participants to elaborate on concepts and statements that they had offered such as “small town atmosphere,” a “good quality of life,” and “unique” qualities of the South Valley. In further discussion, we asked participants to focus on the sites in question and to envision the ways in which these would function, and how they would become a part of their vision to serve the community.

The Project Team inserted its agenda for sustainable water management and merged this with the community’s vision, engineering flood control requirements, and site capabilities, to develop a design concept for each site. A public meeting was held for residents, authorities, and political representatives to present the draft design proposals and to discuss issues that would lead to changes and revisions in the preparation of a final design. The elaboration of data and results that follows focuses on the large detention basin, or Sanchez Farm site.

**Data**

The catchment area for the land drainage was to include the Isleta Boulevard road surface with its new curb-and-gutter design, as well as the
lowlying neighborhoods adjacent to the road. The design calculations for drainage were based on the one-hundred year storm event. Water was to be collected in catch basins in and around the road and delivered through a forty-eight inch (1220 mm) storm sewer to the Sanchez site. Surge ponds located strategically along the road would prevent local flooding in extreme events. Ideally the design of the system would have incorporated overland flow to encourage maximum infiltration, but the researchers were bound to work with the system as designed to the point at which the storm water enters the Sanchez site. The retention capacity requirement of the Sanchez site was sixty-four acre-feet (77,700 cu.m.). According to state law water can be held on the site for a maximum of ninety-six hours. The forty-eight-inch outlet would enter the site at approximately nine feet (2.74 meters) below grade in order to achieve the drainage gradient in this flat valley/floodplain region. At the point of entry there was to be a port structure that would capture the large amounts of trash that finds its way through the storm sewers, and in times of low flow would act as a sediment trap. At the South of the site, the low end, pumps were to be installed to pump out excess water through an eighteen-inch force main to the Rio Grande. The Albuquerque region receives between seven and nine inches (178-229 mm) of rainfall annually, with 45% of the precipitation occurring in July, August, and September, and the remainder distributed relatively evenly throughout the other nine months.

Sanchez Farm site
The Sanchez Farm property has a long history of agricultural production and animal husbandry, and for over two hundred years exemplified the economy, traditions, and culture of the South Valley area. The fourteen-acre (5.67 hectares) site is surrounded by private properties with no access on the east, west, and south sides, and is bordered by Arenal Road to the north (see fig.). An acequia (irrigation ditch) runs along the east side, and the site has some water rights from the acequia. Water rights permit a certain amount of water to be extracted from the irrigation ditch each year. The amount depends on the size of the site, and whether any of the precious rights had been sold off or traded in the past. The site slopes at about two percent from north to south. The silty-clay-loam flood plain soils are well drained. The vegetation is comprised of weedy pioneer species covering recently disturbed areas, some native grasses and shrubs, a line of cottonwoods along an old lateral ditch, and a significant population of pioneer Siberian Elms at the South end. The site is entirely bordered by Siberian Elms. The water table is quite high at about thirteen feet (3.96 meters). The old Sanchez house on the east side of the site is in very poor condition, having gone through two fires. Some felt, nevertheless, that the building has historic importance and ought to be saved.
peaceful, calm site that would be like an oasis in the community. The site would have sufficient vegetation to differentiate various spaces and to provide an attractive visual environment. Although they wanted the site to reinforce the existing character of the South Valley, they wanted it to be unique and different from their back yards, and to stimulate a sense of discovery.

Residents’ suggestions for specific landscape elements and features that would achieve functional and qualitative goals were to incorporate gathering areas, to make water visible in some areas, to provide opportunities for outdoor classrooms, to develop some form of interpretive program, to use sufficient trees and other vegetation, and to incorporate public art.

Site development
The challenge for the project team was to develop a strategy for site development that satisfied the engineering specifications and the residents’ views and desires, while working with the site environment and carrying capacity, and implementing sustainable methods of water management. The capital cost of the project as well as the on-going maintenance costs were important considerations.

Sustainable storm water management
In order to hold the sixty-four acre-feet of water required for the one hundred year storm event, the site needed to be excavated and recessed. The preliminary engineering drawing had shown a basin with relatively steep, constant slopes around the perimeter, and this technique for recessing resulted in the site being perceived as a large hole. In order to address the situation, the design team modulated the slope around the edges, with some areas being gentle to allow for easy and comfortable access, and others being steeper. The varied topography around the edge added visual complexity and interest, as well as provided friendly and inviting entry points for site visitors (fig.).

Basic sustainable storm water management practices became the generative principles for the design of the site structure. These principles were to maximize distance and area over

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which water flows in order to allow as much infiltration as possible, to use vegetation to filter out contaminants and act as sponges for water absorption, and to slow water down as much as possible thereby increasing infiltration as well as reducing damage and erosion.

The basin was designed with four terraces that drop from north to south. The storm water sewer outflow was located at the north end of the site, rather than towards the south end as had been shown in preliminary engineering drawings. This allowed for a longer distance of travel once the water was on site, and the reduction of required forty-eight-inch pipe had a significant impact on costs. The water was directed through the site in a bioswale that was designed to slow down the flow and to absorb most of the water in an average storm event. Water that made it through the bioswale would circulate through the last terrace that was planted with thirsty cottonwoods and willows, mimicking the riparian forest of the Rio Grande. A solar pump would deliver any water threatening to remain on the site for more than ninety-six hours back up to the top three terraces, where it would support the landscapes developed there (fig.). The port structure into which the water would enter at the north end would serve as a sediment trap in low to medium flows. In major events the surge ponds would become additional sediment traps, but some sediment would find its way onto the northern portion of the bioswale area.

The site design would require approximately six acre-feet of water per year for maintenance. There would be more than sufficient water annually for these needs, but the issue was the uneven distribution of water throughout the year. Although the months of highest water use coincide with the months of highest precipitation amounts, there would be a need for some supplementary water in the driest times. The vegetation planned for the site was primarily native or species well adapted to the water availability in the region, but drought cycles and increasingly un-even precipitation needed to be accounted for. Gravity-fed water from the acequia would be used as a supplement to address any deficits.

*Response to the community*

Each of the four terraces were designed as different ‘gardens’ that comprise a community open space. The top terrace has been named the art garden. Water drawn from the acequia drops into a basin and flows along an elevated wall-channel from which it is distributed to various parts of the garden. The water supports tree bosques and herb gardens, planted in a formal composition. Visitors will be able to sit under the shade of trees, listening to the trickle of water, enveloped in the fragrance of herbs. The art garden is to be maintained by a local herb society.

The second terrace down has been designed as a fruit orchard. The orchard will be managed and maintained by a local agricultural college and used by them as a teaching resource, but will still function as public space.

![Figure 5. Acequia water spilling out of a canoa in the Art Garden](image)

The third terrace down has been designed as an open area for picnicking, social gathering, and informal events. It will be planted with a low-water grass mix, with Chihuahua Desert tree species surrounding the edges.

The fourth and final terrace has been designed as a public forest of cottonwoods, willows and other Rio Grande riparian species. The forest terrace is closest to the water table, as the Rio Grande Bosque would be, and will become an ecological education area for the community.

*Conclusions*

The research and design team for this project developed a solution that is workable, sustainable, and attractive, bringing community aspirations and engineering requirements together with ecologically based urban water management. The process demonstrates multi-factored sustainability for urban infrastructure that achieves a dynamic balance among a complex set of issues and constituencies. As a university-based research team, faculty and students had the opportunity to work together on issues of mutual interest.
and disciplinary importance. The community, public administrators, and the landscape were beneficiaries.

The results of the Sanchez Farm study, when presented, were embraced by residents, County administrators, and the flood control authority, who all perceived benefits in the proposal. All of these groups participated in the process and felt that they had some ownership of the outcome. The process was a productive collaboration among residents, community groups, planners, landscape architects, and public agencies to make flood control infrastructure cost-effective, an environmental benefit, and a neighborhood amenity.

References


Exploring Spontaneous Uses in Urban Streams

Chia-Ning Yang

Introduction
In the past century, various regions in the world traced a more or less identical pattern of transformation of urban waterways. The progress of damming, burying, channelization, and diversion left unmistakable records, while its compound impacts on the quality of urban living are not easy to calculate, particularly in terms of the dwindling of the once-common daily interactions with a nearby stream. In his book *The Thunder Tree*, Robert Pyle clearly illustrated how a watercourse can provide a lifeline of rich experiences for city-bound youth:

Since the public trail along the canal service road was opened in the seventies, tens of thousands have taken their pleasure there. But even before that, in the days of its unofficial access, I was not alone in finding it. Laura’s dad, Charles, rafted significant portions of the canal, and his children tubed, biked, chased frogs and crawdads, swung, dived, and swam all summer long. It was all against water department rules, but ‘without the canal I don’t know what I would have done,’ Laura told me, ‘or what growing up would have been like.’ (Pyle 1993, p. xvi)

This paper names such daily interactions with nearby streams spontaneous use, where spontaneous is defined as “coming or resulting from a natural impulse or tendency; without effort or premeditation” (Webster’s College Dictionary 2001). While this theme is the subject of much nostalgic expression, the research focuses on its current status. In 2002, an extensive field investigation was conducted in California, Japan, and Taiwan to gain a comprehensive understanding of spontaneous use and to seek insights to design for it under the current context of urban stream restoration. As a partial outcome of this broader effort, this paper concentrates on the works done at Marsh Creek in Brentwood, one of the Californian sites. From an adult-oriented household questionnaire survey, in-depth interviews with selected adults, school drawing exercises, and creek tours with selected children, the study demonstrates the effect of spontaneous use on forming creek conceptions and values. It advocates the need to promote such use through positive design efforts and argues that it be treated as the central theme in urban stream restoration.

Value, Conception and Use: Marsh Creek in Brentwood
Located at the innermost tip of the San Francisco Bay, Brentwood, California is literally the suburban front of the sprawling Bay Area. Running through the heart of the city is Marsh Creek and its three tributaries. Although largely channelized by the 1950s, the waterways remain open due to the relative short history of the surrounding developments (Figure 1). Investigating Marsh Creek and its users thus provides a guidepost to understanding the current scene of human-creek relationships in suburban America and allows us to reflect on the role of spontaneous use in urban streams.

![Figure 1. Marsh Creek at Brentwood, California](image)

Adult Household Survey
To begin with, a household questionnaire survey sampled 1,800 adult residents who live within one-fourth mile of the creek channels to inquire into their values, conceptions, and uses of the creek. The following points summarize the primary findings from this stage:

1. In general, the creek is valued as “nature,” both in terms of abstract concept as well as the actual use of it. But for most people, such value is devoid of sense of ownership and place attachment.

2. As a trend, residents’ visual preferences are enhanced by familiarity and by adopting judgment criteria other than “cultural aesthetics,” such as “use potential” or “intimate experience.”
3. The recall of creek experiences seems to resort to a different channel of conception than the judgment of photographic scenes. Even though vegetation is singularly effective in determining the visual preference, wildlife is the most mentioned element in recalled, wonderful experiences.

4. Although the current uses of the creek verify it as part of people’s daily lives, most of them are routine exercise on the trail with little interaction with the creek environment. Three quarters of the uses can be categorized as “moving along the trail” (walking, biking, jogging and rollerblading), while only 16% can be called “dynamic nature interaction” (watching and catching of wildlife and other forms of play) and 10% belong to “static base-point use” (thinking/relaxing, watching the water, reading, etc.).

5. It is the reciprocal engagement with the creek environment that gives rise to “wildlife experience” and “aesthetic experience,” the two major themes of creek memories. Themes such as the enjoyment of relationship and body challenge are usually concurrent, but do not tend to constitute memorability by themselves. Similarly, “moving along the trail” rarely serves as a memorable experience without “dynamic nature interaction” or “static base-point use” being present.

6. Users with higher creek interaction levels value the creek more across all listed aspects, but particularly on place attachment, solitude, and sense of ownership. They are much more likely to possess wonderful creek experiences and commit themselves more to actions enhancing the creek. They also consider mosquitoes and pests less of a problem and pose significantly less restriction on kids playing in the creek. Compared to the type of use, frequency of use has a much weaker effect on these aspects.

7. Parents are much more likely to approve of their kids playing at the creek if they can see the creek from the houses, the yards, or walking around the neighborhood. The approval rate is notably higher at the area where subdivisions hold a more friendly relationship with the creek channels.

In short, spontaneous interaction with the creek brings about positive creek experiences and creek values, which in turn raise the individual’s creek advocacy. The survey, however, did not reveal obvious relationships between spontaneous use and the conception of the creek.

**Adult Interviews**

From the survey, twenty respondents who demonstrated high levels of appreciation and interaction with the creek were recruited for one-on-one interviews, so as to delve into aspects such as the conditions of creek appreciation, valued creeks in the past, and ideal images for a nearby creek.

The interviews discovered a range of modes in creek appreciation, including stewards, educators, observers, and hands-on users. The dominant mode, which almost every subject displayed to a degree, is nevertheless what I call “idyllists”.

Idyllists are more or less idealists. They succeed the two powerful threads of the centuries-long nature ideology: pastoralism that purports a tamed middle ground between wild nature and artificial city (McHarg 1966), and wilderness purism that seeks untouched wild land as the only perfect physical and moral paragon (Nash 1982). The two views have now been sufficiently confused that many would mistake the cultivated landscape for the “original” nature, and an image intended to be “as natural as possible” could be indeed full of human interventions.

For instance, subjects overwhelmingly identified year-round flow with the natural and ideal image of Marsh Creek, although, as most Mediterranean streams, the creek had always been intermittent until the great irrigation projects took place in the 1920s. One subject moaned about the widening of the channel in the early 1980s making it “not the original creek anymore—it’s sort of man-made now,” while that section was straightened and channelized in the 1960s.

Idyllic mode involves solitude as a basic form of creek interaction, and the creek is frequently mentioned as a quick escape. As one subject put it, “I throw on my shoes and just walk down the creek and I’m miles away!” Another subject described his ideal creek straightforwardly: “To be able to walk through it and not feel like you’re surrounded by where you really are—so many houses and civilizations.”

Almost all subjects had valued creeks in their
past, and many presented their ideal creek images as amalgams of them. Although these images point to a consistent pastoral scene, the actual use habitats display a higher diversity. One subject would go crawdad fishing with her kids under a concrete road bridge, which she commented “wasn’t that nice, but that’s where the crawdads were.” Another subject, when asked to recall human-built structures in her wonderful creek experience, asserted that there were none, that their experience was to “look at the nature-built structures.” However, at the creek tour it became clear that not only did she and her kids walk through a footbridge to get to the creek, the very spot they were standing at was a piece of concrete riprap so they could be close to the edge of the water without getting muddy.

Although the idyllist viewpoint remains distorted at times, to label it as simply romantic would be unfair. The therapeutic effects or spiritual gains acquired through experiences of solitude are undeniable. The loss they felt is not pure sentiment—they have observed the substantial decrease of wildlife and, parallel to that, the dwindling of experience.

The strong idyllist tendency among those with the greatest appreciation for the creek thus presents a paradox. On one hand, they are the reliable advocates for stream restoration efforts; on the other, their conceptions of the creek tend to be what is not and what cannot be. Even if we reduce how much solitude a little creek can afford to a technical design issue, the idyllist image is something that designers eventually have to confront.

School Drawing Exercises
Brentwood children’s interaction with the creek was surveyed through drawing exercises held in 6 classes ranging from the 2nd to the 8th grade. These kids were asked to draw a good time they had at Marsh Creek. Those with no experience with the creek, or who finished the first drawing early, were directed to draw a dream creek in their minds. I then talked with each child briefly to get information on frequency and content of their creek uses.

The results indicate that spontaneous use does significantly enhance the understanding of the creek environment. Kids who use the creek both frequently and interactively, rendered a much greater variety in all the four measurements: the number of vegetation “species,” wildlife “species,” water features, and channel features. They demonstrated rich knowledge on the details of the landscape, including habitat features. In contrast, the drawings of non-users either displayed plain nothingness or were strewn with stereotyped elements as a remedy (Figure 2, 3).

Non-users’ dream creek drawings give us hints about the forming of creek conceptions devoid of actual contact. Young children’s dream creeks are full of whimsy collages from contexts unrelated to the stream environment. The desires to see animals, swim, or play at a tree house mixed with the themes of urban materialism (TVs, soda machines, manicure/pedicure stands, money, etc.), amusement parks (looping water chutes, play equipment, etc.), and futurism (cloning machine, flying saucer, etc.). Pastoral scenes dominate the dream creek drawings of the 6th graders, with grassy fields, neat looking trees, little bridges, and rocks in the water. At the 8th grade
level, dream creeks remain pastoral, with the additional elements of tents, horses, and campfires from the experiences of camping trips at remote scenic streams. The dream creek drawings given by spontaneous users, on the other hand, tend to preserve the fun elements from their experiences (wildlife, tree houses, fishing spots, bike jumps, etc.) and invent new ways to have fun (“swimming-only zone,” adventure caves, etc.).

**Children’s Stream Tours**

The climax of the Brentwood research was the creek tours led by kids selected from the drawing exercises or encountered in the field. The Marsh Creek tours, along with similar tours conducted in other sites of California, Japan, and Taiwan, provided a rich spectrum of spontaneous use and insights for their specific habitat needs. Due to the constraint of space, this paper will only present a typology of spontaneous uses concluded from these trips.

1) **Quiet and secluded use**: The transcendental appreciation, temporary escape, and intimate time with significant others.

2) **Nature observation**: The observation of wildlife and plants in a highly intensive but unintrusive way.

3) **Catching**: The wit matching with fish, frogs, tadpoles, shrimps, crawdads, crabs, insects, and many other fascinating creatures (Figure 4).

4) **Caring**: Actions (planting, trash cleanup, feeding, weeding, etc.) taken to make the environment approach the ideal scene in one’s mind.

5) **Building and arranging**: From the “big” projects of constructing tree houses, huts, dams, ponds, to small ones such as arranging rocks and sticks (Figure 5).

6) **Collecting**: Treasure hunting (rocks, plant leaves, fruits, nuts, animal bones, etc.) from the basically chaotic stream environment.

7) **Adventures**: The action of connecting known parts to unknown parts of the environment through biking, swimming, jumping, climbing, creeping, crossing, etc.

![Figure 4. The charm of catching attracts kids to even unfriendly environment. (Nangoku, Japan).](image)

8) **Clever craft**: The skillful manipulation of materials found in the stream environment, from skipping a rock to whistling with a deergrass leaf or making bamboo leaf boats.

![Figure 5. The gravel beach provides rich materials for building and arranging. (Kochi, Japan).](image)

9) **Physical water contact**: From gentle dabbling to violent diving, with varieties of walking in water, swimming, floating, bathing, etc. (Figure 6).

10) **Moving along on the trail**: Walking,
jogging, biking, skating, horse riding on the trail in a consistent way.

11) **Social gathering**: Chatting, eating, drinking, chess playing, etc. at specific spots adopted by a group of users.

Juxtaposing the above typology and the modus operandi of current restoration or greenway projects, it is hard to miss that the planning and design of urban streams has been quite hostile to spontaneous users. Projects seem to cater exclusively for the most unintrusive and innocuous forms of use—“moving along the trail” and “social gathering.” Although “nature observation” is a widely claimed goal, there has been little innovation to encourage it. The field of stream planning and design is pervaded by timidity, a whole gamut of concerns on the impacts of streams on people as well as people on streams. The fear is understandable, because in the past we both received and inflicted excessive impacts at times. We have throttled and suffocated streams to control flooding for the sake of safety before we have a chance to learn how to live with them. The environment has become safer now; the poverty of human experience is nevertheless getting severe.

![Figure 6. An old weir provides diverse environment for physical contact with water. (Kochi, Japan).](image)

**Conclusion: Filling in the Missing Piece**

Except for the stellar works built by Olmsted and Vaux in the late 19th century, urban stream is not a traditional realm for landscape architects. Before the call for urban stream restoration, designers only had their roles in the limited number of waterfront development projects. On the other hand, recreational planners have concentrated their efforts on remote rural streams to develop tourism. If “wild and scenic rivers” serve best for the wilderness purists and the waterfront resorts take care of the comfort recreationists, what is the central theme for the majority of the urban streams that can never be genuinely wild or completely tamed? The results of this study give rise to five grounds to promote for spontaneous use as the central theme of urban stream restoration.

**Therapeutic Effect**

Urban nature is known for its therapeutic power (Kaplan and Kaplan 1989). This research has verified that such effect is not only substantial, but a central mode of appreciation for an urban stream.

**Developmental Effect**

The research demonstrated the importance of the diverse stream environment as the bountiful source of “loose parts” (Nicholson 1971). Through spontaneous interaction with such environments, children acquire competence-through-play, a quality key to healthy development (Moore 1986).

**Raising environmental awareness**

The research confirmed that spontaneous users pose higher value at urban streams and are more willing to extend help in creek enhancement efforts. As Orr (1992) contended, ecological literacy is driven by the affinity for the living world, without which, literacy of any sort will not help much. The forming of stream conception and knowledge, although tampered by culture and limited in extent, is significantly linked with the experiences of spontaneous use. Before we reach a new stable plateau in culture, knowledge procured through both direct experiences and indirect data needs to be vigorously supplemented.

**Preserving remote habitats**

The backcountry recreational boom shares the same mechanism with urban sprawl, both rooted in a yearning for nature not being fulfilled near the residence (Nash 1982). In this regard, proposing spontaneous use operates the other way around—it generates place attachment and provides a magnet for people to stay in the city while raising their awareness for habitat preservation.

