



TERRAPIN
BRIGHT GREEN

DEEP ECOLOGICAL HISTORY

DESIGNING FOR HUMANS AS PART OF THE ECOSYSTEM

Designs that marry deep ecological history with contemporary green building strategies improve not only the functionality of the building, but the health and wellbeing of entire communities. This dual benefit is the beauty of embracing deep ecological thinking.

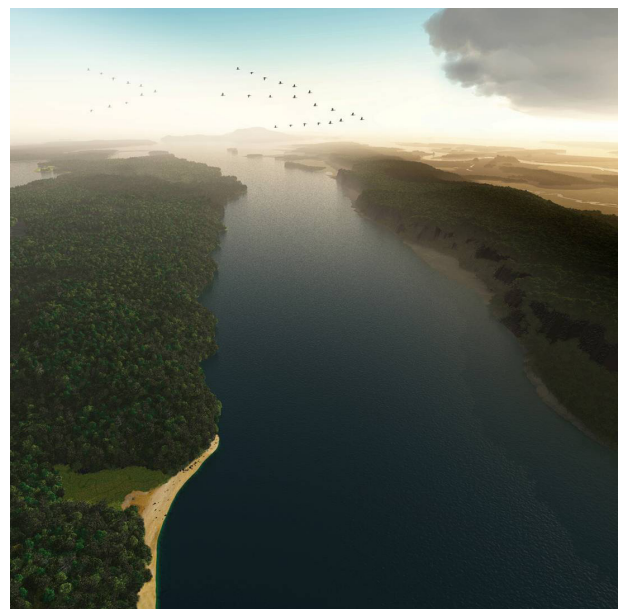
Throughout the summer of 2009, the Mannhatta exhibit at the Museum of the City of New York was packed with visitors crowding around maps, models, and renderings of Manhattan as it may have looked in 1609. A broad audience of tourists, school groups, and curious passers-by examined gradients of suitability for beaver habitat and Lenape Indian settlements locations amongst components of the 1609 ecosystem. To anyone familiar with the mass quantity of complex data that went into creating the project, the intense interest from visitors was an inspiring sight. With its ability to give New Yorkers a tactile sense of the pre-development conditions of their home, the Mannhatta project opened a sense of possibility for many of its viewers in connecting a seemingly unnatural Manhattan to nature. It showed us which neighborhoods were originally an oak-tulip tree forests and which buildings were built on the former homes of masked shrews and gray foxes. The project defined a striking contrast to the buildings and roads that occupy those spaces now. It reminded us that Manhattan in its current semblance is only a very recent phenomenon, and it asked us to envision the future as anything but pre-determined by what exists today.

Ecological history provides a rich source for designers who are willing to tap into that sense of possibility. Many environmentalists, rooted in the 1970's era of constraints created by the Oil Embargo, see natural systems as a limiting factor in relation to human development. Conversely, we see nature as a vast source or inspiration and opportunity to be understood through deep ecological history. We strive to develop systems that learn from past conditions and preserve

a wide range of possibilities for the future, restoring ecological functions integrated with contemporary culture. Manhattan may support vastly different ecosystem diversity than it once did, but knowledge of the habitat that once existed can teach us important lessons about the variety of life and ecosystem services that are possible on our land. For example, understanding how the island's water cycle works can help us redesign ineffective portions of our stormwater drainage systems, so that they can function more seamlessly as a part of the natural water cycle.

Beyond Conservation & Preservation

Conservation and preservation are often positioned as disparate views within environmentalism – one utilitarian, the other aesthetic – but both contain two important assumptions: that humans exist



Hudson River looking south, circa 1609

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apart from nature and that the natural world needs protection from humanity. This rigid distinction between humans and nature has characterized much of the American environmental movement. Some of this can be traced to the writings of Thoreau and Emerson that communicated their experience with ecosystems that no longer benefited from the constant interaction of American Indians as active agents in the management of the landscape, and the effects of the beginning of the industrial revolution. For their part, the American Indians had no concept of a landscape without humans. In the late 19th century, Gifford Pinchot, the first chief of the United States Forest Service, championed one of the emerging strands of environmental thought. Pinchot and his followers, worried over the rapid pace with which Americans were consuming resources, developed a philosophy of “wise use” conservation that was focused on maintaining the natural capital to allow for continued future consumption [Dunalp and Mertig, 1992]. Rachel Carson published *Silent Spring* in 1962, launching the modern environmental movement and spreading profound concern about the environmental and health impacts of pesticides and pollution. *Silent Spring* brought environmental thought into the popular political and cultural consciousness, and its influence has been responsible for major environmental improvements. Nevertheless, *Silent Spring* and the resulting environmentalism maintained the premise that human activities are primarily negative, and that the natural world can best be protected from them by separation.

In the 1970s, the Norwegian philosopher Arne Naess introduced the concept of Deep Ecology, arguing that the view of humans as apart from nature rather than as a part of nature had limited our ability to live well within the natural world [Drengson, n.d.]. This perspective helped to set the stage for drawing design inspiration from the

tenet of deep ecological history, emphasizing the inherent connection between humans and their environment. In the twenty-first century, our ability to separate ourselves from nature collapses in the face of practical problems that cities and towns face in creating a sustainable future. Many of our most pressing problems come from trying to manage what ecosystems already manage so expertly: water, carbon, population, energy, transportation, housing and food.

The idea of humans as part of the community of nature has only recently met wide recognition in the humanities, social sciences, and design professions. This mode of thinking has given birth to emerging fields, such as biomimicry, biophilia and evolutionary psychology. This inspiration from deep ecology as a tool for improving ecological design is beneficial because of its roots in systems theory. Systems theory is the idea that the world is not comprised of discrete parts, but rather it is comprised of systems, each one a whole that is more than the sum of its parts. Take for example a cell. A cell is more than just an accumulation of molecules; the sum total of the molecules is bigger than any of its discrete parts. Additionally, the cell is itself part of a larger system – an organ, for example – which is part of a larger system – a person – which is part of a larger system – a community and so on.

Humans function the same way within nature. We live with clusters of other humans to make larger systems- communities. These communities interact with other species that cohabit the land, as well as the land’s water, soil and atmospheric cycles to make up a larger system. In this way, humans are inextricably linked to the ecosystems they inhabit. These interactions can be positive or negative in terms of biodiversity and the health of local ecosystems. Many North American ecosystems co-evolved with human interaction after the ice sheets



pulled back from New England and the Midwest. As these ecosystems developed, the American Indians utilized annual burning techniques to support the extensive biodiversity of the native savanna forests.

Planners, architects and engineers are now looking to nature for inspiration and approaches that combine some of these systems, integrating green roofs, daylighting, and other natural elements into