**Interaction with processes**

Most spontaneous uses are choreographed by the creek environments and correspond to the creek processes. An action as simple as skipping a rock requires a stretch of calm water and a gravel bar, where one finds the rock with the right shape and size, which in
turn depends on a subtle balance of fluvial processes. It is this intricate relationship with the processes that attunes them to the outlook of an ecologically healthy urban stream system. Planners and designers can regard spontaneous use as a layer of human ecology. A matrix may be woven for spontaneous users and stream organisms to cohabit.

References


Biomimicry as a Runoff Management Strategy: Multi-Modal Landscapes

Robert D. Sykes
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Aaron A. Mikonowicz

Introduction
Multi-modal landscapes that support rail and other transit systems necessarily require higher density development to place more riders within walking distance of transit stops. However, because of the larger roof areas and pavement areas per unit of land area, higher densities tend to produce more runoff per unit of land area than lower densities. This leaves higher density development types such as Traditional Neighborhood Development (TND), Transit-Oriented Design (TOD), and similar recent innovations in development pattern open to criticism for negative impacts on stormwater runoff. This study investigated the integration of new types of higher density development with stormwater management systems devised working from a strategy of biomimicry. It compared the stormwater performance of complete site designs for TND, TOD, and New Suburbanist cluster developments, to designs using conventional practices on the same parcels of land. This work was completed as part of a larger project that compared the effects of multi-modal, water-sensitive landscapes to conventional development at the subdivision scale near a proposed station on a proposed commuter rail corridor (Neckar 2002).

Background
Urbanization of the landscape takes place in the context of the hydrological cycle. It has been well established that urbanization locally disrupts the hydrologic cycle by shifting the balance of rainfall loss vectors from infiltration to surface runoff (Mockus 1972, p. 10.17; Schueler 1995, ch. 2). Thus, in the process of designing urbanization, the dramatic increase in impervious surface area and the relationship of impervious to pervious surfaces are significant concerns. Related concerns are increased risk of flooding to downstream areas, and increases in erosion and sedimentation.

Erosion and sedimentation has also become a focal issue. Since the Federal Clean Water Act of 1972 (as amended by the Water Quality Act of 1987) Federal and State regulations have been developed to reduce the pollution of waters receiving runoff, including streams, rivers, ponds, lakes, wetlands, and the oceans (Federal Register 1988). Since then, significant regulatory efforts have been made to reduce nonpoint source contamination of surface waters based on sections 401 and 402 of the Clean Water Act. These regulations are focused on reducing the concentration of contaminants per unit volume of stormwater.

The Sites
There were two sites used in this study. The first was a 120.11 acre site with rolling terrain, located in Woodbury Minnesota, a suburb of St. Paul. The second site was a 250.40 acre with a mix of flat land, bluff land, and ravines, located in Cottage Grove, a suburb of St. Paul. The Woodbury Site has six subwatersheds defined by exit points from the site, and the Cottage Grove Site has seven subwatersheds.

Conventional or Baseline Development
Baseline development designs using conventional development strategies and techniques for general development and for stormwater management systems were created for each site as controls. These schemes were developed for the larger project reported in Transportation, Urban Design and the Environment (Neckar 2002). The baseline designs used a pattern consisting of a primarily internal circulatory structure, loop and cul-de-sac streets, curbs with gutters, and storm sewers.

Biomimicry as a Strategy for Stormwater Management Systems Design
Biomimicry is an interesting design strategy introduced in Janine M. Benyus’ book, Biomimicry (Benyus 1997). The term biomimicry is from the Greek bios meaning life, and mimesis meaning imitation. Two of Benyus’ definitions of biomimicry are of particular interest for developing the stormwater infrastructure schemes for the new development design types. These two definitions are as follows:

1. Nature as model. Biomimicry is a new science that studies nature’s models and then imitates or takes inspiration from these designs and processes to solve human problems... (Benyus 1997, p. xi)
2. Nature as a measure. Biomimicry uses an ecological standard to judge the ‘rightness’ of our innovations. After
3.8 billion years of evolution, nature has learned: What works. What is appropriate. What lasts. (ibid.)

Design of the stormwater system according to the principles of biomimicry first required the isolation of essential characteristics of the natural drainage system. The next task was to use these characteristics to create a stormwater handling system that mimics a natural system in function (nature as model) and performance (nature as measure), not merely in appearance.

To isolate the principal natural system characteristics, the hydrological system used by nature was examined from a system’s point of view (Churchman 1968). By thinking through the water cycle in terms of landscape form and function, three basic characteristics could be isolated.

The first characteristic isolated was the fact that water starts being intercepted and removed from the runoff where rain hits the ground (Leopold 1974, pp. 9-10). This removal of water from runoff flow relies most heavily on (1) infiltration and (2) wetting of large complexes of leaf surfaces.

The second characteristic observed was that the methods nature uses to remove water from runoff flow are found in constant and redundant repetition as one follows the runoff flow across the landscape.

The third characteristic can be best understood in contrast to the way runoff is typically handled in conventional development. Typical developments use a pond to collect runoff from the site, usually located at the principal outlet point from the site. In effect, standard development uses a centralized scheme for the control of water flow. Nature, however, uses a decentralized strategy, distributing rate and volume controls over the entire watershed, not just concentrated at an outlet (Krebs 1972, Leopold 1974).

In summary, there were three basic characteristics that needed to be exhibited by a biomimicry design for stormwater management: (1) Intercept and remove water from runoff as close as possible to where rain strikes the ground, focusing especially on infiltration and interception; (2) Use techniques of runoff management redundantly along the runoff path; (3) Use a decentralized application of runoff management techniques over the entire catchment.

The Biomimicking Stormwater Management Scheme for Higher Density Sites

The general architecture of the infrastructure scheme designed for the higher density sites included the features below.

Lots and Parcels: As far as possible, these were designed so that water flows first from impervious surfaces to absorptive vegetated surfaces. The importance of this technique is discussed fully in Claytor (1996), Schueler (1995), Pitt (1987), and Sutherland (1995). Bioretention and other infiltration techniques were used wherever possible (Ferguson 1994; Claytor 1996, p. 2-14; ETA/Biohabitats 1993).

Stormwater inlets: In every case, inlets were designed to filter and remove larger particles of sediment from the flow before it entered the larger system. There are many proprietary devices and traditional catchbasin designs that can be used for this. In some cases the inlets could be a small bioretention pond, depending on space (Claytor 1996, ch. 5 and 6).

Stormsewer: In new high-density developments, storm sewers are invariably required. In these cases, a “leaky sewer” was used. The idea of a leaky sewer was gleaned from Modern Sewer Design (A.I.S.I. 1971, p. 182), which describes the use of perforated sewer pipes that infiltrate runoff.

Connective open space system: Connective open space systems were designed to both hold and convey stormwater. The conveyance type principally used was the biofilter, or enhanced swale. These swales were integrated into the street network and provided temporary storage areas for runoff from the 10- and 100-year storms. The vast storage capabilities of such an integrated system of swales was described by D. Earl Jones (Jones 1967 and 1971).

Surge areas: This technique was used just before every outlet from the site. They were typically dry basins, that, with major storms, temporarily fill with water to delay flow downstream, mimicking floodplains and wetlands (Leopold 1974).

New Development Design Types

Three design case studies were developed using the biomimicking runoff strategy described above. These are more fully described in the book.
project report (Neckar 2002). The case studies are identified below (note that instead of TOD, the term Commuter Rail Oriented Development (CROD) is used):

1) Traditional Neighborhood Development (TND) design approach with a gross density of 3.54 (net density of 8.75) dwelling units per acre. This design is designated “TND/CROD-LO” (Low Density) development. It was designed for the Cottage Grove site.

2) TND design approach with a gross density of 7.0 (net density of 16.44) dwelling units per acre. This design is designated “TND/CROD-Med/Hi” (Medium to High Density) development. This design was also developed for the Cottage Grove site.

3) Cluster/Conservation approach that evolved into a “New Suburban” pattern. This design is designated “Cluster” development, and achieved a gross density of 4.35 (net density of 9.06) dwelling units per acre. This design was developed for the Woodbury site.

**Question for Investigation**

The question for investigation was: *Can dense, new development design paradigms that use a biomimicry strategy for stormwater management system design, compare favorably with baseline development in terms of runoff impact per dwelling unit?*

**Methodology**

Since the proposed designs included more units per acre than the baseline development standards, it was recognized that it would be important to compare the runoff performance on a per-housing-unit basis rather than on a straight area basis. This would give an expression of environmental cost per housing unit in terms of runoff impact. Such a measure recognizes that measurement on a per acre basis would ignore the fact that for low density, conventional development, more land would have to be consumed to get the same number of housing units as the denser schemes. It further recognizes that more houses per unit area of land would mean more acreage somewhere that would not be occupied by the houses. A pure area basis of comparison would skew the comparison in favor of a less efficient land development scheme that dilutes the impact on a regional scale.

**Hydrology Modeling**

Each case study site was modeled to provide hydrologic measures for purposes of comparison of stormwater runoff performance. Modeling was done assuming baseline development for each site and for TND and TOD.

**Water Quality Volume Modeling**

The Minnesota Pollution Control Agency’s (MPCA) draft general permit for stormwater runoff (MPCA 2003) establishes a 1.25 inch rainfall as the water quality volume (WQV) storm (approximately the 4 month, 24 hour rainfall) to be used for the design of stormwater treatment ponds used to clean storm water in order to meet Federally mandated water quality objectives. The WQV storm represents a runoff depth that accounts for nearly 95% of the historical rainfall record in the Minneapolis-St. Paul (Twin Cities) area (MPCA 2000, pp 1.10-4 through 1.10-6). Also, this storm better represents the category of runoff flows that nourish plant and animal communities than more infrequent, standard storms traditionally applied for stormwater facility design. WQVs were calculated using Robert Pitt’s Small Storm Hydrology Method (Pitt 1997a; Pitt 1994; Claytor 1996, pp. 2-15 through 2-29).

The Small Storm Hydrology Method was also used to determine a peak discharge in cubic feet per second for the WQV rainfall event. Times of concentration were estimated using the same standards used for the 10-year, 24-hour rainfall models, except that for vegetated channel flow, an average velocity of 1.5 feet per second was assumed.

These methods were applied to all of the alternative scenarios for each case study site.

**Rate and Volume Modeling for 10-Year Storm**

The design storm used for the 10-year, 24-hour rainfall calculations was 4.15 inches (Herschfield 1961). Peak discharges and volumes were calculated for the 10-year, 24-hour rainfall event using a TR-20 (SCS 1982) based hydrology model called HydroCAD (Applied Microcomputer Systems 1998) that is well accepted by municipal authorities.

Several important assumptions were necessary to drive this model for use at this concept level of site planning. Peak discharge calculations require time of concentration estimates. A planning level estimation of time of concentration was made for all the scenarios modeled. Standard velocities and distances were established for the component flow types found along mapped time of
concentration paths. These standards were applied consistently among the scenarios to ensure balanced comparisons.

Sheet flow portions of time of concentration calculations were standardized: maximum lengths used were 100 feet over grass and 25 feet over impervious surfaces. After sheet flow maximums were reached, shallow concentrated flow conditions were assumed to occur. Shallow concentrated flow lengths were assumed to be a gutter length up to a maximum of 150 feet (half the spacing between manholes).

Storm sewer reaches were assumed to flow at 3.0 feet per second (fps) for WQV and 10-year events. For 100-year events, storm sewer flow rates of 4.0 fps were assumed. For planning purposes, a storm sewer flow rate of 3.0 fps is commonly assumed by Twin Cities engineers.

Grassed channel reaches were assumed to be flowing differently for each design storm. A velocity of 1.5 fps was used for the WQV storm because it corresponds to the maximum velocity at which a biofilter or natural swale would flow. For the 10-year event, a flow rate of 2.0 fps was assumed because it is the velocity at which sediment will be transported.

For the Baseline, TND/CROD-LO, TND/CROD-Med/Hi, and Cluster scenarios, the volume flowing into the standard mitigation ponds was measured in order to isolate the effect of the land pattern on runoff yields from the control effects of the ponds. The runoff yield from the water surfaces of ponds was assumed to be 100% of rainfall and was included in the runoff volume totals.

The TND/CROD-LO, TND/CROD-Med/Hi, and Cluster scenarios include mixed uses of retail and commercial/office space on the first one or two floors of mixed-use buildings with apartments above. To provide an approximate basis of comparison, commercial/office and retail square footage was divided by the standard apartment square footages to arrive at a reasonable number of residential unit equivalents for the retail and commercial/office space. This means that, if anything, the per-unit runoff figures for the TND/CROD-LO, TND/CROD-Med/Hi, and Cluster scenarios are somewhat higher than they would actually be if only dwelling units were developed, because of the larger percentage of impervious surface area due to parking associated with commercial land use.

Peak discharges cannot be compared on a site basis, but can be compared on a catchment basis within the site, using the same outlet points as the locations for measurements. Unfortunately, there is not sufficient space to report and discuss these data here.

Results From the Cottage Grove Site
For the Cottage Grove site, the Water Quality Volume Storm runoff volumes are summarized in Table 1, and the 10-year, 24-hour runoff volumes are summarized in Table 2.

Results From the Woodbury Site:
For the Woodbury site, the Water Quality Volume Storm runoff volumes are summarized in Table 3, and the 10-year, 24-hour runoff volumes are summarized in Table 4.

Again, peak discharges cannot be compared on a site basis but can be compared on a catchment basis within the site, using the same outlet points as the locations for measurements. There is not room to report and discuss these data here.

Conclusion
The applications of the biomimicry strategy of stormwater system design demonstrated a robust positive effect on runoff volume yield per dwelling unit for the 10-year, 24-hour storm. The CROD-LO, the CROD-Hi/Med and the Cluster alternatives showed reductions of 59%, 83%, and 50%, respectively. The CROD-LO, the CROD-Hi/Med designs also showed 10-year, 24-hour per acre reductions from baseline amounts of 35.8% and 42.4%, respectively. The Cluster design showed a 4.6% increase in runoff per acre.

The most dramatic effect of the biomimicry approach was demonstrated for the WQV storm, where each alternative showed 100% reduction from baseline amounts, both in terms of per acre and per dwelling unit measures. This is very significant because nearly 95% of the Twin Cities’ historical rainfall record storms for April through October, 1891 through 1998, were equal to or less than the WQV (Claytor 1996, p. 2-22; MPCA 2000, pp 1.10-4 through 1.10-6; Pitt 1997a).

Overall, the results of the modeling support an affirmative answer to the question for investigation. Further, the results suggest that denser development with carefully re-thought stormwater management systems can substantially out-perform the stormwater
This study provides substantial evidence that adverse impact on stormwater attributed to denser development types such as TND and TOD should not be assumed. Given the biomimicry approach to stormwater systems design used in the applications presented here, Traditional Neighborhood Development, as well as Cluster development can significantly reduce the impact of development on stormwater runoff per unit of housing. It also raises the question with respect to stormwater performance: Why continue to roll out new developments designed using the Baseline standards and approaches?

References


-------2000. Protecting water quality in urban areas: Best management practices for dealing with storm water runoff from urban, suburban and developing areas. St. Paul, Minnesota: MPCA (March).


------- 1997a. Section 3: Integration of water quality and drainage design objectives. In Incorporating water quality into stormwater design, text for short course of the same name directed by Patrick Egan,
<table>
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<tr>
<th>Design Scheme</th>
<th>Runoff Volume (cu. ft.)</th>
<th>Runoff per Acre (c.f./ac.)</th>
<th>Diff. from Baseline, Runoff per Acre</th>
<th>% Change from Baseline</th>
<th>Dwelling Units (equiv.) in Scheme</th>
<th>Runoff per Dwelling Unit (c.f.)</th>
<th>Diff. from Baseline, Runoff (cu. ft./d.u.)</th>
<th>% Change from Baseline</th>
</tr>
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<td>1616</td>
<td>0</td>
<td>-1,109</td>
<td>-100%</td>
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**Table 1** Water Quality Volume Storm Runoff Volumes – Cottage Grove Site

<table>
<thead>
<tr>
<th>Design Scheme</th>
<th>Runoff Volume (cu. ft.)</th>
<th>Runoff per Acre (c.f./ac.)</th>
<th>Diff. from Baseline, Runoff per Acre</th>
<th>%Change from Baseline</th>
<th>Dwelling Units (equiv.) in Scheme</th>
<th>Runoff per Dwelling Unit (c.f.)</th>
<th>Diff. from Baseline, Runoff (cu. ft./d.u.)</th>
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**Table 2** 10 Year 24 Hour Storm Runoff Volumes – Cottage Grove Site

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<th>Design Scheme</th>
<th>Runoff Volume (cu. ft.)</th>
<th>Runoff per Acre (c.f./ac.)</th>
<th>Diff. from Baseline, Runoff per Acre</th>
<th>%Change from Baseline</th>
<th>Dwelling Units (equiv.) in Scheme</th>
<th>Runoff per Dwelling Unit (c.f.)</th>
<th>Diff. from Baseline, Runoff (cu. ft./d.u.)</th>
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<td>-100%</td>
<td>522</td>
<td>0</td>
<td>-910</td>
<td>-100%</td>
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**Table 3** Water Quality Volume Storm Runoff Volumes – Woodbury Site

<table>
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<tr>
<th>Design Scheme</th>
<th>Runoff Volume (cu. ft.)</th>
<th>Runoff per Acre (c.f./ac.)</th>
<th>Diff. from Baseline, Runoff per Acre</th>
<th>% Change from Baseline</th>
<th>Dwelling Units (equiv.) in Scheme</th>
<th>Runoff per Dwelling Unit (c.f.)</th>
<th>Diff. from Baseline, Runoff (cu. ft./d.u.)</th>
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<td>1,246</td>
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<td>-50.1%</td>
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**Table 4** 10 Year 24 Hour Storm Runoff Volumes – Woodbury Site
Madison, Wisconsin: College of Engineering, University of Wisconsin.

------ 1997b. Section 5: Detention pond design for water quality. In *Incorporating water quality into stormwater design*, text for short course of the same name directed by Patrick Egan, Madison, Wisconsin: College of Engineering, University of Wisconsin.


Sprawl. Nicesprawl or Multi-modal Hydroburbia

Lance M. Neckar

Introduction
Suburban subdivision design epitomizes America. The landscape of suburbia mirrors the internalized and private values of its residents, middle Americans that are now the country’s majority. Taken in aggregate, suburban land continues to be developed at such a large horizontal scale that it is commonly characterized as sprawl. Americans have affirmed sprawl as ideology and supported its continuance with a legal and policy framework and investments in cars and trucks to support transportation network tailored to their exclusive use. The effective rise of vehicle miles traveled is colossal, and the adverse impacts on the environment largely immeasurable. This study asked a general question: “Can ideologies, laws, economies, and technologies be inflected in formal ways such that suburban growth could be more sustainable?” The study focused on the subdivision of land and especially the shape and form taken by the provision of public space of streets—and, to a secondary extent, parks—that conditions the development of private suburban space.

Given the aggregate effects of so many individual actors in superficially disaggregated sequences of subdivision, the study hypothesized a genetic code of sprawl, an organizing matrix of ubiquitous generative forces that overlay a superficially homogeneous order on individually differentiated manifestations of suburbia. Subdivision and design of streets are the strategic media of change in the genetic code of a sprawl. (fig. 1) In urbanized areas, streets function as conduits of drainage as well as vehicles. Two variables, vehicle miles traveled and stormwater runoff, though independent, are both functions to a high degree of the introduction of the most extensive system of public impervious surface associated with suburbanization, the pavement of roads and streets. The street, the primary medium of this research, reveals, in section its dual nature as pavement for transport in multiple modes and conduit of water. In plan, in its extent, the street network is also the armature of civic design, of community forms that reveal the social and environmental intentions of developers and designers. The legibility of the relationship of these intentions to the form and character of the network is founded, for example, on the fact that the developers’ sales of lots are necessary to pay for the construction of residential streets. Combined with the subdivision of these private lands and public open space, then, the design of streets sets the scale and the social and environmental template of settlement as it also determines modal choices.
multi-modal and hydrologically sensitive, thereby reversing trends in two of the central problems incurred by sprawl.

**Commuter Rail and Multi-modalism in Suburban Form**

Multi-modal landscapes imply transit. Even the two core Twin Cities, Minneapolis and St. Paul, have always been a suburban-scaled cities in metropolitan area largely characterized by free-standing houses. This largely uni-modal situation is compounded by increasing job dispersal on major limited access ring roads and arterial highway spokes. The Twin Cities is today more jobsprawled than Seattle or Chicago with the central cities having less than 20% of the region’s jobs.²

Nevertheless, downtown Minneapolis still has the state’s largest employment base, and several plans have been made to capitalize on this advantage, including the opening of the Hiawatha LRT, the region’s first light rail line in 2004. In order to link relatively dispersed populations living at low densities, the state’s Department of Transportation has since 1995 also proposed to provide commuter rail service into the cities on existing heavy rail routes. (fig. 2) More than 95% of commuter rail trips in other metropolitan systems, such as Chicago’s METRA and Seattle’s Sounder are job-related.³ The three Twin Cities routes were that were given top priority in order were the Northstar line from St. Cloud to Minneapolis, the corridor of the state’s greatest growth in the 1990s; the line between Minneapolis and St. Paul; and the Red Rock Corridor, from St. Paul to Hastings, another area of rapid growth..

This design research, part of the Twin Cities Transportation and Regional Growth Study, sponsored by the Minnesota Department of Transportation and the University of Minnesota Center for Transportation Studies, focused on the Red Rock. The Red Rock runs through a floodplain terrace of the Mississippi River, and the communities it will serve are located both on that terrace and on the bluff and ravine lands above. The watershed defined the subregional corridor-scaled context for the subdivision design work, which focused on the area where the Red Rock line will serve Cottage Grove, Minnesota, a community directly straddling the boundary of the Metropolitan Urban Service Area (MUSA) which defines the core of the metropolitan area that is served by sanitary sewerage. Because sewerage had not been yet extended to large tracts of this area, the opportunities to redefine the infrastructure in relation to the hydrological context as well as to the incipient commuter rail service seemed propitiously linked.

Since over 90% of commuter rail riders arrive at the station in the morning by car, it seemed important to analyze various components of that modal split. Here is one of several isochrone analysis confirming the spatial and temporal nature of this situation. Another subregional contextual scale of the study, then, was set by the relationship of the subdivision development site to the commuter line, within

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**Figure 2. MnDOT, Parsons Brinckerhoff, Commuter Rail Feasibility Study, 1995.**

**Figure 3. Jamaica Avenue, Cottage Grove Station and Subdivision Development Sites.**
twelve minutes of one of the proposed stations, and inside the city limits of Cottage Grove.

**Precedents**

If the subdivision of land as process embodies the formal arrangement of space and systems associated with the code of sprawl, suburban design precedents that placed these relationships in a different order of integration than is conventionally operational today could be used to generate design principles for the subdivision designs in the Red Rock. (fig. 3)

From the 19th century the designs of Highland Park and Riverside, Illinois, both commuter rail suburbs, were used for their integration of street design with drainage, grading and open space design. (fig. 5) The classic grade-separated approach of Forest Hills Gardens gave another large-scaled formal clue to the station area street approaches.

New urbanism was represented by both the Traditional Neighborhood Development (TND) principles of projects such as Seaside and Transit Oriented Development (TOD) principles from heavy and regional light rail communities, especially around newer stations such as those on Portland’s MAX, and the Seattle’s Sounder, and the Alewife Area of Boston’s Red Line. New hydrological infrastructure techniques innovated by James Patchett at Coffee Creek Center, Chesterton, Indiana, gave direction to the specific design of streets and open spaces. A study by S. B. Friedman of Chicago’s Metra suggested the range of acceptable densities of successful transit communities and raised important ideas about techniques to increase ridership in low-density communities.

**Objectives of the Research: Integrating Transportation and Water as Regional Resources**

This was an applied research study; the participating agencies, the Minnesota Department of Transportation (MnDOT), the Metropolitan Council, Washington County, and the City of Cottage Grove were all, to varying degrees, looking for answers to the larger questions posed by the study, many of which focused on various costs of growth as they related to transportation investments. An important challenge of this study was the integration of design and governmental objectives within and across scales and jurisdictions of investments in the public realm. What emerged from this research was a clear problem of fragmentation of design: commuter rail development would be stewarded by the

*Figure 4. Five-Minute Isochrome Study showing high-degree of accessibility to the Jamaica Avenue station site with relatively few riders(symbolized by the single dots at intersections of the grid in the largely undeveloped area beyond the metropolitan sewerage system inside the MUSA line.)*

*Figure 5. Highland Park, Illinois, Cleveland & French, 1874. This design forms the street network in an organic relationship with the site. The center of town is a grid related to the rail line; the residential areas are subdivided to relate to the topography and form of the ravines, which are treated as shared and public spaces.*
state, related suburbanization would be reviewed on a metropolitan scale, but subdivision is controlled locally. Similarly, water quality and quantity controls are fragmented across units and levels of government. Suburban drinking water, for example, is largely overseen by local jurisdictions with 110 separate water utilities in the seven-county core metropolitan area. Yet these groundwater reserves are also regional resources. Surface water regulation is similarly mostly a regional and state concern, and, except for the Department of Natural Resources which oversees well permits, is housed in agencies unrelated to groundwater. Yet, in the Minnesota landscape, with suburbanization creeping up from the river valleys and lakes through the middle third of many watersheds, it was hypothesized that surface and groundwater hydrology are intimately related in many landscapes. Water underpins and is a rough proxy for ecological stability. The state and regional commuter rail transit service investment effects on local units of government would hypothetically, then, be integrated not only with the design of new and adaptation of existing public space such as streets and parks, and a vision of the long-term value of developed private space that yields sustainable tax bases, but also to these regional concerns. In other words, the research hypothesized that regional concerns of water and transit would justifiably be considered in the suburban design and development process given state and the metropolitan investment in commuter rail transit and the region-wide shared ecological and economic values embodied in its public water resources. What form this consideration would take was seen as a policy question that could be exposed by design.

Overarching Conditions, Assumptions and Principles of the Design Approach

Commuter Rail

Commuter rail is different from light rail in that it depends primarily on the commute from home to job. Central cities in commuter rail metropolitan areas are strong job locations. The types of suburban places served by commuter rail are diverse, though commuter rail riders tend to have higher incomes than bus or, on average, even light rail riders. The scale is different from light rail: stations are miles apart. Commuters sometimes walk, take feeder transit, or bike to the train, but 90% arrive by car. Riders are generally assumed to be within fifteen minutes of a station as seen in the isochrone analysis; in other words, all ridership is not necessarily defined by 1/4- to 1/3-mile radius pedestrian market commonly used to describe the pedestrian reach of a light rail station. This pattern, while it favors the automobile, must also provide access to other modes in order to shave the peak demand for parking yet not contribute to congestion at bottlenecks. Mode separation and grade separation in the street network between modes are principles of an ideal form designed to increase both safety and multimodal porosity of the network.

Corridor-Scaled Design: the Watershed and the Intermediate Street Network

Within the corridor/watershed-scaled study area surface transportation is largely structured by the grid of county highways on the one-mile section lines that were the imprint of the Land Ordinance of 1785. Since roads overlay and mediate hydrological function, the relationship between roads that would become arterial streets that bound new suburban subdivisions was seen as a critical medium of design relative to the two variables in play. In order to suggest protection of water bodies, stream corridors were mapped and buffered to 50 meters. Adjacent slopes over 15% and forest cover were also used as measures by which both hydrology and larger ecological resources might be protected while suggesting a pattern of a connective subregional green infrastructure, part of which will include highways (and roads) that will, when urbanized, become either parkway-like arterial or multimodal/transit-oriented collector streets. This subregional structure, then, becomes the new connective transportation and hydrological tissue into which the subdivision is integrated.

Figure 6. The subregional pattern of green corridors overlaid by new hydrological arterial streets and parkways with multimodal access to the station.
Baseline and Alternative Commuter Rail-Oriented Design: Research Method

The method of the research was to evaluate alternative design approaches to subdivisions of land within the 15-minute commute of the proposed Jamaica station in Cottage Grove. These approaches compared and contrasted effects of baseline conventional design with ‘smart growth’ approaches designed to inflect the two central variables evaluated: VMT and stormwater runoff. GIS coverages were used to frame the subdivision design opportunities and constraints. Diagrams, such as the ‘genetic code of sprawl’ sketch illustrated here, were used to explain to stakeholders and technical advisors (who met at two-month intervals over the entire project) how formal and infrastructural aspects of the designs were to address the complex array of conditions that affected VMT and storm water runoff.

Baseline

The baseline research hypothesized the unimodal effects of an internalized and relatively homogenous residential street network that characterizes subdivision design today as prescribed ‘the genetic code’ operative today in most of this suburbanizing zone of the metropolitan area. This design was done to provide a comparative baseline of data on VMT and stormwater runoff that would be reflective of the development approved by the Metropolitan Council in the City of Cottage Grove comprehensive plan and of MnDOT design guidelines for road network design; i.e., the status quo. In designing the baseline treatment of the development site near Jamaica Avenue, the street plan and gross density (@ 4.5 d.u./acre) of an adjacent subdivision was mirror-projected onto the site. Typical characteristics of the design included internalized and disconnective patterns of circulation in large blocks, unstratified street hierarchy, minimal sidewalk construction (usually on one side of collector streets); arterial streets with backyard frontage and limited intersections (one intermediate intersection per mile). This design also had conventional piped storm drainage.

Alternatives

The project used ‘smart growth’ design principles of ‘conservation/cluster, neo-traditional development (TND), transit-oriented development (TOD) to contrast performance against baseline conditions of ordinary development as guided by current practices and ordinances. While the formal characteristics of these alternative designs were generally recognizable as exemplars of their classes (e.g., in the general patterns of arrangement of streets, blocks lots and open spaces), they also demonstrated how they would be specifically adapted across scales from details of drainage infrastructure to subregional traffic conditions. The principal design variables were mix of land uses, modal intentions, block and lot scales, density, storm drainage infrastructure, and open space configuration.

Figure 7. CROD-Lo Design.

Commuter Rail-Oriented Design-Low Density and Commuter Rail-Oriented-Medium/High Density Alternatives: Principles of Cluster/Conservation, TND and TOD

To demonstrate whether VMT and water quality could be positively affected by the ‘smart growth’ design approaches across densities, several alternative designs for subdivisions were created for the subdivision near the Jamaica Avenue station. The two proposals evaluated were cluster/conservation (with some mixed land use elements of TND) called here Commuter Rail-Oriented Design-Low Density (CROD-Lo, 3 to 4 dwelling units/acre) and Commuter Rail-Oriented-Medium/High Density (CROD-Med/Hi, 7 dwelling units/acre), a hybrid TND/commuter rail density/feeder bus approach. For each an expanded station area urban design was also shown, although not evaluated. (figs.7 and 8)

The CROD alternative subdivision designs focused on connective street and public open
space patterns, a hierarchy of multi-modal streets, multiple uses with service and job destinations (some at walkable locations), mixed densities, and stormwater infiltration and exfiltration as part of new connective infrastructure and armature of public space. Another explicit design strategy was the creation of linked open space with both recreational and hydrological functions as a method of stabilizing and adding taxable value to residential areas near these systems. Finally, certain specialized intermodal services such as peak-hour jitney service and feeder buses (CROD-Med/Hi only) to the station were hypothesized.

Figure 8. CROD-Med/Hi Design.

General and Specific Findings
Certain types of design approaches explored in the research could be deemed effective generally and broadly applicable to areas where new growth is served by commuter rail. Other approaches are more specific to the Red Rock and the development site near Jamaica Avenue. For example, the basic connectivity of street networks and mixed land uses might be generalizable. More specific types of findings in this study include those, for example, related to the specific forms of networks, soils, topography, vegetation, and other site-specific issues.

1. VMT
VMT is, indeed, a measure of spatial sprawl. The simple two-tiered street networks of arterials and residential streets with no intermediate connective streets in their current internalized form become an armature, (or the bones, and circulatory system) of single-mode, single-use suburban patterns of growth in which people living in low density, dispersed patterns have to drive more. However, even with the inclusion of mixed uses in walkable locations, the low-density cluster density of the CROD-Lo alternatives to this pattern do little to reduce regional VMT. This finding may have stemmed, in part, from the insensitivity of the model to street network design, but also largely stemmed from the inefficiencies of mass transit for principle trips (home to job) in such a low density areas. Only when density begins to approach that of existing multi-modal neighborhoods (7 d.u./acre) in the Twin Cities as represented in the CROD-Med/Hi design, is there any discernible effect on the spiraling growth of VMT in the metropolitan area.

Figure 9. Topography and Water.

2. Water Quality/Quantity
Storm water is currently treated as waste and piped to distant receiving basins, often with little ecological or recreational connectivity in largely independent institutional frameworks (110 local water utilities in the suburban metropolitan area). Stormwater design is conventionally done on a one-size-fits-all basis.
The soils on this site were extremely deep—50 feet to the water table—and extremely porous, infiltrating 6 inches per hour. In both the CROD-Lo and CROD-Med/Hi designs, 100% of the water quality volume (2 year storm event) could be infiltrated or stored and exfiltrated in the leaky pipe system developed for the site. (See Robert Sykes, et.al., “Biomimicry as a Runoff Management Strategy for Multi-Modal Landscapes” for a fuller description of the evaluation processes on the performed on the designs.) Improvements to surface water quality in receiving basins and streams were inferred but not measured. (fig. 9)

Results and Conclusions
The reporting of these findings to the sponsoring agencies, MnDOT (and the Metropolitan Council,) has created for staff some new windows on the evaluation of the planning and design of road networks and suburbanization. By using design to elucidate some relationships between land use and transportation a more comprehensive and yet, comprehensible, sense of what issues are at stake was induced into the sprawl debate. However, these processes remain fragmented, in part because of the cycles of political change that characterizes elective office in both state and regional government. One of the most important findings was that current baseline development is being authorized a density below the threshold of transit service (7 d.u./acre) by the metropolitan agency that also runs the transit system. Yet this finding may be lost on the current administration.

If, however, politicians were able to focus suburbanization, the comparison of the CROD-Lo and CROD-Med/Hi designs also illuminated some significant values of various ‘smart growth’ approaches. If by adopting more site-specific approaches to subdivision, similar hydrological results could be attained on all such open sites developed in commuter rail corridors at the CROD Med/Hi densities with similarly mixed land uses, then VMT could be stabilized with minimal damage to local and regional hydrological function. Since CROD-Lo (cluster/conservation) performed hydrologically no better than CROD-Med/Hi, or ‘Multi-modal Hydrosurbubia,’ the encouragement of lower density development in areas served by line-haul transit service, can best be seen as ‘Nicesprawl’ policy, visually and hydrologically sound, but potentially only slightly more sustainable in a metropolitan strategy than the existing baseline approaches.

However, to enrich the argument for ‘Multi-modal Hydrosurbubia,’ there is another problem in the VMT models used by traffic engineers in the Twin Cities. Effects on VMT of specific aspects of subdivision design, including multi-modal street and public open space patterns, specific uses (services and job destinations), mixed densities or the development of walkable multiple use destinations could not be modeled. Missing this level of information, arguments default easily to issues of congestion and bottlenecks.

On the other hand, this lack of refinement in the modeling seems to suggest for worse, not better, the validity of a genetic code of sprawl that is productive of an all-too recognizable, nearly ubiquitous form of landscape that, in fact, can be modeled anywhere in the Twin Cities metropolitan region, perhaps anywhere in North America. In other words, our models seem to affirm our current choices.

Notes
1 A huge number of sources were used to inform the questions raised by this project and some of the design approaches used and evaluated. Since Peter Calthorpe, who has been among the most articulate of designers in his comprehension of formal aspects of the problems we had posed, had been retained by the Metropolitan Council to update its Blueprint 2030 in this period, the research used his older book, The Next American Metropolis, and in mid-project, his most recent work with William Fulton, The Regional City: Planning for the End of Sprawl, Washington: Island Press, 2001 as a frameworks of organization.

The research team had also produced a number of previous projects evaluating transit- and stormwater-sensitive approaches to design, the most recent being summarized in the report, ‘Organic Infrastructure as City Rebuilding,’ Department of Landscape Architecture, University of Minnesota, 2001. The full citations for this work are contained in the research report, Lance M. Neckar, “Transportation, Urban Design, and the Environment: Highway 61/Red Rock Corridor,” Center for Transportation Studies, University of Minnesota, Minneapolis, 2003.


3 See http://www.soundtransit.org/sounder/sounder.htm for current information on ridership on the
4 Designs for station areas on the MAX in Portland were well known to the team, who included Professor James Pettinari, Department of Architecture, University of Oregon, then principal of the University’s Portland center for urban design. http://www.bikexpurt.com/massfacil/cambridge/alewife/intro.htm gives an overview of the multimodal aspects of the Alewife design.

5 See www.coffeecreekcenter.com for current news about the development and some of the design approaches; http://www.cdfinc.com/CDF%20Portfolio/CDF%20Portfolio.htm is the website of the Conservation Design Forum, headed by James Patchett, the landscape architect and hydrologist of Coffee Creek Center.


7 Highland Park, Illinois, and the Minneapolis Park system, designed by H. W. S. Cleveland, demonstrate this effect.
Technology

Aesthetic, Recreational and Ecological Value of Rural Landscape at Town Edge:
Public Opinion and 3D-Visualization Technology
Sigrid Hehl-Lange, Ph.D., Eckart Lange, Ph.D.

Strategic Environmental Assessment:
Change Detection and Sustainable Development
Stephen L. Sperry

Remote Havens for Terrorist and Other Illicit Activity:
Geospatial Modeling
Douglas S. Way, Ph.D.
Aesthetic, Recreational and Ecological Value of a Rural Landscape at Town Edge: Public Opinion and 3D-Visualization Technology

Sigrid Hehl-Lange, Ph.D., Eckart Lange, Ph.D.

Introduction
In many cities around the world, attractive urban parks, woodlands, green corridors, and other types of green spaces can be found. Urban green space is often a legacy of earlier decades. Already, at around 1900, the town planner Camillo Sitte acknowledged and underlined the importance of urban green space. Sitte (1922) made a distinction between sanitary and decorative green. Besides fulfilling an important amenity and social function, in ecological terms urban green spaces provide habitats for wildlife, and also function as the lungs and water filters of our cities.

In addition, green space and urban open space have a considerable economical importance. Lange & Schaeffer (2001) showed that the economic value of views from hotels in Zurich, i.e. the prize for renting a room, is directly related to the quality of the view on the surrounding area.

The presented work is part of the GREENSPACE project http://greenspace.ethz.ch. It is funded by EU 5th framework and Bundesamt für Bildung und Wissenschaft, Bern. The project consortium consists of the University College Dublin, Robert Gordon University Aberdeen, University of Surrey, Universidad Autónoma de Barcelona, Eindhoven University of Technology, University of Hohenheim, and the Swiss Federal Institute of Technology Zurich.

General Objectives
The overall goal of the project is to advance the planning and design of urban green space (Greenspace 2003). In our research we are developing applied methodologies to identify the types and varieties of green spaces and other public open spaces that best satisfy people’s needs. In several case study cities, the Greenspace project demonstrates how citizen participation can be brought to the strategic planning of green space. Three-dimensional visualization plays a key role in the project by allowing people to explore existing and future landscapes.

The Kaferberg Case Study
The Kaferberg case study site is located in the greenbelt north of the city center, between the campus of the Swiss Federal Institute of Technology and the Kaferberg forest (fig. 1). This site is mainly agriculturally used, but is also very popular for urban recreational purposes such as walking, jogging, cycling, etc.

![Figure 1: Model of Zurich with the Alps in the Background. The Kaferberg green space is in the foreground.](image)

Of special interest to the Käferberg case study is the relationship between aesthetics, recreation, and ecology. The research focuses on the presence of pasturing animals and the influence of vegetation structure on the perception of landscape quality in terms of ecological value, aesthetic value, and recreation experience. In the realm of the wide discussion of sustainability issues, recently this topic has gained greater importance. Studies include the work of Hands & Brown (2002), Hehl-Lange (2001a), Kaltenborn & Bjerke (2002), and Sheppard (2001). In addition, the impact of wind turbines (see e.g. Ulm & Lange 2002), planned by ETH Zurich in the case study site Kaferberg, is studied.

Research Approach

Visualization Methodology
The purpose of the visualization is to provide a basis from which to analyze how people interpret and react to the visual experience of the landscape and to different green space...
attributes. In this way the visualizations will provide the foundation for the assessment of landscape changes and will enhance a project’s ability to explore the contribution that green space can make to quality of life.

Of principal research interest is the extent to which it is possible to visualize various potential maintenance practices, management strategies, design alternatives, and scenarios for change in general (see e.g. Lange 1994, Bishop et al. 2001, Jorgensen 2001, and Muhar 2001). In the Zurich case study, static and dynamic real-time representations of urban green spaces are used as a basis for public surveys and in participatory planning.

Static visualizations show a single green space scenario as seen by a static observer, at one point in time. Dynamic simulations allow for two types of visualization. The first type is to show a demonstration of proposals as viewed by a moving observer. The second type allows the viewer to see changes due to vegetation growth and evolution at a particular site over time. In general, dynamic visualizations are a more innovative and immersive approach to visualization (see Danahy 2001).

The goal for the models is to provide optimal resolution and detail while allowing the digital model to be computationally efficient. Both for static and dynamic visualizations, Polytrim software from the Centre for Landscape Research at the University of Toronto (Danahy & Hoinkes 1995) is used. Polytrim is visualization software for the Unix environment that has strong links to GIS and CAD software (see Hoinkes & Lange 1995). Visualizations of polygonal models augmented with texture maps possess a medium to high degree of realism (see Lange 2001). They should not be interpreted to compete with photo-realism.

The visual representation of the landscape for the Kaferberg site consists of a digital terrain model with various ground resolutions, an orthophoto, and 3D-elements such as houses, trees, and farm animals. From contour line and road grade data, the terrain is built into a TIN (Triangulated Irregular Network). The roads with their embankments, two bridges and an underpass, as well as some trails, are edited by hand in order to get a precise terrain representation.

The modeling of the 3D-elements is based on planning data, zoning data, and on-site visual surveying. Once built, these structures are automatically set to the terrain surface. The Campus of ETH Honggerberg and the neighboring farmhouses are modeled and visualized in detail with geospecific, textured facades. Other buildings are mostly derived from the digital topographic map 1: 25'000 of Zurich using pattern recognition techniques (Institute of Geodesy and Photogrammetry of ETH Zurich). The resulting 2D data sets are handled by the Geographical Information System, ARC/INFO, and can be exported semi-automatically in Polytrim in the 3D environment.

Texture mapping is used to provide detail, both for the ground surface and for the architecture. Due to hardware texture requirements, the terrain is divided into squares that correspond to the maximum texture size. When using a 0.5m-resolution, aerial orthophoto, these squares measure roughly a half kilometer.

The orthophotos are ‘draped’ over the TIN to give the terrain its visual characteristics. The advantage of this procedure is that it creates highly efficient terrain models; the disadvantage of this procedure is that terrain in the foreground of an eye-level image, depending on the position of the viewpoint, sometimes appears to be pixelated.

For a precise representation of the existing vegetation, tree and shrub species are surveyed, mapped, and photographed in the field. Of these photographs, a texture library consisting of local, woody vegetation such as acer, aesculus, alnus, etc. is established. Both the basic terrain data and the digital orthophoto are provided by the Swiss Federal Office of Topography.

Research questions
The Visualization for the Kaferberg case study site is a basis for the exploration of the aesthetic value, the recreation experience, and the ecological value of the landscape. Of special interest are peoples’ preferences with respect to different types of changes in the landscape, such as more or less hedges and more or less orchards.

In order to pursue a practice related approach to green space planning, it was decided to develop different scenarios for landscape change, including as variables, trees, hedges, orchard, forest, and pasturing livestock.

There are less than a handful of studies known that explore the influence of the presence or
absence of animals on the visual quality of the landscape. It is hypothesized that especially livestock has a strong positive influence on the visual landscape quality. Hull & McCarthy (1988) looked at the influence of different kinds of animals, kangaroos, wallabies, deer, and waterfowl in Victoria, Australia. They photographed the landscape with the wildlife, then scared the animals away and took the same pictures again without animals. This approach, however, does not allow a structured experimental setup with a combination of animals and different landscape changes at the same time, which is possible in our approach.

Modelling the visual appearance of static animals is somewhat comparable to other landscape elements. To represent moving animals or to represent the behaviors of animals in the landscape is much more difficult. Hehl-Lange (2001b) used amphibians, a bat species, and the green woodpecker to demonstrate spatial-functional relationships in a 3D representation of the landscape. Among few other examples, Bishop & Karadagli (1997) studied the effect of forest management on the presence of owls.

**Scenarios**

For the Kaferberg site, Grun Stadt Zurich, the horticulture department of the City of Zurich is planning, within the next few years, to develop a so-called ‘Landscape development concept,’ a masterplan which functions as a guideline to improve the landscape in terms of ecological and recreational purposes. The principle of landscape development concepts is to pursue a participatory planning approach, incorporating the views of the public.

In order to develop scenarios of landscape change, several experts were asked by us to articulate their opinions in a 2D plan format:

- Status quo, i.e. the existing virtual model of the Kaferberg site
- Agriculture, developed by the farmer of the Kaferberg site
- Recreation, developed by a recreation researcher of our institution
- Nature conservation, developed by a landscape ecologist of our project partners from the University of Hohenheim
- Wind turbines, as proposed by ETHZ.

Depending on the level of potential opposition to the wind turbines, the construction is planned for 2003. The project will be cancelled if the opposition by the public is too strong.

For the five scenarios altogether, eight representative viewpoints are chosen. The visualizations of views from three of the eight viewpoints are shown in figs. 2-7. In addition to the scenarios, in selected scenes three different kinds of pasturing livestock, i.e. cows, sheep and horses, are added.

**Scenarios for the Kaferberg Case Study Site Survey**

In order to test responses to the different scenarios, a survey was conducted both in print form and on the internet (see also Wherrett 2000, Davies & Laing 2001). For interested local citizens, stakeholders, and special interest groups, a complete print version of the test set with all eight viewpoints was provided in a face-to-face situation, or was provided as a mail survey (see e.g. Stemerding et al. 1999).
The same set of images was then placed on the internet. In order to reduce the time needed to do the test, a random selection of 20 images of the overall test set was loaded each time a user accessed the website. Interviews on the web are perhaps the most efficient way to test people's preferences. Altogether, several hundred responses were gathered this way.

Preliminary survey results
All suggested changes in the scenarios are rated equal or far higher than the status quo. This shows that there is great potential for improving the existing landscape.

Preliminary results indicate a very strong preference for the nature conservation scenario, followed by the agriculture and recreation scenarios. The existing situation and the wind turbines scenario can be considered of equal value in terms of landscape preference, recreation preference, and ecological value.

Within each scenario, the scores for landscape preference, recreation preference, and nature conservation are relatively close.

Compared to scenes without livestock, there is a considerable effect when livestock is present in the scene—especially horses influence the ratings very positively.

Conclusions
Parks, play areas, and green spaces enrich people’s lives. They promote lifelong learning and healthy living, combat disadvantage, encourage community enterprise and social inclusion, and help regenerate urban communities. DTLR (2001) proposes, as the most prominent criterium for good practice, to understand the values, needs, and aspirations of local people, and to develop a clear and shared vision for the space.

The purpose of visualization in the Greenspace project in the Zurich case study is to analyze how people interpret and react to the visual experience of the landscape, specifically to the different urban green space context. The digital visualization of the landscape can assist in communicating planning and design issues.
that are of physical nature. The visualizations aim to articulate the dynamics of landscape over time, in the fourth dimension, depicting present and hypothetical future scenarios. Such scenarios are useful in assessing people’s visual preferences for different conditions of landscape qualities.

References


Strategic Environmental Assessment: Change Detection and Sustainable Development

Stephen L. Sperry

Introduction
Urban sprawl – a landscape of similar low-density suburbs, strip malls, and additional highways spreading across the landscape – is a contentious topic. The symptoms of frustration are endless: long drives to work; frequent traffic jams; aggravated air and water pollution; lost agriculture and degraded biodiversity. While these effects are visible, sprawl may place fiscal burdens on towns to extend services and infrastructure – sewers, schools, police and fire service – to outlying areas, even as the older core areas are drained of economic vitality. Arguments can be made on both sides of the issue as to whether these development patterns are what Americans desire. Concerns about sprawl reflect a general frustration that suburban life does not always live up to the expectations created and memorialized in TV shows about the 1950s and 60s. Today generally, both parents find themselves working. Their jobs compete with taking kids to athletic practice; help them with their homework or being together for family dinnertime. The reaction to these frustrations is understandably emotional. Suburbanites complain about constant gridlock, long commutes and overcrowded schools. At the same time, families cherish the open spaces, safer streets, better schools, and convenient shopping that they may not get living in the city. People want solutions to congestion without taking away the conveniences and freedoms, that suburban life offers them.

Issues of Sprawl
Historically most urban growth has been outward. In the modern era, the trend is accelerating because of rapidly falling communications and transportation costs. Favorable public policy has encouraged growth with funded highway networks, special tax treatment of residential mortgage interest, zoning codes, and low gasoline taxes. (Gordon, 2001). In the US, the popular preference is often for suburban living, reliance on the automobile for personal mobility, and being closer to the natural environment. Cheaper development costs result in larger homes on larger parcels. European and Canadian urban policies favor compact development and more sustainable development.

According to Robert Burchell, sprawl can be characterized by unlimited outward expansion of development. The growth is primarily low-density residential and commercial settlements. The result is using more land for fewer people (Burchell, 1998). Widespread strip commercial development is the new development form. There are no downtowns or village centers. Sprawl leap frogs over existing development. and results in an abundance of roads with the dominance of private automobiles for transportation. Sprawl research has focused on the pattern of land use in an urban area. Studies suggest there are different types of sprawl exhibiting low levels of some combination of eight distinct dimensions: density; centrality; continuity, nuclearity; concentration; mixed-uses; clustering and proximity (Galaster, 2001)

Reid Ewing and others in Measuring Sprawl and its Impact identified sprawl as the process in which the spread of development outpaces population growth. They developed a sprawl index based on four factors that can be measured and analyzed: residential density; neighborhood mix of homes, jobs, and services; strength of activity centers and downtowns; and accessibility of the street networks. (Ewing, 2002)

In researching sprawl, quantification of the impacts or changes has been limited. The focus is measuring/identifying the pattern or indicators of sprawl. The only real impact on the environment has been traffic congestion (the catalyst for sustainable development). It requires monitoring and evaluating of policies, plans and programs. It also requires true environmental measurement and accountability. Linking environmental assessment with sustainable development or sprawl can address the measurement issues.

Environmental Assessment in the United States
Environmental assessment developed in the 1960s and became US law in 1970 with the NationalEnvironmentalPolicyAct(NEPA). The act was designed to evaluate the environmental consequences of proposed federal actions and to minimize resulting environmental damage. Over the years biodiversity has become apart
of the Environmental Assessments (EA). It has been used as threshold to determine need for an Environmental Impact Statement (EIS). Additionally, US Laws include the Endangered Species Act, Clean Air and Water Acts, Wetland, Critical Areas, and Floodplain laws. Many states have seized upon the opportunities presented in these laws as biodiversity conservation tools (Environmental Law Institute 2003).

The American Planning Association (APA) completed the Growing Smart Legislative Guidebook - seven-year project to draft the next generation of model planning and zoning legislation. The project involved a wide variety of partners and advisors and has produced multiple research and education products related to the revision of state enabling legislation for planning and land use. The Guidebook, includes state and local barrier removal plans, state zoning reform, conflict resolution or mediation, streamlining state regulatory responsibility, time limits on processing and approvals, and state impact fee standards (APA 2002).

Reform envisioned and enabled by Growing Smart will provide improved predictability in the planning and development process. It starts at the state level with a statewide biodiversity conservation plan and continues with the regional plan. If needed, urban growth boundaries are determined at that level. Protection of biodiversity identified at the state level is a criterion. Finally, at the local level, the comprehensive plan requires a monitoring every five years of buildable lands and the carrying capacity within the urban growth boundary.

This kind of predictability aids the development and construction industry. It also should create a better climate for all stakeholders. Similarly, the kind of state and local planning processes proposed by the optional statutory models promotes efficiency in the investment of public funds in the location of government facilities and in transportation and utility infrastructure and strong public participation. In other words, this is America’s answer to sustainable development planning.

An exciting new development for monitoring an assessment recently occurred. On May 15, 2003, Congressman Ose, from California, introduced House Bill H. R. 2138. It will raise the Environmental Protection Agency to Cabinet status. As part of the bill, it would create the Bureau of Environmental Statistics with the responsibility for gathering environmental data.

Presently at least five government departments or service groups monitor and collect data. Focusing the responsibility on one agency should offer a consistency to analysis and monitoring and lower the exaggerations on both sides of the environmental degradation debate.

**Strategic Environmental Assessment (SEA)**

Strategic Environmental Assessment (SEA) emerged internationally in the early 1990s. It has been a response to sustainable development and the limitation of an EA. Most SEAs are carried out in Europe, Canada and Australia. The stimulus for SEA occurred after the United Nations Conference on Environment and Development Conference in Rio de Janeiro in 1992, and in response to Agenda 21. Additional conferences in London in 1999 and Johannesburg in 2002 reinforced the SEA concept for managing sustainable development.

Sustainable development is a term for many conditions. There is much debate over the term sustainable development based on ideology, experience and effects. For this paper the definition provided by the Nature and Ecotourism Accreditation Program will be used. It states “Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Australia: NEAP, 2000)

In 1996, the European Commission (EC) adopted a Proposal for a Directive on Environmental Assessment. In December 1999, the Environment Ministers reached a political agreement on a common text for the future directive. The common position was formally adopted on March 3, 2000 as the SEA-Directive. The purpose of the SEA-Directive ensures that environmental consequences of certain plans and programs are identified and assessed during their preparation and before their adoption. SEA will contribute to more transparent planning by involving the public and by integrating environmental considerations. This may help to achieve the goal of sustainable development. Further development of guidelines is incorporating biodiversity-related issues into environmental-
impact-assessment legislation or processes and in strategic impact assessment (EC 2003).

Finally, the United Nation Economic Commission for Europe (UNECE) recently adopted and opened for signature the Protocol on Strategic Environmental Assessment on May 21, 2003 in Kiev, Ukraine (2003). The Protocol defined SEA as

*The evaluation of the likely environmental, including health effects, which comprises the determination of the scope of an environmental report and its preparation, the carrying-out of public participation and consultations, and the taking into account of the environmental report and the results of the public participation and consultations in a plan or programme* (UNECE, 2003).

The protocol, once in force, will require countries to evaluate the environmental consequences of their official draft plans and programs. An important difference from the original concept of SEA evaluating process was the elimination of policy. SEA is undertaken much earlier in the decision-making process than EIA, and is seen as a key tool for sustainable development. (UNECE 2003)

**The SEA Process**

The basic steps of SEA are similar to the steps in EIA procedures. SEA allows the identification and prevention of possible environmental impact right from the start in decision-making in order to develop a more sustainable policy. Rather than minimizing the environmental impact of a project, it enables environmental objectives to be considered on a par with socio-economic and health issues. The scopes differ with SEA covering a wider range of activities than with the EIA. The SEA process may be applied to an entire sector or to a geographical area to address national policy on air quality or a regional development scheme. While SEA does not replace project-level EIA, it can help to streamline the incorporation of environmental concerns (including biodiversity) into the decision-making process and thereby making project-level EIA a more effective process. (EC 2003)

**Study Methodology**

A review of the literature suggests that SEA terms and intents are well defined. The processes for determining a project are clear. How the environment is measured and monitored are not obvious, although biodiversity is an important indicator. This study addressed monitoring and the quantification issues of the SEA process, using an increasingly common application of remotely sensed data for change detection. Change detection is the process of identifying differences in landscape at different periods. Change detection is an important process in monitoring and managing natural resources and urban development because it provides quantitative analysis of the spatial distribution of the population of interest. Change detection is useful in such diverse applications as land use change, deforestation assessment, changes in vegetation phenology, lost agricultural lands, as well as biodiversity degradation (Singh, 1989).

The study focus was the Greenville-Spartanburg -Anderson Metropolitan Statistical Area (MSA) located in Upstate South Carolina (Greenville, Spartanburg, Pickens, and Anderson counties). Oconee County was added to the study area. Greenville-Spartanburg MSA is the fifth most sprawling metropolitan region in the US (Ewing, 2002). The effort incorporated change detection into a Strategic Environmental Assessment process. The results are part of longer-term research on sprawl and smart growth in exurbia.

The work looked at portions of the Greenville-Spartanburg MSA for indications of urban sprawl, and the Lake Keowee area in Oconee County for exurban development. Lake Keowee is becoming a retirement haven of expensive low density housing, lakeside housing with septic systems. Oconee County has the highest consumption of land in the region. The study addressed land use and land cover changes over a 10-year period with the effects of forest and agricultural conversion on biodiversity and resultant patterns as the primary focus. The study emphasizes three aspects of change detection to monitoring natural resources and urban growth: detecting the change; identifying the nature of the change in biodiversity; and quantifying the areal extent and mean index of the change by watershed.

The basic premise in using remote sensing data for change detection is that changes in land cover result in changes in radiance values that can be remotely sensed. Techniques to perform change detection with satellite imagery have become numerous because of increasing versatility in manipulating digital data and increasing computing power.
Watershed as the Primary Environmental Unit

From an environmental perspective, watersheds are the natural mapping unit for regional monitoring. As John Wesley Powell wrote:

[A watershed is] that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community. (Seaber 1987)

Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. No matter where you are, you’re in a watershed! The United States national dataset is divided into successively smaller hydrologic units: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). The study used the cartographic unit. It is a geographic area representing part or all of a surface drainage basin (Seaber 1987). The units average 4000 Ha nationally. In the five-county study area there are 150 watersheds averaging 6000 Ha. Thirty basins are located in more than one county.

Landcover Classifications and Change Detection

With rapid changes in land use/land cover occurring because of sprawl development, remote sensing technology is an essential tool in monitoring urban development and environmental conditions. From a strategic perspective, remote sensing (using multi-spectral imagery, such as Landsat Thematic Mapper) and GIS technology offer timely monitoring methods for extensive land areas.

Various techniques are available to detect land cover changes from multi-temporal remote sensing data sets (Jensen, 1996; Coppin and Bauer, 1996). Initiatives to monitor land cover and land use change increasingly rely on information derived from remotely sensed data. Such information provides the data link to other techniques designed to understand the human processes behind environmental changes.

The analysis goal is to characterize those areas of important change (e.g. forest clearing or land cover / land use change) between two or more image dates. One method, image differencing, is simply the subtraction of the pixel digital values of an image recorded at one date from the corresponding pixel values of the second date. The histogram of the resulting image depicts a range of pixel values from negative to positive numbers, where those clustered around zero represent no change and those at either tail represent reflectance changes from one image date to the next (Jensen, 1996).

This method has been documented widely in change detection research (Singh, 1986; Stowe and Sperry, 1990, Green et al., 1994; and Coppin and Bauer, 1996). The method is accurate, simple in computation, and easy to interpret. Image differencing, although mathematically simple, does not allow change to be separated into multiple classes. For this study, multi-spectral images classified into land cover classes were the preferred method of change detection. This image type has robust capability to identify vegetation and development classes.

Classification Scheme

The study used Landsat TM and ETM+ scenes that covered the five county study area and dual dates for the scene were acquired for the change detection discrimination. The period selected was late April in 1990 and 2000, it was preferred for early leaf-on conditions, but with no dense canopy to obscure urban development. In addition, the scenes were cloud free. The 1990 scene was purchased at retail cost, and the Multi-Resolution Land Characteristics (MRLC) consortium contributed the 2000 imagery. The 1990 Landsat 5 TM and 2000 Landsat ETM+ data were geometrically corrected by the EROS Data Center (Sioux Falls, SD) to less than 1/2 pixel root mean square error, registered to Universal Transverse Mercator coordinates, zone 17, North American Datum 1983, and resampled to 30-meter pixels by cubic convolution. All six reflective bands from both dates were used for the classification. Land cover mapping has been conducted for the five-county study areas using satellite imagery augmented by other geospatial ancillary data sets. The classification used unsupervised clustering program ISODATA into 250 classes.

The resulting spectral clusters were grouped into 12 classes using ancillary data sources (e.g., census, slope / aspect / elevation, orthophotography etc.) as required. The 12 thematic classes resemble the well-established Anderson
land use/cover classification system (Anderson et al. 1976). The thematic classes are: open-water; developed open-space; developed low-intensity; developed medium-intensity; developed high-intensity; barren; deciduous forest; evergreen forest (coniferous); mixed –forest; pasture/hay; cultivated crops; and woody wetlands.

The classification followed the new 2001 National Land Cover Data (NLCD) scheme. It is a modification of the previous 1992 NLCD classes. The new scheme uses impervious surfaces for development classes as opposed to the land uses such as commercial. Impervious surface is more consistent with the capability of satellite imagery. This new scheme will be used for the National Land Cover Characterization 2001 project is a cooperative effort involving several US Federal agencies – USGS, EPA, USFS, and NOAA. It will compile land cover data (NLCD 2001) across all 50 states and Puerto Rico and update the 1992 NLCD classification. The key component of this land-cover mapping effort is a database approach that provides flexibility in developing and applying suites of independent data layers.

These independent standardized data layers or themes, will be useful not only within the land-cover classification but as data components for other applications. This database will consist of the following themes: Normalized Tasseled Cap (TC) transformations of Landsat 7 imagery for three time periods per scene (early, peak and late); Classified land-cover data derived from the Tasseled Capped imagery; Independent ancillary data layers, including 30m DEM derivatives of slope, aspect and elevation and STATSCO soil moisture estimates; NLCD 1992 Land Cover/Land Use data; and Independent image derivatives of imperviousness surfaces and tree canopy.

**Urban Classifications**

Steps were taken in processing the data occurred to stratify urban or high intensity classes from rural stratification or cultivated crops. The grouping of the unsupervised classification used the ERDAS Imagine Grouping Tool. Table 1 shows the conflict among the 12 classes. Urban areas, due to confusion with bare soil, can be classified more accurately if done separately from agricultural or rural areas (Robinson & Nagel, 1990). For this reason, road data were overlaid on the imagery to aid visual identification of urban areas. High intensity development was separated from cultivated by careful manual delineation around urban areas greater than 100 contiguous pixels. Orthophotography were visually checked for this delineation.

In comparing the grouping of the classes there were some conflicts. Major factors that have contributed to disagreements between mapped land cover include: 1990 Landsat TM data quality and mapping error; early-spring time period – clear-cut, bare earth vs. paved urban areas(hay/pasture, cultivated crops, and high intensity development); and spatial uncertainty, such as geo-registration error.

**Measurement Process for Biodiversity**

The challenge of the study is to monitor an environmental program’s trends and consequences. Such process requires a common baseline and efficient and effective analysis. The process should integrate environmental concerns in land use policy issues. It can stimulate participation and action of stakeholders from business to citizens in the

<table>
<thead>
<tr>
<th>Class name</th>
<th>Primary conflict</th>
<th>Secondary conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open water</td>
<td>Woody wetlands</td>
<td>Coniferous forest</td>
</tr>
<tr>
<td>Developed open space</td>
<td>Hay/pasture</td>
<td>Mixed forest</td>
</tr>
<tr>
<td>Low int. residential</td>
<td>Mixed Forest</td>
<td>Hay/pasture</td>
</tr>
<tr>
<td>Med int. residential</td>
<td>High int. commercial</td>
<td>Low int. residential</td>
</tr>
<tr>
<td>High int. commercial</td>
<td>Cultivated cropland</td>
<td>Med int. residential</td>
</tr>
<tr>
<td>Deciduous forest</td>
<td>Mixed forest</td>
<td>Coniferous forest</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>Mixed forest</td>
<td>Woody wetlands</td>
</tr>
<tr>
<td>Mixed forest</td>
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<td>Hay/pasture</td>
</tr>
<tr>
<td>Woody wetlands</td>
<td>Coniferous forest</td>
<td>Open water</td>
</tr>
</tbody>
</table>

*Table 1 The most frequent conflict between mapped land cover classes.*
development process. If all parties are involved, better and more accessible information on the environment can streamline the development process and benefit all stakeholders. A quality SEA process informs planners, decision makers and affected public on the sustainability of strategic decisions, facilitates the search for the best alternative and ensures a public decision making process. The process can enhance the credibility of decisions. SEA process is integrated, focused and accountable.

To demonstrate this process, the study assessed the biodiversity quality of the five counties and monitored the trend over a 10-year period. For the purposes of this study, biodiversity information is defined as data on the location, status, and history of vegetation and ecosystems key is monitoring trends or indicators. In monitoring biodiversity, ecosystem degradation is more difficult to measure than habitat loss. The subtle effects of changing vegetation diversity and fragmentation of habitats into smaller patches can have significant impacts on biodiversity. It is generally understood among ecologists that smaller patches of habitat provide lower quality habitat than larger patches. (Calhoun and Klemens, 2002).

The study used both ERDAS Imagine for processing satellite imagery in land cover classes and ESRI’s ArcGIS for generating statistics representing the number or density of landscape patches, the size and variability metrics of patches, the diversity metrics of the landscape and the variation in patch shape at the class and watershed levels. These metrics are best considered as representing landscape configuration, even though they are not spatially explicit measures. Generating mean values at the watershed level are good in determining the trend of the condition over time. The number of patches in a landscape can serves as an index of spatial heterogeneity of the entire landscape pattern (see figure 1). Although the number of patches in a class or landscape may be fundamentally important to various ecological processes, often it does not have any interpretive value by itself because it conveys no information about area, distribution, or the quality of patches. If total landscape area and class area are held constant, then number of patches conveys the same information as mean patch size and could be a useful index to interpret. Number of patches is probably most valuable as the basis for computing other, more interpretable metrics. The size, diversity and shape of patches in the entire landscape can serve as a good biodiversity index because a landscape with greater variety and constant shape would have more spatial stability and in theory support more species. Another class and landscape index based on the number of patches is mean patch size (see figure 2).

The number of patches in a landscape can serves as an index of spatial heterogeneity of the entire landscape pattern (see figure 1). Although the number of patches in a class or landscape may be fundamentally important to various ecological processes, often it does not have any interpretive value by itself because it conveys no information about area, distribution, or the quality of patches. If total landscape area and class area are held constant, then number of patches conveys the same information as mean patch size and could be a useful index to interpret. Number of patches is probably most valuable as the basis for computing other, more interpretable metrics. The size, diversity and shape of patches in the entire landscape can serve as a good biodiversity index because a landscape with greater variety and constant shape would have more spatial stability and in theory support more species. Another class and landscape index based on the number of patches is mean patch size (see figure 2).

Again, the area of each patch comprising a
landscape mosaic is perhaps the single most important and useful piece of information contained in the landscape. The area comprised by each patch type is equally important. For example, progressive reduction in the size of habitat fragments is a key component of habitat fragmentation. Thus, a landscape with a smaller mean patch size for the target patch type than another landscape might be considered more fragmented. Mean patch size at the class level is a function of the number of patches in the class and total class area (McGarigal and Marks 1995). Therefore, at the class level, these two indices represent slightly different aspects of class structure. For example, two landscapes could have the same number and size distribution of patches for a given class and thus have the same mean patch size. However, if the total landscape area differed, patch density or canopy quality could be very different between the landscapes. In addition, two landscapes could have the same number of patches and total landscape area and thus have the same patch density. However, if the class area differed, mean patch size could be very different between landscapes. This study did not address density directly and further research on density and canopy quality will be conducted. For this study, the mean size by watershed is a key value.

Diversity is another measurement. Diversity measures a patch’s richness or variety of classes (see figure 3). While it measures the number of vegetation types present, it is not affected by the relative abundance of each vegetation type. In this application, it helps in evaluating the edge condition. Because richness does not account for relative abundance of each patch type, rare patch types and common patch types contribute equally to richness. Patch diversity, nevertheless is an important element of landscape structure because the variety of elements present in a landscape can have an important influence on several ecological processes. And because many organisms are associated with a single patch type, patch diversity often correlates well with species richness. Diversity richness is partially a function of scale - larger areas are generally richer, and they have greater heterogeneity than over comparable smaller areas (McGarigal and Marks 1995). Therefore, comparing diversity among watersheds of different sizes can be problematic. The mean of diversity over a watershed standardizes diversity to a per area basis that facilitates comparison among watersheds.

Figure 3. Shows the change in diversity over a 10-year period. The images from left to right are 1990 diversity and land cover followed by 2000 diversity and landcover. Notice the pasture area changing to forest.

Figure 4. Classifying Shape by Mean Perimeter/Area Index.

The final variable to quantify of a landscape configuration is the complexity of patch shape at the patch, class, and landscape levels (see Figure 4). The lower index number is a better shape because the area is large and the perimeter is small. The interaction of patch shape and size can influence a number of important ecological processes. Patch shape has been shown to influence inter-patch processes such as small mammal migration (Buechner 1989) and woody plant colonization (Hartd and Forman 1989) and may influence animal foraging strategies (Forman and Godron 1986). Shape is a difficult parameter to quantify concisely in a metric. The study used a mean shape index to measure the average patch shape,
or the average perimeter-to-area ratio, for a particular patch type (class) and all patches in a watershed. Although there are other means of quantifying patch shape (Lee and Sallee 1970), this shape index is widely applicable and used in landscape ecological research (Forman and Godron 1986).

The final analysis categorized each index into five value levels based on standard deviation. The three indexes were added to determine the biodiversity for 1990 and 2000 by watershed. The final trend analysis was determined by subtracting the mean values of 1990 from the 2000 mean values.

Results and Discussion
Tables 2 through 8 present the land cover and biodiversity change from April 1990 to April 2000. Within the five county study area medium intensity development grew 191% from 370 square kilometers to 1076 kilometers. High intensity development grew 79% from 124 square kilometers to 281 square kilometers. Deciduous forest and coniferous forest grew 38% and 8%. These changes came at the expense of agriculture. Over 1000 square kilometers were lost. In 2000, cultivated crops are essentially nonexistent, and pasture decline by 689 square kilometer. While the growth in Greenville and Spartanburg grew outward, the expansion in Anderson and Oconee were more significant. The growth showed more of a leapfrog pattern and had significant impact on exurbia. Urban growth was more concentrated and contiguous to the 1990 development.

The relationship between sprawl and the quality of life shows that development is far outpacing population growth. The region grew in population by 12.7%, but the area of new development grew 48.9% (see table 8). In Anderson and Oconee counties, the developed land increased even faster at 63.4% and 77.4%. In the northern portion of the study area, the outward growth resulted in a decline in the biodiversity of the Appalachian foothills. Biodiversity near existing built-up areas showed only a slight improvement. Biodiversity degradation does not match the development change. In fact, several watersheds showed improvement. While 33% of the 150 watersheds declined in biodiversity, another 42% improved. Eighty-five percent of the agricultural land changed from pasture and cultivated crops to development and forest vegetation. The result is the natural patches increased in size over the 10-year period. There appears to be a strong locational association of new forest land and the development pattern (see Table 7 and Figure 7).
9 and 10). The changes were far less than would be expected for type of sprawl the study area showed. These results suggest that after initial development the vegetation/habitats can improve. The development of cul-de-sacs roads and clustering may actually offer more opportunities for patches to remain connected than previously thought.

**Future Research**

It is important to understand that these are preliminary results. The research intent was primarily an SEA process study. The classification was secondary, and improvement of biodiversity near exiting built-up areas was unexpected. Accuracy assessment must be performed, and some reclassification may occur. The area also needs to be ground-truthed. More analysis is required to verify the biodiversity trends and the development patterns, and reviewing new Landsat TM imagery and visiting specifically Spartanburg County is required. Using either a fuzzy tolerance classifier or a knowledge-based classifier may improve the results. Using new high-resolution data will also be explored for determining impervious surfaces and tree canopy. Finally acquiring additional change detection data such as road pattern density from imagery will be assessed.

**Conclusion**

Change detection, as part of Strategic Environmental Assessment, is a tool that can promote sustainable development. With cheaper data, better software and more powerful computers, remote sensing produces reliable monitoring data. Change detection

<table>
<thead>
<tr>
<th>2000 Land Cover</th>
<th>Anderson</th>
<th>Oconee</th>
<th>Pickens</th>
<th>Spartanburg</th>
<th>Greenville</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Water (11)</td>
<td>105</td>
<td>118</td>
<td>41</td>
<td>27</td>
<td>20</td>
<td>311</td>
<td>3%</td>
</tr>
<tr>
<td>Developed Open Space (21)</td>
<td>51</td>
<td>23</td>
<td>16</td>
<td>18</td>
<td>17</td>
<td>125</td>
<td>1%</td>
</tr>
<tr>
<td>Low Density Urban (22)</td>
<td>217</td>
<td>116</td>
<td>96</td>
<td>183</td>
<td>175</td>
<td>788</td>
<td>9%</td>
</tr>
<tr>
<td>Medium Density Urban (23)</td>
<td>252</td>
<td>137</td>
<td>126</td>
<td>276</td>
<td>284</td>
<td>1,076</td>
<td>12%</td>
</tr>
<tr>
<td>High Density Urban (24)</td>
<td>45</td>
<td>23</td>
<td>24</td>
<td>80</td>
<td>109</td>
<td>281</td>
<td>3%</td>
</tr>
<tr>
<td>Barren (30)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
</tr>
<tr>
<td>Deciduous Forest (41)</td>
<td>585</td>
<td>444</td>
<td>374</td>
<td>618</td>
<td>568</td>
<td>2,589</td>
<td>28%</td>
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<tr>
<td>Coniferous Forest (42)</td>
<td>231</td>
<td>366</td>
<td>251</td>
<td>400</td>
<td>351</td>
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<td>Mixed Forest (43)</td>
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<td>308</td>
<td>372</td>
<td>419</td>
<td>1,782</td>
<td>19%</td>
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<tr>
<td>Open Fields/Pasture (81)</td>
<td>179</td>
<td>94</td>
<td>75</td>
<td>128</td>
<td>102</td>
<td>579</td>
<td>6%</td>
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<tr>
<td>Cultivated Crops (82)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Woody Wetlands (91)</td>
<td>10</td>
<td>27</td>
<td>13</td>
<td>20</td>
<td>17</td>
<td>86</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total Sq Km</strong></td>
<td>1,962</td>
<td>1,744</td>
<td>1,324</td>
<td>2,121</td>
<td>2,064</td>
<td>9,216</td>
<td>100%</td>
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<table>
<thead>
<tr>
<th>1990 Land Cover</th>
<th>Anderson</th>
<th>Oconee</th>
<th>Pickens</th>
<th>Spartanburg</th>
<th>Greenville</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
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<th>Spartanburg</th>
<th>Greenville</th>
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<th>Percent</th>
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<td>(141)</td>
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<td>(88)</td>
<td>(77)</td>
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<td>(43)</td>
<td>(91)</td>
<td>(84)</td>
<td>(363)</td>
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<td>(10)</td>
<td>(22)</td>
<td>(16)</td>
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<tr>
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Area in Square Kilometers

Table 2 1990 – 2000 Land Cover Change
using Landsat TM imagery offers very useful information. At 30-meter resolution, the imagery works well at map scales of 1:75,000 to 1:250,000 or larger.

With SEA process assessing the quality and vision of sustainable development, SEA involves testing against environmental/sustainability standards. The process needs to assess development patterns and their affect on environmental quality. It should be based on land cover information. For the process to work, it required the following:

- Governments must offer land cover information just as they supply census data.
- Government has a responsibility to establish and update land cover data.
- Programs, such as the NLCD program in the US, should perform the classifications to establish consistent baselines.
- International standards for the land classes should offer consistency for worldwide environmental trend analysis.
- Monitoring should occur on a regular basis with data collection every five years with matching census estimates.
- Environmental statistics should be mapped by watershed boundaries.
- Matching census tract boundaries with cataloging watersheds units should allow demographic and environmental data to be used together.

SEA with change detection can become a transparent and flexible process. By thinking strategically at a regional level stakeholders can review and monitor the effectiveness of policy decisions for development. The SEA process allows assessment of both positive and negative affects. The broad-brush or qualitative nature of the process allows program changes to be altered more quickly. It offers enough detail to highlight the regional development trends and the environmental consequences. It is a red flag approach, whereby change detection can allow stakeholders to act quickly and only focus on the detail where need.

Change detection can allow stakeholders to act quickly and focus where detail analysis is required. It can clarify for politicians, planners, developers and the public the political priorities and judgments that are less easily realized by the existing development process. Less conjecture and more facts on both sides of the sustainable development issue may become a reality. We need to place as much emphasis on the strategic decision-making as we do on project level environmental assessment.

Acknowledgments
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References


Cartagena Protocol on Biosafety by Parties to the Convention on Biological Diversity.


Dobson, J.E., Bright, E.A., Ferguson, R.L., Field, D.W., Wood, L.L., Haddad, K.D., Ireland III, H., Jensen, J.R., Klemas, V.V., Orth, R.J. and Thomas,


Ewing, Reid, Pendall, Rolf, and Chen, Don. 2002, Measuring Sprawl and Its Impact, Smart Growth America, Fannie Mae Foundation.


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</tr>
<tr>
<td>Size</td>
<td>Patches</td>
<td>Percent</td>
<td>Patches</td>
</tr>
<tr>
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<td>253</td>
<td>9.0%</td>
<td>347</td>
</tr>
<tr>
<td>40-400 Ha</td>
<td>50</td>
<td>1.8%</td>
<td>66</td>
</tr>
<tr>
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<td>0.4%</td>
<td>11</td>
</tr>
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<td>1</td>
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Table 3 1990 – 2000 Patch Size Change

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<th>Area*</th>
<th>Percent</th>
<th>Patches</th>
<th>Area*</th>
<th>Percent</th>
<th>Patches</th>
<th>Percent</th>
<th>Area*</th>
<th>Percent</th>
<th>Change</th>
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Table 4 Patch Area Change
### Table 5 1990 – 2000 Diversity Change

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<th>Kilometers</th>
<th>Sq Miles</th>
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<th>2000 PAI</th>
<th>Changed PAI</th>
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### Table 6 1990 – 2000 Patch Perimeter/Area Index

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<th>Degraded</th>
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<td>76%</td>
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<td>2</td>
<td>25</td>
<td>27</td>
<td>0%</td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
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<td>0</td>
<td>6</td>
<td>23</td>
<td>29</td>
<td>0%</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
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<td>40</td>
<td>5</td>
<td>46</td>
<td>2%</td>
<td>87%</td>
<td>11%</td>
</tr>
<tr>
<td>Greenville</td>
<td>0</td>
<td>23</td>
<td>19</td>
<td>42</td>
<td>0%</td>
<td>55%</td>
<td>45%</td>
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<tr>
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<td>80</td>
<td>150</td>
<td>1%</td>
<td>46%</td>
<td>53%</td>
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</table>

* Portions of 30 Watersheds are in multiple counties
Figure 6. 1990 and 2000 Biodiversity Analysis.
### Table 7 1990 – 2000 Biodiversity Change by County

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<th>Hectares</th>
<th>Sq Kilometers</th>
<th>Sq Miles</th>
<th>1990 Biodiversity</th>
<th>2000 Biodiversity</th>
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<td>757.0</td>
<td>9.1</td>
<td>8.7</td>
<td>(0.4)</td>
</tr>
<tr>
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<td>12.0</td>
<td>12.3</td>
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</tr>
<tr>
<td>Pickens</td>
<td>29</td>
<td>132,389.3</td>
<td>1,323.9</td>
<td>511.2</td>
<td>11.5</td>
<td>11.3</td>
<td>(0.2)</td>
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<td>Spartanburg</td>
<td>46</td>
<td>212,005.3</td>
<td>2,120.1</td>
<td>818.6</td>
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<td>42</td>
<td>206,269.1</td>
<td>2,062.7</td>
<td>796.4</td>
<td>9.4</td>
<td>9.3</td>
<td>(0.1)</td>
</tr>
<tr>
<td><strong>Study Area Watershed Average</strong></td>
<td><strong>6,141.4</strong></td>
<td><strong>61.4</strong></td>
<td><strong>23.7</strong></td>
<td><strong>10.0</strong></td>
<td><strong>10.3</strong></td>
<td><strong>10.3</strong></td>
<td><strong>0.3</strong></td>
</tr>
<tr>
<td><strong>Highest Biodiversity Average</strong></td>
<td><strong>6,996.5</strong></td>
<td><strong>17,288.7</strong></td>
<td><strong>27.0</strong></td>
<td><strong>15.0</strong></td>
<td><strong>14.3</strong></td>
<td><strong>15.0</strong></td>
<td><strong>0.7</strong></td>
</tr>
<tr>
<td><strong>Lowest Biodiversity Average</strong></td>
<td><strong>2,556.4</strong></td>
<td><strong>6,317.0</strong></td>
<td><strong>9.9</strong></td>
<td><strong>3.0</strong></td>
<td><strong>3.1</strong></td>
<td><strong>3.1</strong></td>
<td><strong>0.1</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Counties</th>
<th>No Change</th>
<th>Improved</th>
<th>Degraded</th>
<th>Total*</th>
<th>No Change</th>
<th>Percent Improved</th>
<th>Percent Degrades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson</td>
<td>15</td>
<td>7</td>
<td>19</td>
<td>41</td>
<td>37%</td>
<td>17%</td>
<td>46%</td>
</tr>
<tr>
<td>Oconee</td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>27</td>
<td>44%</td>
<td>41%</td>
<td>15%</td>
</tr>
<tr>
<td>Pickens</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>29</td>
<td>28%</td>
<td>31%</td>
<td>41%</td>
</tr>
<tr>
<td>Spartanburg</td>
<td>10</td>
<td>33</td>
<td>3</td>
<td>46</td>
<td>22%</td>
<td>72%</td>
<td>7%</td>
</tr>
<tr>
<td>Greenville</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>42</td>
<td>31%</td>
<td>33%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Total Study Area</strong></td>
<td><strong>49</strong></td>
<td><strong>63</strong></td>
<td><strong>38</strong></td>
<td><strong>150</strong></td>
<td><strong>33%</strong></td>
<td><strong>42%</strong></td>
<td><strong>25%</strong></td>
</tr>
</tbody>
</table>

* Portions of 30 Watersheds are in multiple counties

**Figure 7. 1990 – 2000 Biodiversity Change by Watershed**
Figure 8. Biodiversity With Development.

Figure 9. Shows the 1990 land cover classification on the left and the 2000 classification on the right. Notice the change in pasture from open field to new development and forestland.
<table>
<thead>
<tr>
<th>County</th>
<th>1990 Area / Sq Km</th>
<th>1990 Population</th>
<th>1990 Density / Sq Km</th>
<th>Percent of County</th>
<th>2000 Area / Sq Km</th>
<th>2000 Population</th>
<th>2000 Density / Sq Km</th>
<th>Percent of County</th>
<th>Population Growth</th>
<th>Land Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson</td>
<td>1,961.22</td>
<td>145,196</td>
<td>346.38</td>
<td>17.7%</td>
<td>163,654</td>
<td>565.9</td>
<td>289.2</td>
<td>28.9%</td>
<td>12.7%</td>
<td>63.4%</td>
</tr>
<tr>
<td>Oconee</td>
<td>1,744.65</td>
<td>57,494</td>
<td>168.53</td>
<td>9.7%</td>
<td>299.0</td>
<td>218.8</td>
<td>17.1%</td>
<td>13.8%</td>
<td>77.4%</td>
<td></td>
</tr>
<tr>
<td>Pickens</td>
<td>1,324.25</td>
<td>93,894</td>
<td>72.10</td>
<td>12.4%</td>
<td>110,394</td>
<td>245.5</td>
<td>449.7</td>
<td>18.5%</td>
<td>17.6%</td>
<td>49.6%</td>
</tr>
<tr>
<td>Spartanburg</td>
<td>2,120.21</td>
<td>226,800</td>
<td>427.38</td>
<td>20.2%</td>
<td>252,842</td>
<td>557.0</td>
<td>453.9</td>
<td>26.3%</td>
<td>11.5%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Greenville</td>
<td>2,063.22</td>
<td>320,167</td>
<td>406.71</td>
<td>19.7%</td>
<td>358,012</td>
<td>565.8</td>
<td>611.1</td>
<td>28.4%</td>
<td>11.8%</td>
<td>44.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9,213.54</td>
<td>843,551</td>
<td>657.49</td>
<td>16.4%</td>
<td>950,337</td>
<td>2,253.3</td>
<td>421.8</td>
<td>24.5%</td>
<td>12.7%</td>
<td>48.9%</td>
</tr>
</tbody>
</table>

**Table 8** Population Growth Versus Development Growth

<table>
<thead>
<tr>
<th>Land Cover Classes</th>
<th>Anderson</th>
<th>Oconee</th>
<th>Pickens</th>
<th>Spartanburg**</th>
<th>Greenville</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Water (11)</td>
<td>41.9</td>
<td>25.9</td>
<td>19.5</td>
<td>44.4</td>
<td>32.3</td>
<td>164.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Development (21,22,23,24)</td>
<td>19,507.5</td>
<td>7,519.8</td>
<td>7,293.5</td>
<td>16,636.1</td>
<td>14,861.8</td>
<td>65,818.7</td>
<td>40.4%</td>
</tr>
<tr>
<td>Forest (41,42,43)</td>
<td>20,346.0</td>
<td>11,890.2</td>
<td>8,976.4</td>
<td>20,699.1</td>
<td>14,005.7</td>
<td>75,917.4</td>
<td>46.6%</td>
</tr>
<tr>
<td>Agriculture (81,82)</td>
<td>7,423.4</td>
<td>2,597.1</td>
<td>2,319.9</td>
<td>4,764.0</td>
<td>3,591.6</td>
<td>20,696.0</td>
<td>12.7%</td>
</tr>
<tr>
<td>Woody Wetland (12)</td>
<td>63.7</td>
<td>117.4</td>
<td>52.7</td>
<td>94.5</td>
<td>60.0</td>
<td>388.3</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Total</strong>*</td>
<td>47,382.6</td>
<td>22,150.4</td>
<td>18,662.0</td>
<td>42,238.1</td>
<td>32,551.5</td>
<td>162,984.5</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* Area in Hectares
**6.21 Ha were not contained in the 2000 image

**Table 9** Landcover Classes in the four neighboring Counties

![Figure 10. 1990 – 2000 Patch Size Change near Spartanburg, SC.](image)
Possible Remote Havens for Terrorist and Other Illicit Activity: Geospatial Modeling
Douglas S. Way, Ph.D.

Introduction
Landscape architects have significant skills in landscape analysis, site suitability studies, and geographic information systems. They have long addressed problems such as where and what geographic areas have suitable conditions to support a defined use. Why then, shouldn’t landscape architects contribute these analytic skills to the broad range of military, intelligence, and environmental security applications? Many of these application questions contain the word “where,” which provides an opportunity for GIS analysis. The marketplace is large and encompasses many groups, from federal-state agencies and military commands, to those associated with homeland (or global) security. In some instances, security clearances may be required, but as this project demonstrates, there are applications satisfied with open source data.

Throughout history, insurgents (such as Mao, Castro, and Guevara), smugglers, and some terrorist groups not under state sponsorship, have used rugged remote terrain to their advantages. Often referred to as “stateless zones,” these locations encompass characteristics that hinder government troops and favor the illicit groups: rugged terrain, thick vegetation cover, remote from population and lines of communication and control, close to foreign borders, and in countries of poor governance (O’Neil 1990). This perspective was confirmed by Ian Beckett, U.S. government expert in insurgencies:

Fairly obviously, features of insurgency that have remained constant over the centuries have been the tendency for insurgent groups to operate in difficult terrain – mountain, desert, forest, swamp, and jungle – of which they often possessed local knowledge denied their opponents.

While the knowledge of these criteria is not new, changing global terrorist strategies are capturing the attention of the US Military Commands. In the March 12, 2003 issue of the San Diego Union-Tribune, Andres Oppenheimer reported:

In the new U.S. military doctrine, one of the biggest dangers to Latin America no longer comes from foreign armies or urban guerrillas taking over capital cities and expanding their reach to the interior. Rather, it comes from criminal forces occupying empty spaces in jungles, mountains and other remote areas, and expanding their reach from there to big cities and centers of power.

Also, in the same article, it was reported that during a security conference in March in Miami, General James T. Hill, head of US Southern Command in charge of military relations in Latin America, spent much of his speech addressing the ungoverned areas challenge:

Today, the threat to the countries of the region is not the military force of the adjacent neighbor, or some invading foreign power. Today’s foe is the terrorist, the narco-trafficker, the arms trafficker. This threat is a weed that is planted, grown and nurtured in the fertile ground of ungoverned spaces, such as coastlines, rivers and unpopulated border areas.

It is noted, however, that these locational elements are not as important in states where groups find either official or defacto safe harbor, and thus do not need to strategically distance themselves from government forces. For example, the al-Qa’ida training camps in Afghanistan, while somewhat remote to facilitate their armed exercises, operated with full knowledge and agreement with the Taliban government.

Illicit groups that may seek remote operational centers can include insurgents and guerrilla fighters, terrorists, and smugglers. However, it is noted the objectives, and hence the operational patterns of these groups, may be very different (Hoffman 1998). While difficult to precisely define, it is generally agreed that terrorists commonly portray themselves as “freedom fighters,” operate in small groups, and take part in operations designed to disrupt and shock governments and societies. On the other hand, guerrillas and insurgents operate more like military units, attacking enemy forces and capturing and holding territory over which they may exercise sovereignty and control. The analysis explored in this paper
focuses upon suitable locations for remote camps and operational centers for illicit groups not condoned by the local government. At first glance this would encompass insurgencies, guerrillas, and smugglers, but can also include terrorist camp locations where training activities require a more remote location. Recent examples of terrorist groups that have operational camps in “loosely governed” areas include: al-Qa’ida fighters in Afghanistan and southwest Pakistan, Ansar al-Islam in Iraq, Al-Ittibad al-Islami in Somalia, and Jemaah Islamiya in Southeast Asia.

Data Sources and Methodology
GIS software programs, most notably ERDAS (all recent versions) and soon to be released ArcGIS 9.0, have matured, now containing tools that support geospatial modeling. These modeling tools support numerous commands; one can link defined geospatial manipulations, create sequential outputs if desired for error checking and validation, and record the entire model construct. Thus, once formulated, a model can be run through multiple iterations, comparing results as weightings, variables, and geospatial manipulations are modified.

Data utilized for this project was open source, available globally, and was typically in one-kilometer raster format. Digital terrain elevations (dted 0) and transport infrastructure are from Digital Chart of the World (DCW), population density from Oak Ridge National Lab (Landscan), and land cover from the International Global Biosphere Program (IGBP). While the Oak Ridge and IGBP data were available in global format, the DCW data originated in five-degree cells. Mosaicing and transforming these data into appropriate equal area projections was not trivial.

For disk storage, processing efficiencies, and use of appropriate projections, these data were formatted into regions consisting of Central America and the Caribbean, South America, Africa, Eastern Europe, East Russia, West Russia, South-Central Asia and the Middle East, South East Asia, and China-Mongolia. Note that that the more developed nations were not included in the analysis, namely North America and Western Europe. Once the model was established it was run for each region, maintaining the one-kilometer resolution. Validation of results utilized the Delphi method, where various experts reviewed interim and final products, suggesting model modifications. In addition, the modeled surface was compared to a number of actual illicit operational centers, where a high correlation was obtained. Since a number of those camp locations contain sensitive information, those results are not presented here. After completion of each regional segment, each was transformed to Robinson projection and mosaiced into a global map. For final graphics, vector files containing country boundaries, coastlines, and graphic meridian data, were also transformed to a Robinson projection. The final global graphic was created at both one and five by five-kilometer resolutions to support varied hardcopy requirements. To simplify the display of the final analysis, the 185 values created by the model were aggregated into 16.

Key Analysis Criteria
The model criteria included definitions of terrain complexity, vegetation cover, lines of communication and proximity to population centers, proximity to foreign borders, climate, suitable size of operating area, and governance. Terrain is important, as rugged terrain presents mobility difficulty for government troops while favoring small indigenous forces. Vegetation cover is similar in providing visual screening and mitigation of aerial detection. Optimum distance from lines of communication and transport infrastructure affect supply issues for both government and partisan forces.

Government forces require closer proximity to transport infrastructure and military facilities for resupply; illicit forces can have a more remote relationship and tend to obtain supplies locally from small villages. Proximity to foreign borders is important, as illicit groups may need to seek safe haven when under pursuit, or find a strategic advantage in operating across borders. The size of area suitable for these illicit actors also affects the control ability of government forces. Larger areas of connectivity increase the manpower of government forces necessary to exert control. Conversely, smaller areas can be more easily controlled by government forces. Lastly, as identified by the State Failure Task Force (2002), the effectiveness and legitimacy of government can be a significant modulating factor. Weak governments are challenged to extend forces into remote areas.

Terrain Complexity
The objective of this measure is to quantify the mobility attributes of terrain. The model measures, within a five by five-kilometer focal filter, the terrain texture, elevation difference, and mean elevation difference. Terrain texture
is calculated by passing a diversity filter over a nine-category aspect map and then over a slope map that has been summarized in five-percent increments. Thus, an area that is surrounded by many different aspect orientations and with many slope categories, has a higher slope-aspect diversity (texture) than a more homogenous surface and provides a greater mobility complexity and visual screening. Elevation difference is also an important mobility factor. It is measured by twice applying a five by five focal filter: first measuring the maximum elevation, and second, recording the minimum elevation. The focal minimum is then subtracted from the focal maximum to get the elevation difference that occurs within the five by five-kilometer area. Again, higher values indicate a higher level of mobility difficulty. As a final refinement, illicit camps are typically located in visually absorptive areas. Small ravines and valleys are identified and separated from ridgelines by calculating the mean elevation with a five by five focal filter and subtracting the original elevation. The resulting negative values are exposed ridges; the positive values are ravines and valleys that are more visually closed. These four sub-analyses are combined to create the final terrain complexity surface.

High values having the best suitability for illicit groups and difficult for government troops to control are characterized by high slope and aspect diversity, high elevation difference, and contain tight ravines and valleys (see figure 1). Conversely, flat, homogenous areas of little or no elevation difference receive the lowest score and are most easily controlled, in that they don’t offer visual screening and mobility constraints.

**Vegetation**

The visual characteristics of the IGBP land cover data were interpreted and scaled for their visual absorption characteristics (Jacobs and Way 1969). Evergreen, deciduous, and mixed forests were the most visually absorptive, closely followed by shrubland, and decreasing to grassland, agriculture and barren areas. Since the IGBP spatial resolution and categories are fairly coarse, these measures just provide for a regional characterization.

**Climate**

Many experts dismiss climate as a critical variable in this context. It is both positive and negative as it affects equally the illicit groups and government forces. That being said, it is also true that climate would adversely affect illicit group training operations and the ability of new recruits to acclimate. After much discussion on this variable, it was agreed to degrade areas as a function of the number of days below freezing. Thus, much of central and northern Russia and the Tibetan Plateau received lower suitability scores for camp locations. The additive effects of vegetation cover and climate are shown in figure 2.

**Population and Lines of Control**

The issues of resupply differentially affect both illicit groups and government forces. Resupply of government forces relies upon transport infrastructure and travel time from major supply points such as major cities and/or military bases. Illicit groups also require supplies but can rely upon a closer proximity from much smaller settlements. However, while there is a strategic desire by these groups to be remote, being too remote is a supply

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**Figure 1.** Composite terrain complexity in Central Asia. At this scale it is apparent that the analysis has quantified mountains and rugged terrain.

**Figure 2.** Composite of terrain complexity, vegetation cover, and climate. Northern South America has a moderately high score (medium gray); the vegetation is very thick but does not contain complex terrain.
disadvantage for illicit groups. For the purpose of this model, a preferred supply zone of 10 to 200 kilometers from smaller villages was used. Thus, when examining the final maps, it is noted that while many areas in the Saharan desert satisfy the remote criteria, they are too remote, and therefore are not scored highly. Also, in the Sahara there is neither suitable vegetation cover nor complex terrain. In addition to proximity to resupply centers and transport infrastructure, population density was considered. Utilizing the global Landscan population density data, higher densities were penalized while lower densities received higher scoring (see figure 3).

**Border Proximity and Area Size of Suitable Terrain**

At this point the model components of terrain complexity, vegetation cover, lines of communication-population, and climate are combined to create a preliminary composite. This map is then processed through a density filter to further weight suitable areas as to their densities of connectivity. Thus, areas containing a greater number of high scoring pixels are positively weighted verses single or few isolated pixels. Government forces have less trouble securing relatively small areas of terrain that satisfy the model criteria than vast regions where this terrain is continuous. Finally, proximity to foreign borders and, to a lesser extent, coastlines, are included to create the final model composite (figure 4).

**Governance**

All other criteria being equal, a government’s ability to control its remote territory is influenced by its effectiveness and legitimacy. According to O’Neil, “The poor performance, corruption, and neglect that characterized the administration of the South Vietnamese government of Ngo Dinh Diem in the formative years (1958-1964) of the Vietnam War were exploited by the Vietcong” (O’Neil 1990). While there aren’t any accepted measures of a state’s ability to control its territory, experts often cite geography and physical conditions as one of the influential variables (Rotberg 2003). In the context of this project, several experts of the US Government State Failure Task Force nominated measures of legitimacy and effectiveness listed in the World Bank publication, *Aggregating Governance Indicators* (Kaufmann, Kraay, and Zoido-Lobaton 2000). These factors, which are generated by expert survey, were averaged and normalized 0-100. As applied to the model, a mid value of 50 did not change a pixel’s score. But, if a country had poor governance rating from 50 to 100, the suitability scores of the model increased by a factor scaling from 1 to 10. Conversely, if governance was excellent (from 0 to 50 on the scale), the remote havens model score was reduced by as much as minus 10. The resulting map, figure 5, shows the effect of poor country governance. Note that the two Congo’s, Paraguay, Somalia, and Afghanistan, among others, have increased scores and more territory in the darker gray. Conversely, countries relatively well-governed, such as Namibia in Africa, show reduced vulnerability.

**Figure 3.** Lines of control and population proximity. Note that the Saharan desert does not receive the highest score since it is too remote for reasonable resupply. Conversely, much of north Central South America receives a high score due to the presence of many small villages.

**Figure 4.** Map of composite-terrain complexity, vegetation cover, climate, population and lines of control, proximity to foreign boundaries and coasts, and area density.

**Conclusions**

From the broader perspective of landscape planning and analysis, landscape architects can play an important role in the markets of
homeland security, military operations, and intelligence. Similar to work in resource analysis, this is accomplished by working with experts, utilizing geospatial tools, implementing models, and employing validation processes. This project that identifies possible remote havens for terrorist and other illicit activity is not methodologically different from identifying suitable locations for high valued resort housing. It demonstrates the value of visualization that provides a discussion format for military strategists. The model itself provides the ability for the experts to argue and propose criteria modifications and evaluate the result modulations. In addition, individual factors can be added or subtracted to perform sensitivity analysis. Landscape architects should be challenged by emerging global issues, become involved, and apply their skills.

![Figure 5. Final map adding governance. Note the increase in values in Congo, Liberia, Ivory Coast, Central Asia, and Paraguay.](image)

As a final note, there are several important data improvements soon forthcoming that will further enhance this analysis. Global landcover mapping prepared by Earth Satellite Corporation for NIMA/NASA at a 30-meter resolution is nearing completion. In addition, the Shuttle Radar Topographic Mapping (SRTM) project will provide as high as 30-meter digital elevation data, the equivalent of dted2. Both datasets provide a significant improvement (from 1 kilometer to 30 meters) in spatial resolution.

References


Learning

International Landscape Architecture Programs: CELA Programs in the United States
Robert Hewitt, Hala Nassar, PhD,

Structuring Teams for Learning and Performance: Criteria and Methodology for Instructor-Assigned Teams
Kim L. Wilson

Assessing the Potential Play Value of Vegetation: Outdoor Environments of Preschools in Tuscon, Arizona
Beth W. Darnell, Margaret Livingston, Lauri Macmillan Johnson
International Landscape Architecture Programs: CELA Schools in the United States

Robert Hewitt, Hala Nassar Ph.D.

Introduction

The vast majority of American universities offer international education opportunities through most of their schools and colleges. Among those schools and colleges that offer international education, agriculture, health, business, communications, journalism, law, library science, public administration, international service, theology, engineering, languages, and education have been best defined in the scholarly literature. That body of largely descriptive literature typically treats the various programs’ graduate and undergraduate degrees, their scholarly areas of emphasis, and their affiliated foreign institutions. Information on embassies, professional associations, granting agencies associated with the programs, and relevant international periodicals are also typically provided. No published work to date, however, is available that defines or describes the international education opportunities within the design professions—including landscape architecture.

In addition to this extant body of descriptive literature, a significant stream of scholarly work relevant to international education addresses contemporary trends in international education—including multiculturalism, globalization and internationalization, comparative education, pedagogy in international settings, and education policy, planning, and development. As with the more definitive literature on international education, little published work to date treats this subject matter as it relates to the design professions—and none as it relates to landscape architecture.

Accordingly, this paper provides an analysis of the results of several recent, unpublished surveys concerning international education in landscape architecture and in the design professions generally, providing needed definition and descriptions of the international education offerings in the various programs of CELA-participating colleges and universities, particularly in the United States. The paper also notes relevant correlations between the data evidenced in the recent surveys and the existing scholarly literature concerning contemporary trends in international education.

Method of Inquiry

Data were collected on the international education offerings of the CELA-participating Landscape Architecture/Design programs in the United States and abroad, from two principal sources.

The first source is a survey of published information about the subject departments and their respective program offerings derived from program, department, college, and university websites, as well as from departments closely associated with the subject departments—usually architecture and planning departments within the same school or college, or from the international studies programs of their university.

The second source is an unpublished survey of department or program heads or chairs / directors conducted and made available by Ball State University faculty members Malcomb Cairns and Anne Hoover, in collaboration with the Council of Educators in Landscape Architecture, that compiled data about landscape architecture program offerings, student and faculty participation, and the perceived benefits of international education.

In the broader, web-based survey, 160 department, school and/or university websites were reviewed in order to evaluate the subject landscape architecture programs. Data were available for 85% of the 62 programs polled. In Professors Cairns’ and Hoover’s survey, 48% of the seventy-five survey requests sent to department/program heads, chairs or directors were returned and compiled. The compiled data from both surveys were analyzed for consistencies and natural groupings, and for relevant correlations with existing international education literature.

General Finding

The data from the two surveys provide several significant findings:
Considerable variety exists among the programs that offer international education activities in terms of the breadth of their offerings, faculty participation, time spent abroad, the number of students participating in the offerings, and in international study destinations.

The programs were most similar in their perceptions of the benefits of international education, in their available study destinations according to continent, in the extents of affiliated and exchange study opportunities available to students, and in the degrees that they support international education through financial aid.

Natural breaks in the data suggest several groupings based primarily on the breadth or focus of individual program overseas offerings, associations with permanent overseas study centers, and the extent of additional international study offerings available at the home campus.

Discussion of the Findings Concerning Program Variety

The data reported in both the broader, web-based survey, and the survey of program heads, suggest the following characteristic description about program variety in CELA participating landscape architecture programs.

Study destinations associated with a program’s international education offerings are often unique to the individual programs - in landscape architecture and the design professions in general. The duration of program activities can range from several weeks to several semesters. Activities are led by one to four faculty members leading a range of small, medium and/or large groups of students who have options for additional international study activities at home and overseas that are unique to their programs.

Specifically - in programs reporting international study offerings - students have the opportunity to travel to 33 different destination countries in Europe, Asia, Africa, the Middle East, Australia/New Zealand, North America, and South America. Of those 33 destination countries, more than half (54%) are associated with only one CELA program.

The number of weeks spent overseas by students is somewhat evenly distributed:

- 14% - 1 to 2 weeks
- 24% - 2 to 4 weeks
- 14% - 4 to 6 weeks
- 28% - 6 to 12 weeks
- 15% - stays of varying durations

The largest number of programs reported sending: one or two faculty members overseas (63%); 16% reported sending three or four faculty members; 5% reported sending more than four faculty members; and 16% reported sending various numbers of faculty members.

The number of students participating in the programs is relatively evenly distributed between:

- 33% - less than 10 students
- 39% - 10 to 20 students,
- 28% - more than 20 students.

The variety exhibited between the programs was particularly telling in the breadth and type of international study activities offered. While most program heads reported additional international study activities above and beyond the travel portion of their offerings, few reported similar offerings (although there were slightly more similarities noted in the larger, web-based survey).

A sampling of additional activities reported in both surveys include: international workshops and seminars with various foreign universities, collaborations with the American Academy in Rome, internet/student exchange studios and other web-based exchanges, informal exchanges of staff, visiting professors or lecturers, exploring third world design build, international concentrations within the major, international distance learning, and international faculty development programs emphasizing multiculturalism and foreign languages.

The variety noted in the international education activities of the surveyed landscape architecture programs was also evident in the architecture and planning programs in the broader, web-based survey. Similar variety was also noted in some of the international education literature, particularly regarding the implementation of university internationalization policy by individual schools and departments, and in strategic planning and development at university level—suggesting that variety

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may be a significant characteristic of international education in general, and in landscape architecture and design education in particular.

II Discussion of the Findings Concerning Program Similarities

The data reported in both surveys suggest the following description of program similarities between the CELA participating landscape architecture programs.

Study destinations focus largely on European countries, with a significant concentration of study centers and offerings in Italy, reflecting destination choices similar to those in design and planning programs. The vast majority of programs have arranged affiliation agreements with other international institutions, and more often than not, programs have exchange agreements with other international institutions. Most programs offer financial aid in support of their international study activities, and virtually all view their international study activities as beneficial in terms of promoting multiculturalism, enhancing pedagogy, and fostering student/faculty professional development.

Specifically, nearly half of the study destinations (46%) are shared by two or more of the programs. Italy is the most popular destination, with 20% of all programs offering study there. Italy is also home to most of the offshore centers in the programs that have such facilities.

While there is generally great variety in the study destinations, both surveys indicate that European destinations are most numerous (53% of landscape architecture program destinations offer study within Europe, and 69% of the design and planning professions offer study there).

Regional study destinations other than European destinations also exhibit a similar rank order among landscape architecture and the design professions:

- **Asian and Middle Eastern destinations**: 20%-landscape architecture, 11%-design professions
- **Central and South American destinations**: 16%-landscape architecture, 7%-design professions
- **Australia and New Zealand**: 7%-landscape architecture, 7%-design professions
- **African destinations**: 2%-landscape architecture, 2%-design professions
- **North American destinations**: (2%-landscape architecture, 2%-design professions)

The vast majority of landscape architecture programs have also made agreements with affiliated foreign institutions (91%)—as have most of the design and planning programs (94%). Most of the reporting landscape architecture programs offer international study through their own program and/or with their affiliates (85%), but some programs offer international study just through their affiliates (15%). The number of agreements that CELA landscape architecture programs have arranged with affiliated international institutions range from 1-5 with 3.1 per program as an average. And while the web-based study suggests a moderately greater amount of affiliation agreements (from 1-8), the average number of agreements per program is similar (3.3 per program).

Slightly more than half the programs (51%) report exchange agreements with foreign universities. 78% of the programs report that financial aid is available to their students for international education. And while only 9% of the programs report that international study is mandatory, the fact that 1/6 (16%) of the entire student body of reporting programs takes part in international education annually suggests that most students in the reporting programs participate in international education during their matriculation, and that mandatory participation alone may not be necessary to encourage high rates of participation.

The Perceived Benefits of International Education

The survey results also suggest that the extent of participation likely reflects the perceived benefits of international study by students. Most program heads (91%) report benefits to the students, while fewer program heads (65%) reported benefits to their faculty—although the benefits, when reported, were similar to those reported for the students in several ways.

The perceived benefits of international education for landscape architecture students were reported within three broad categories:
Issues related to an “expanded view of culture and design” and a change in perspective about “where students are in the world” are the most frequently reported aspects of these benefits, but social, historical, communication, and aesthetic aspects of multiculturalism were also specifically mentioned. Issues related to out of classroom educational settings, the effect of immersion in unfamiliar cultural settings on student maturity and decision making, more intense student/teacher interaction, and more flexible study situations were the most reported aspects of pedagogical benefits. Opportunities to practice outside the United States, international networking, and the benefits of international experience to the student’s résumé were reported as benefits for student professional development.

The reported perceived benefits of international education for landscape architecture faculty also fell largely within the same three areas:

- 25% - multiculturalism
- 25% - pedagogy
- 43% - professional development

As with the perceived student benefits, issues related to an “expanded view of culture and design,” and a change in perspective on “where faculty are in the world” were frequently reported aspects of these benefits. Similar issues related to out of classroom educational settings, the effect of immersion in unfamiliar cultural settings, and more intense student/teacher interaction were noted, but sharing research interests was also an aspect of pedagogical benefit reported in the data for faculty.

The biggest difference reported in the benefits of international education to faculty, however, concerned professional development. 43% of the responses noted its importance, citing “enrichment much like a sabbatical,” “enhancing teaching awareness of new theories and projects,” “research opportunities,” and “international networking” as beneficial attributes of international study activities.

More than half of the CELA participating landscape architecture programs in the United States offer international study activities to their students. Of those programs, most focus on one or two kinds of offerings with some variation. A significant number of programs offer broad-based activities in a variety of study destinations. While more than one-third of the landscape architecture programs provide center/off-site /facilities as part of their international education activities, the broad-based programs are far more likely to provide such facilities than the more focused programs.

Specifically – the data from the broader website survey found 52% of the CELA landscape architecture programs offer international study activities, and the survey of heads suggests 64% provide offerings (the amount of variation in this category is likely related to the difference in response rates and data sources of both surveys). The data from both surveys, however, is more consistent concerning breadth
of offerings, program focus, and availability of off campus international study facilities

The programs defined here as broad-based, as a whole, offered many study destinations (often more than 5) through affiliations, exchanges, and/or centers. These broad-based programs also often offered activities during the semester and/or summer and/or other briefer periods time, often in conjunction with a variety of additional international study activities at home or abroad. There was also often some evidence of future planning for more international education activities reported by this program type. 34% of the programs in the broader, web-based survey, and 30% of the programs from the program heads survey, fit this program description.

The kinds of programs found to be focused on just several kinds of offerings with some variation, offered fewer study destinations, often only through affiliations or exchanges. They also reported fewer additional international study activities, often for one or a limited number of study durations. 66% of the programs in the broader, web-based survey, and 70% of the programs from the program heads survey, fit this description.

38% of the programs in the broader, web-based survey, and 43% of the programs from the program heads survey, reported international study activities related to a center/off site facility. Of those reporting international study activities related to a center/off site facility, between 78% and 84% were broad-based programs. Between 19% and 22% of the focused programs reported international study activities related to a center/off site facility.

Summary and Conclusions

The paper suggests that the international education activities of CELA participating departments and programs -- particularly in the United States -- exhibit three significant characteristics:

- Variety, in terms of breadth of offering, faculty participation, time spent abroad, numbers of participating students, and international study destinations.

- Consistency, in terms of the perceived benefits of international education, study destinations according to continent, the extent of affiliation and exchange study opportunities, and the degree to which

programs support international education through financial aid.

- Clustering, based primarily around broad-based program offerings or focused offerings, association with permanent centers/off-shore facilities, and the amount of additional international study offerings available at the home campus.

Evidence from both the scholarly literature and the surveys suggests that the kind of variety exhibited in landscape architecture international education may be a common characteristic of international study offerings in general, and at departmental, college, and university levels in areas of strategic planning and policy development.

Reported benefits associated with international education were generally universal among the landscape architecture programs and are largely related to notions of multiculturalism, enhanced pedagogy and student/faculty professional development. While multiculturalism and enhanced pedagogy are considered important for both students and faculty, professional development is clearly considered the most important aspect of international education for faculty.

Particularly strong correlations were noted in the scholarly literature concerning the integration of professional or practical areas of knowledge with a range of multicultural competencies for students, educational gains in social domains of learning, and the relationship between second-language acquisition, experience abroad, and ethno-relativism for faculty and staff. The degree to which landscape architecture students attribute benefits to international education is evidenced in the data indicating extensive voluntary participation.

The paper also found that the majority of landscape architecture programs provide more focused international education activities, but a significant minority provide broad-based activities. Of the significant minority of programs that were affiliated with centers/offset-shore facilities, the vast majority were of the broad-based type.

Finally, while this paper has provided considerable description, correlation, and definitive groupings not previously available concerning the international study activities of CELA landscape architecture programs, areas
of inquiry remain unanswered by the data and analysis. Unfortunately, data from some of the CELA participating landscape architecture programs is still not available. Further attempts to ascertain a complete reporting would surely be worthwhile.

Other research questions that seem immediately valuable include: comparative studies between non-US CELA programs and US CELA programs, the history of international programs in landscape architecture, and surveys of the current research in multiculturalism, globalization / internationalization, and pedagogy. Also immediately relevant to the subject is the extent to which students have been surveyed, and to what degree student surveys support the perceived benefits of multiculturalism, enhanced pedagogy, and professional development.

Notes
1 The analysis was limited to the United States programs because its university systems generally differ significantly from the university systems of the non-US CELA schools

References


Structuring Teams for Learning and Performance: Criteria and Methodology for Instructor-Assigned Teams

Kim L. Wilson

Introduction
Teams of individuals complete most projects in the landscape architecture profession. An individual’s ability to work effectively as part of a team is critical to project success, whether it’s an interdisciplinary team with expertise in managing, designing, and technology, or a multidisciplinary team of landscape architects, architects, engineers, and planners. Historically, preparing students for careers in landscape architecture has included heavy usage of teams. My experience as an undergraduate in 1978 and as a graduate in 1981 included use of teams to complete many assignments. Teams are used in landscape architecture curriculums, currently and historically, for efficient use of materials and teaching resources, to minimize faculty/student contact hours, or reduce individual student responsibilities and commitment.

Little thought is given to student learning required to develop critical teamwork skills and qualities that are important for workplace collaboration. Other professional areas of study such as engineering, business, science, and technology have responded to industry needs and recommendations by modifying curriculums and teaching methods for better development of student cognitive, communication, and interpersonal skills through the use of student teams in the learning process (Kunkel & Shafer, 1997). Team learning is an attempt to develop self-directed learning skills and introduce students to real-world experiences before graduation.

For learning and team skill development to occur in teams, the instructor must structure the learning experience by making informed decisions relative to goals of the assignment, the size and structure of teams, individual and team accountability and rewards, and feedback (Michael, 2002). One of the primary learning objectives in senior urban design class was for students to work in semester-long teams towards a common goal requiring the combination of multiple skills, experiences, and judgments. The instructor designed a complex service learning project with a short timeframe to ensure participation of all team members. Team building and skill development exercises along with formative assessments were used to assist in student learning. Dissatisfied with team performance and team learning in the previous three years, the instructor conducted this study to determine if student learning and performance could be promoted if multiple selection criteria are used to assign teams. The criteria used in instructor-assigned teams included technical skills, student preferences, learning styles, interpersonal style, and aptitude.

This article begins with a general review of cooperative learning on teams and methods for assigning teams; a description of criteria and methodology used to assign teams; and results, best practices, and recommendations for instructor-assigned teams.

Literature Review:

Cooperative Learning and Teams
Cooperative learning is the instructional use of small class groups where peer interaction plays the key role in learning (Johnson, 1985). Teams, a type of cooperative learning, are students working together to achieve a common goal and share leadership responsibility to facilitate learning. Cooperative learning involves the design of course structure that supports the development of high performance learning teams and provides opportunities for teams to engage in significant learning tasks (Michael, 2002). Team learning improves information acquisition and retention, higher-level thinking skills, interpersonal and communication skills, and self-confidence (Johnson, 1998).

Team learning and performance are two criteria used to evaluate student teams (Druskat, 2000). Team learning is defined as team members acquiring and sharing unique knowledge and information and also examining team performance to continually improve as a unit. Team performance is defined as meeting or exceeding the performance standards of the people who receive or review the team “output” (Hackman, 1987). Two team processes that highly influence the prediction of both team learning and performance are interpersonal understanding and proactivity in problem solving (Druskat, V.U., 2000). Interpersonal
understanding involves an understanding of the spoken and unspoken preferences, concerns, and strengths of team members. Knowing and understanding one another enables effective knowledge sharing and open communication in a team (Cannon-Bowers, 1998). Proactivity in problem solving is predictive of team learning and performance. Members anticipating and preventing potential problems increases the thought and attention with which the team approaches tasks, thereby improving efficiency by minimizing unexpected challenges (Druskat, 2000).

Team learning and performance is largely impacted by a single factor: the high level of cohesiveness that can be developed within the student learning team. Studies show that students evolve into cohesive learning teams when these teams are properly formed (Michaelsen, 2002).

Methods of Assignment of Teams
Assigning effective teams involves two variables: team membership characteristics that are not likely to interfere with the development of group cohesion; and team diversity ensuring teams have approximately the same talent pool to draw from in completing their assignments (Michaelsen, 2002).

Three approaches to assigning teams have been explored in literature (Decker, 1995): self-selection; random assignment; and instructor-assignment. Self-selection offers higher initial team cohesion (Strong and Anderson, 1990), which tends to generate quick productivity and mitigate interpersonal conflict. Self-selection encourages students to take ownership of group problems, motivating students to manage interpersonal conflict more successfully. Commitment to team performance could be high, but increases the risk of group-think, a team decision-making phenomenon where consideration of team solidarity leads to ignoring available information and accepting a non-optimal decision (Janis, 1972). When students self-select team, they rely primarily on social networks without giving much thought to the knowledge, skills, and abilities that these members will contribute (Levine & Moreland, 1990). Self-selected teams compromise lack of diversity and critical skills for initial cohesiveness, productivity, and minimal conflict.

A second approach is random assignment. Though some recommend random assignment because it seems fair to the students (Griffin, 1985), others have questioned this conclusion, suggesting that randomly assigning teams is “just as unfair as randomly assigning grades – each student would have the same probability of getting an A or an F, regardless of their ability or efforts” (Bacon, 1998). Random assignment is not likely to generate teams with a combination of skills or create cohesive groups of students (Bacon, 1999).

The third approach is instructor-assigned teams. Some instructors assign students to teams to maximize heterogeneity using: a mix of males and females, ethnicity, and performers and non-performers (Connery, 1988). Team learning theories are premised on some level of heterogeneity among team members, since heterogeneity is assumed to be the source of different points of view on a topic and on skills. Instructor-assigned criteria for making teams differ widely, can be difficult to implement, and are seldom used (18% in a study by Decker, 1995). However, instructor-assigned teams offer the greatest possibility of ensuring diversity and critical skills.

Instructor-Assigned Teams
The instructor assigned in this study were heterogeneous teams using the following criteria: technical skills, student preference, learning styles, interpersonal style, and aptitude. Below is a description of each criterion and team implications.

1. Technical skills required to produce the final project in this class included hand graphics, computer graphics, writing, and public presentation. Since many believe that forming teams begins with identifying a leader (Scholtes 2000), leadership was identified as the fifth skill. Each team had equal representation of strengths in all five skill areas.

2. Because student preference inhibits the development of team cohesiveness (Michaelsen 2002), previously established relationships between a subset of team members and the potential for a cohesive subgroup that excluded other members was avoided. Because personal dislike for a team member based on previous differences also affects team cohesiveness it was also taken into consideration.

3. While learning styles, a student’s preferred way of acquiring and using information, have been an active research area in adolescent education (Gregorc, 1982), the intent of
learning styles testing in this study was to identify student learning styles and match them with instructional methods to optimize learning. Research verifies that students with particular learning styles select majors and disciplines and play specific roles on teams (Ross 2001). The Gregorc Style Delineator (1982) was used to merge qualities of personal learning style in four distinct ability channels: concrete sequential, abstract sequential, abstract random, and concrete random.

4. Personality style relates to enduring personality characteristics that are reflected in individual behavior. A balance of personality types is desirable for effective complex problem solving teams. The Personal Profile System (1996) was used to measure two dimensions of human emotion: how a person perceives himself or herself in relation to the environment; and how the person is likely to behave in response. The instructor assigned teams were composed of diverse personality styles in this class.

5. Aptitude and cognitive ability are the best predictors of individual performance (Wagner 1997) and mean level cognitive ability of team members predicts how well a team will perform (Devine 2001). Prior performance was assumed to be an asset for the team in solving course related assignments and performance. Aptitude was measured using the student’s final grade in the previous design studio. The instructor assigned teams with similar average team grades.

6. Team size and longevity are important in team learning and performance. Teams must be large enough to maximize their intellectual resources, and as heterogeneous as possible, but yet not so large as to prevent full participation by all team members (Michaelsen, 2002).

Recommended team size is three to seven members for classroom projects involving research that culminates in a written report and /or an oral presentation (Scholtes, 2000). Instructor-assigned teams that maximize heterogeneity are initially less likely to be cohesive and less effective than homogeneous teams. Diverse teams take longer to develop to the point where they can use member resources effectively. Diverse teams working together over along period will be effective performers (Watson, 1993). The instructor in the study assigned teams of four and five members for the entire semester in this class.

Materials and Methods

Participants
The data used in this study is from a sample of 104 students enrolled in a Landscape Architecture Design IV: Urban Design course at a major public university from August 1999 to January 2003. The student sample formed 22 instructor-assigned teams. The study focuses on the final year with a sub-sample of 26 students in 6 teams.

Forming Teams
On first day of class, each student participated in five self-evaluations to assess technical skills, student preferences, learning styles, interpersonal style, and aptitude. The following assessment instruments were used.

1. Questionnaire A - A five-item self-questionnaire was developed to assess technical skill levels. Students defined themselves as strong, average, or weak for leadership, hand graphics, computer graphics, writing, and public presentation.

2. Questionnaire B - A two-part questionnaire was developed to identify possible problem relationships affecting cohesion. Students were asked to list up to three classmates they work with well and those they do not work with well.

3. Learning Style Assessment - A 10-item Gregorc Style Delineator (1982) was used to assess learning styles.

4. Interpersonal Style - A twenty eight-item Personal Profile System (1996), was used to assess interpersonal style.

5. Aptitude - Students recorded their final semester grade from the previous design class.

Using student’s self-reported information, the instructor developed a matrix to organize the five criteria. Students were listed down the left side and criteria across the top. Starting at the top of the matrix, students were ordered by technical skills beginning with students that identified strength in leadership. The rest of the students were listed sequentially by the following characteristics: strong hand graphics without strength in leadership; strong computer graphics without strengths in leadership and hand graphics; strong writers without strengths in leadership, hand graphics, and computer graphics; strong public presenters
without strengths in leadership, hand graphics, computer graphics, writers, and public presenters; students with no strength area; and ending with students with only weaknesses. All weak skill areas were recorded. The four other criteria were recorded after each student’s name in the following order: student preferences, learning styles, personality style and aptitude.

The instructor formed 4 four-person and 2 five-person teams, starting by assigning the first six students from the matrix to six different teams. Students were added to teams, distributing each skill area uniformly between teams. Students were not assigned to teams with students they had identified as preferring not to work with. Team membership was refined to include strengths in all four learning styles. The personality style instrument identified 9 perfectionists and they were distributed across all teams. Similar team mean aptitude ensured uniformity between teams.

Outcome Measures
Team learning and performance was measured using instructor journal, student journals, formative assessments, experts review, and final project grade. Throughout the semester the instructor recorded qualitative observations on student team learning and performance. A qualitative analysis was made on 26 students, 15 journal entries each using the learning and performance criteria. Self and peer evaluations and formative assessments were used to ensure individual accountability and assist the students in learning. Teams presented final projects to six professionals (experts) where the experts made comments and criticisms on team performance. Projects were evaluated by the instructor and assigned a final grade. A final assessment was conducted during finals week where students were asked to identify and prioritize what they learned.

Results
The instructor’s journal indicated all teams were communicative and engaged, struggled with team members and concept development, discovered new ideas, and were surprised and pleased with their final projects.

Student journals were assessed using performance and learning criteria. Of 390 journal entries, 64 percent included comments on interpersonal understanding of team members and 53 percent included comments on proactivity in problem solving. The following are examples of student journal comments:

“Team officially rolling with ideas. ___ has a great grasp on architecture, very much a visionary; ____is jumping on a renovation plan, which reminds me of how wonderful he is to work with; _____. the detailed person, is working on a model; and I am looking at beginning to put some of these ideas in the computer.

“He is so tedious in his perfectionism, could make me look sloppy. Dealing with very detailed people is very hard for me. Even during brainstorming activity one member tried to take over and was putting too much detail. I am aware that my own perfectionism may be bothersome to other team members. So I keep that in mind and try to zoom out to the big picture. Sometimes details matter, but when it doesn’t, I tell myself to move on and leave it alone.”

“This team stuff is definitely a learning process about understanding, communicating and effectively handling situations. Our team has talked about the difficulties we all were having and I think this is a step in the right direction. ...I feel there will be frustrations and at times hardships but I hope we can learn to identify problems as they occur and learn to appreciate the differences that we bring to the team.”

“I feel this team is able to work well together because we have been honest with each other, able to communicate differences. We do need to switch roles...I want to focus more on the ideas rather than writing what other people are thinking (her strength and learning style).”

“I have to really encourage ____ to speak her mind and encourage her to have confidence in herself and to leave unimportant issues behind when meeting in the team.”

“____ and I resolved our conflicts”

“___ is very detail oriented. ___ is so graphically oriented, he was being extremely fussy on our boards. I guess I am turning into the time beeper, concerned with the deadline. I guess...”
after thinking about it more, I realize that it takes all of us, with these very different qualities, to complete the project.”

“So that’s it. Nothing more to stress over; we got it done. Blow-ups, plans, framework, text, photo simulations, final board layout...all done. It’s kind of sad though. Presentation went well. I like the final project...everyone work. It was wonderful.”

A jury of experts that included a city engineer, a planner, an environmental designer, an architect, a landscape architect, and an academic reviewed all of the projects informally. The students presented the projects formally, and the jury, after questions and clarifications, complimented all teams on their thorough understanding of the project context, unique approaches, creative and practical solutions, and professional presentations. In the past the experts thought that at least one and up to three teams’ methodologies and solutions did not respond to the project issues or the urban context.

Students, on the final self and peer evaluation form, were asked, “What was the most significant team trait that contributed to the project?” Of a possible 26 responses, 80 percent of the responses identified some kind of interpersonal understanding of team members or proactivity in problem solving. Comments included integration of ideas, delegation, ability to resolve conflict, team cooperation through the struggle to develop ideas, mediation, listening, diversity of personalities, encouraging and supporting one another, dealing with difference to understand, and ability to overcome differences to produce a great project.

Students on the final assessment responded to the statement, “List and prioritize the three most important things you learned this semester.” Of the 75 responses, 45 percent of the responses sighted teamwork skills such as communication, patience, timeliness, conflict resolution, and stepping outside normal and expected behavior. Of the 45 percent recorded, over half ranked team skills as the highest.

All six teams satisfied the performance criteria and received an A for a final project grade. In each of the previous three years, when the instructor-assigned criteria was not used, all teams did not perform A work. This indicates that the criteria could ensure more uniform success in performance.

Discussion

It is the responsibility of the instructor to create the best environment in which a student can learn. The manner in which teams are composed plays an important role in creating a learning environment, which yields high team performance. The findings support the expectation that instructor-assigned, heterogeneous teams play a significant role in team learning and performance. However, as an instructor who administers team assignments, there is a valid concern with the number of instructor-assignment criteria.

The assessment of technical skill, preference, learning style, interpersonal style and aptitude measures different individual characteristics contributing to team diversity. Which of the six criteria is the best predictor for team learning and performance? Technical skills, learning styles and interpersonal styles are the most divergent and most predictive of learning and performance. Campion and colleagues (1993) found that using technical skills as team assigning criteria aligns most with the formation of professional teams. Self-reported measures of skills are significantly related to team process and effectiveness in assuring team performance, but do not ensure the extent of diversity required for team learning.

Learning style assessment provided the student and team members with knowledge of how they process information, and interpersonal profile assessment provided knowledge of how a student perceives themselves in relation to the environment, and how they are likely to behave in response. Journal writings indicated that both assessments not only increased student awareness of behaviors, but also assisted in the development of a shared responsibility towards understanding.

Research findings suggest that activities focused on interpersonal understanding can increase both learning and performance (Druskat, 2000). As proposed by Cannon-Bowers (1998), knowing and understanding one another seems to enable more effective knowledge sharing and open communication within a team. That an understanding of the spoken and unspoken preferences, concerns and strengths of team members helped to predict the amount of learning occurring within a team. More time spent on becoming familiar
with one another can have a positive impact on teams (Deeter-Chmelz 2002). Both learning style and interpersonal style assessments proved to be valuable for developing team cohesion, helping students with self-awareness, assisting students in adapting to teams’ expectations, and providing members with a higher level of understanding.

Learning style and interpersonal assessments provided the instructor with knowledge and understanding that assisted in supporting individual and team learning. The instructor assisted students in realizing their natural abilities and capabilities, recognizing and appreciating others’ abilities and developing skills that allow stretching beyond their natural abilities to adapt and cope.

In establishing highly diverse teams, journals and formative assessments revealed the following shortcomings in preparing students for teamwork in the workplace: team practice; communication skills; and student maturity. Students study landscape architecture as a learning community, a pedagogy where students and faculty are organized into smaller units with curricular integration. One of the drawbacks is individual work is emphasized early in their academic careers creating competition between students. When use of cooperative learning teams is limited to the final year, students are challenged to overcome individual competition in favor of cooperation and interdependence instead of independence. Therefore, a balance of individual learning and cooperative learning on teams should occur throughout the curriculum.

Student journals identified the lack of communication skills necessary to advance teamwork, such as the abilities to describe, persuade, listen, and negotiate. The ability to communicate is a learned behavior and is required for effectiveness in any profession. Unlike most curriculums, Alverno College, in Milwaukee, WI, uses an ability-based outcome program with communication ability training and assessment in behaviors including leading, reinforcing, information/opinion seeking, challenging, summarizing, evaluating, closure, mediating, advocating, and a myriad of blocking behaviors. Alverno students move through levels of development beginning with identifying individual strengths and weakness in communication through to training ensuring creativity and habitual effectiveness using strategies, theories, and technology that reflect a profession. Landscape architecture curriculums should consider incorporating communication abilities training and assessment beginning the freshman year.

Some students behaved unacceptable as team members. The instructor believes this is the result of student immaturity. Student development theorists believe that emotional, interpersonal, and ethical development is equal to intellectual development. It is the responsibility of higher education to impart transferable skills and relevant knowledge, bolster confidence and creativity, and engender social responsibility and self-directed learning. Fundamental to this is interpersonal competency that entails not only the skills of listening, cooperating, and communicating effectively, but also the more complex abilities of appropriate response, aligning personal agendas with the goals of group, and choosing from a variety of strategies to help a relationship flourish or a team function (Chickering, 1993). As learning communities, the framework is in place for curriculums to teach a wide range of behavior skills that foster tolerance, civility, and personal and social responsibility.

The goal of this study was to provide instructors using teams with recommendations on how to assign students to teams in a way that will enhance performance and better prepare students to deal with teams in the workplace. Results of this study indicate that instructor-assigned, heterogeneous teams using the criteria of technical skills, student preferences, learning styles, interpersonal style, and aptitude promotes greater team learning and performance.

Conclusion
Our responsibility is to prepare students for success in the workplace. Team learning improves information acquisition and retention, higher-level thinking skills, interpersonal and communication skills, and self-confidence (Johnson, 1998). This finding admonishes us as instructors to place students in team situations that have the greatest chance for preparing them for the workplace. Although we cannot ensure the success of every student, structuring the learning experience by making informed decisions relative to goals of the assignment, the size and structure of teams, individual and team accountability and rewards, and feedback and finding ways to improve team training, we can establish an environment that is conducive to team learning and performance.
Lee Bolman, a professor of education at Harvard University commenting on a similar profession, wrote that many practicing architects felt their schools shortchanged them in non-design topics, and 22 percent regretted not having learned how to deal better with people. In addition, Ernest Boyer (1996), from the Carnegie Foundation, stated that for creating sustainable design, a curriculum built around collaboration and teamwork is necessary. In light of the importance of teamwork and cooperation in our society and the lack of instruction concerning these values in current higher-education systems, a more serious and accountable approach to cooperative learning on teams is justified.

References


Assessing the Potential Play Value of Vegetation: Outdoor Environments of Preschools in Tuscon, Arizona

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Introduction

Outdoor play is considered a necessary part of early childhood education. However, outdoor play environments associated with preschools often do not reflect qualities of natural environments, particularly the presence of vegetation. Furthermore, curriculum for teaching children about their natural environment may be equally devoid of hands on experiences with vegetation and other natural elements. This study explored the potential play value that vegetation can contribute to early childhood learning environments through both physical characteristics and value attributed to it by educators.

While the very word “play” brings with it connotations of “aimlessness” or “entertainment” that often conflict with educational goals (DeVries et al., 2002), play is the investigative process by which young children construct knowledge and is central to the concept of developmentally appropriate practice, advocated by the National Association for the Education of Young Children (NAEYC) (Bredekamp and Copple, 1997). Nationally accredited programs are recognized as settings in which work and play are integrated with physical, social, emotional, and intellectual development and materials and play activities are abundant and challenging. The teacher’s role in these settings becomes that of environmental facilitator, where play is used as a tool for teaching and appropriate responses to children’s inquiries are met by extending the play experience (Bredekamp and Copple, 1997; DeVries et al., 2002).

If the goals of developmentally appropriate early childhood education are to be applied outdoors, the element of vegetation holds great potential value. In fact, nature and vegetation were central to the curriculum of the first early childhood educators (Herrington, 2001).

However, in the early 20th century, built elements including playground equipment for the primary purpose of physical play began to replace natural elements and this “playground paradigm” persists today. Unfortunately, many children who enter daycare facilities as infants may spend up to 12,000 hours there before they reach school age and these play areas could represent their only experience outdoors (Isbell and Exelby, 2001). Furthermore, there is growing concern that children’s opportunities for outdoor play and direct experiences with nature are shrinking and consequences may include increases in attention deficit behaviors, childhood obesity, and a general lack of concern for the natural environment (Kellert, 2001; Moore and Wong, 1997; Wilson, 1997).

The need for children’s outdoor environments that are sensory rich and facilitate play involving all the domains of development (physical, socio-emotional, cognitive, and sensory) has inspired a handful of designers and educators to advocate ways of incorporating natural elements into outdoor play environments. Moore and Wong (1997) pioneered the redesign of play environments using deliberately selected vegetation to increase the potential for play. Behavior of children was studied before and after implementation of these landmark play areas and results indicated an increase in variety of play behaviors, motor activities and particularly, interactive uses of plants (Moore and Wong, 1997).

Children tend to recognize the potential for play or activities related to vegetation. This coincides with memory research by Sebba (1991) and Francis (1995) in which adult memories of vegetation from their childhood often involved activity. Yet Olwig (1989) maintains that adults, perhaps forgetting childhood memories, tend to see vegetation primarily as passive background scenery. Schneekloth (1989) contends that the relegation of vegetation to background scenic status results in its value being “invisible” to most adults. It seems that assessment of play potential of vegetation in early childhood environments would require both the presence and characteristics of vegetation as well as the awareness of the opportunities vegetation creates as a stimulus for play and learning (Moore, 2002). This study focused on analyses of these two general concepts; the physical presence and characteristics of vegetation and adult awareness of vegetation for play potential. More specifically, methods were developed with the following questions in mind:
1) What vegetation is available for young children in their outdoor learning environments?

2) What are the qualities of vegetation that directly support the development of young children?

3) Do early childhood educators recognize and value vegetation in the context of early childhood education?

Methods
Potential sites were initially identified from a list of NAEYC-accredited programs in Tucson, Arizona and study sites were randomly chosen from schools that agreed to participate. Sites were stratified across Tucson, presumably representing a variety of ethnic and socioeconomic backgrounds of children ages 3 to 5. Sites differed in size and several were part of larger public school playgrounds. Site measurements were restricted to the outdoor play areas used by preschool children. Sites were evaluated using a two-part assessment.

Part I consisted of assessment of existing vegetation and presence of other relevant outdoor elements. Data was used to formulate four indices: 1) plant density and richness, 2) frequency of plant growth types, 3) presence of 19 potential play values (PPV) of vegetation—those characteristics identified in the literature as potentially valuable for play of young children (Table 1), and 4) presence of other natural and built elements, including lawns or cultivated gardens. Values within each index were standardized by dividing the value for each site variable measured by the maximum value for that variable. This standardization resulted in values that could range from 0 to 1.0 for each of the variables used in each index. Characteristics unique to individual sites were recorded and used in site narratives.

Part II consisted of assessment of vegetation value through: 1) analysis of responses by teachers relating to value of vegetation, and 2) analysis of how vegetation was reportedly used in the curriculum. Two indices were developed from these results, using standardized values as previously described. Finally, an overall play value richness was determined by adding the six index values for each site.

Results
Results suggested trends related to plant species occurrence, vegetation density and variety, vegetation value stated by educators, presence of other landscape elements, and overall play value richness. These are discussed in the following sections.

Vegetation Value Based on Site Assessments
Thirty-eight percent of all species recorded were native; however, 67% of those appeared in only two sites. Mulberry (Morus alba) appeared most frequently (46% of sites), a large, non-native tree no longer planted in Tucson due to associated allergies. Mulberry does, however, contribute several play values such as dramatic seasonal change, plant parts and dense shade as well as being the sole food source of a favorite preschool pet, the silkworm.

Vegetation density varied greatly, ranging from 0 to 48 plants/10,000 sq. ft., suggesting no evident consistency in terms of the planting design requirements for these outdoor learning environments. Diversity based on growth structure richness indicated that the majority of plants among the 13 sites were large trees. Indeed, these trees were almost exclusively single trunk trees with canopies above the reach of most young children. A groundcover plant appeared at only one site and vines at only 2 sites.

A variety of shrub sizes appeared infrequently, which is unfortunate since shrubs tend to be at more of a child’s scale and their qualities (i.e. plant parts, fragrance, texture) more accessible to young children. Shrubs are also more likely to form enclosures and refuges or small hiding places of noted importance for children’s play. One site, with its large number of medium to large-height creosote shrubs providing several refuge areas, was the only site in which shrubs were clearly used for this purpose. In general, the diversity of vegetation structure was low, thereby minimizing children’s contact with plants offering variation in texture, size, color and ultimately in their potential for play.

Results regarding potential play value of vegetation among all 13 sites indicated relatively high frequency (10-12 out of 13) for the values A, B, C, H, I, M, O, P, and R. Of the PPV identified, the relative absence of certain values is significant. Values D, E, J, and K all appeared infrequently despite their relative importance based on noted literature. In particular, absence of climbing trees and vegetation refuge spaces may indicate a lack of knowledge about vegetation as potential

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for play and concerns for safety, liability, and maintenance may be playing a more dominant role in the minds of teachers and administrators.

Careful selection of each plant in the design for its potential play value can compensate for low plant density, species richness and growth structure richness. Assessing PPV alone may be a better indicator of play complexity achieved through vegetation while typical vegetation assessments, such as species diversity and richness, offer limited information relating to potential play activities associated with plants.

Vegetation Value Based on Educator Interviews
Measurement of the “visibility” of vegetation is a largely subjective determination by the researcher of how the adults responsible for the design appear to “see” or value the element of vegetation. While a direct correlation between vegetation visibility and actual effectiveness of vegetation was not tested in this study, the assessment of both illustrates that a potential relationship exists and can be used as a guide for future study. Eight out of 17 possible reported values of vegetation was the greatest number mentioned by an educator. Interestingly, this number was reported by an educator from a site with relatively low ranking for vegetation richness. However, this site differed from most others in that the class frequently played in a nearby park with native vegetation and the lead teacher was very knowledgeable about plants. Furthermore the school was in the process of obtaining a grant to redesign their play area with the goal of integrating natural and built elements.

Of those values corresponding to the PPV assessed for in existing vegetation, values A (shade) and B (beauty) were reported most frequently (10 sites), corroborating research suggesting that adults tend to value vegetation as background scenery and not for active learning. In general, the curriculum as reported by educators did not regularly use vegetation, regional emphasis, or the outdoors as means of teaching children about the natural environment. Research by Kellert (2001) suggests that curriculum tends tended to focus on indoor activities, such as growing seeds in cups or reading books about plants.

While this data only reflects the opinion of one educator from each site, it serves as a general indicator of how vegetation is valued in these environments. Recognition and interpretation of the vegetation present or available to educators for potential play value appears to be the most limiting factor in these settings.

Presence of Other Landscape Elements
Sixty-two percent of the sites contained outdoor cultivated gardens and lawns and 78% of them contained built shade structures and all-in-one play structures. Two sites that did not have all-in-one structures, however, contained a much higher proportion and diversity of vegetation than other sites. The high occurrence of built elements suggests a prioritization of these over their natural counterparts. This is consistent with literature citing the bias toward built structures for the purpose of primarily large motor development in children’s outdoor play rather than natural elements and settings providing for additional types of play. Furthermore, these built structures tend to give a generic quality of all play areas, undermining the importance of a “sense of place” or elements that are meaningful to a specific region and population (Herrington, 1997; Bredecamp and Copple, 1997).

Combined data regarding physical qualities and presence of vegetation and educator perceptions suggests that the value placed on vegetation for play can be measured in different ways. Landscape architects should focus on plant selection for play environments that maximizes the number of potential play values associated with each individual species. Sharing results of studies such as this with educators will likely increase their awareness of vegetation as a valuable element supporting their teaching goals.

Overall Play Value Richness
All sites were ranked according to the sum of their individual rankings for each richness category (Table 2). Sites 12 and 13 were ranked first and second as their individual rankings were consistently high. It is significant to note that these sites are both private, tuition-based programs (although the special needs program at Site 12 is publicly funded). Site 4 ranked relatively high (fifth) due to strong rankings in reported vegetation value and curriculum. The lead teacher at this site took the initiative to use vegetation off-site, an activity not feasible at all facilities. Site 8 was also ranked high (third) and represents a good balance of vegetation richness and educator visibility at a publicly-funded program.
Conclusions

While vegetation in study sites showed relatively high potential for play based on observed characteristics, vegetation value as reported by educators did not correspond. For example, presence of plant parts for play was observed at 11 sites but only 2 educators reported it as a vegetation value, suggesting that its potential is possibly not being realized. Great variation in vegetation diversity and natural features in study sites suggests that NAFYC accreditation criteria may not be addressing the quality of “naturalness” in outdoor environments and subsequently not providing adequate teacher training about the topic. While variety and complexity of play may be accomplished through the presence of built structures and play equipment, the unique and necessary relationship children have with such nature is largely missing and presence of nature as reflected by vegetation seems more a function of chance than a planned educational benefit.

Landscape architects can be instrumental in the planning of educational facilities that deliberately use vegetation for play and learning. Plant recommendations, curriculum uses, and maintenance guidelines are examples of some of the valuable information landscape architects can provide. Specific play values, identified in this study, could be a basis for plant selection. Furthermore, a detailed accounting of potential play values for each plant selected for those facilities and provided to lead instructors would help maximize the play potential of the vegetation choices, making each plant “count.”

This clear highlighting of vegetation as a valuable educational tool may increase awareness of teachers as well as parents, planners, and designers not informed about the importance of vegetation for play and their development. In turn, future planning for children’s environments may begin to have greater emphasis on plants and nature and their associated benefits, and less reliance on built structures and playground equipment. More focused integration of vegetation in environments for play seems a logical step in the direction of ensuring future appreciation for natural environments as well as providing memorable learning experiences for children that are necessary for their healthy development.

References


<table>
<thead>
<tr>
<th>Key</th>
<th>PPV</th>
<th>Plant characteristic providing value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Provides physical comfort</td>
<td>Modifies microclimate (provide shade) or reduce wind</td>
<td>Moore, Olds</td>
</tr>
<tr>
<td>B</td>
<td>Provides beauty</td>
<td>Appears well-maintained or softens hard surfaces and architecture</td>
<td>Moore, Olds</td>
</tr>
<tr>
<td>C</td>
<td>Provides unusual texture</td>
<td>Provides especially interesting textures (foliage, bark)</td>
<td>Moore, Francis</td>
</tr>
<tr>
<td>D</td>
<td>Provides edible parts</td>
<td>Produces edible parts</td>
<td>Moore, Francis</td>
</tr>
<tr>
<td>E</td>
<td>Provides fragrance</td>
<td>Produces fragrant flowers or foliage</td>
<td>Moore</td>
</tr>
<tr>
<td>F</td>
<td>Provides sound</td>
<td>Produces wind effects or has parts that can create sounds</td>
<td>Moore</td>
</tr>
<tr>
<td>G</td>
<td>Provides color</td>
<td>Produces high color contrast in flowers and foliage</td>
<td>Moore</td>
</tr>
<tr>
<td>H</td>
<td>Provides a landmark or focal point</td>
<td>Exhibits distinctive form or is single, relatively large and planted near center of play area</td>
<td>Moore, Olds</td>
</tr>
<tr>
<td>I</td>
<td>Provides parts for manipulative play</td>
<td>Produces regenerating parts such as seeds, pods, flowers</td>
<td>Moore, Rivkin</td>
</tr>
<tr>
<td>J</td>
<td>Provides structure for safe climbing or swing attachment</td>
<td>Supports climbing or swinging, have horizontal branching structure</td>
<td>Moore, Francis M.</td>
</tr>
<tr>
<td>K</td>
<td>Forms enclosures (refuge spaces) that support dramatic play</td>
<td>Grows naturally or can be pruned to form child-scale refuge space</td>
<td>Kirkby, Moore, Rivkin, Wilson</td>
</tr>
<tr>
<td>L</td>
<td>Attracts wildlife</td>
<td>Provides food or shelter for wildlife</td>
<td>Kirkby, Moore, Rivkin, Wilson</td>
</tr>
<tr>
<td>M</td>
<td>Shows the passage of seasons</td>
<td>Exhibits noticeable seasonal changes (leaf color, leaf drop)</td>
<td>Moore, Olds</td>
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<tr>
<td>N</td>
<td>Contributes to regional or cultural identity</td>
<td>Native or drought tolerant plant, distinctive of the region</td>
<td>Moore, Olds</td>
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<tr>
<td>O</td>
<td>Is safe for young children</td>
<td>Not toxic or dangerously thorny Does not create a complete visual barrier. Has resilient surfacing as required below climbing trees</td>
<td>Moore, Rivkin</td>
</tr>
<tr>
<td>P</td>
<td>Does not create significant maintenance requirements.</td>
<td>Produces minimal litter and requires minimal pruning and irrigation</td>
<td>Moore</td>
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<tr>
<td>Q</td>
<td>Is accessible to children</td>
<td>Exhibits features at a young child’s scale</td>
<td>Cooper-Marcus and Barnes, Moore</td>
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<tr>
<td>R</td>
<td>Is well-maintained</td>
<td>Appears healthy and is actively growing</td>
<td>Cooper-Marcus and Barnes, Moore</td>
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<tr>
<td>S</td>
<td>Is intentionally planted or placed</td>
<td>Appears to have been planted in relation to potential use by children.</td>
<td>Cooper-Marcus and Barnes, Moore</td>
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</table>
Table 2  Overall play value richness(PVR) index for thirteen early childhood programs in Tucson, AZ based on indices total for species and growth structure richness, PPV(potential play value), related landscape elements richness (RLE), RVVreported vegetation values) and curriculum related to the natural environment (CNE).

<table>
<thead>
<tr>
<th>Site #</th>
<th>Species richness</th>
<th>Growth structure richness</th>
<th>PPV richness</th>
<th>RLE richness</th>
<th>RVV richness</th>
<th>CNE</th>
<th>PVR Total</th>
<th>Site rank of PVR</th>
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<td>0.88</td>
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<td>0.58</td>
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<td>10</td>
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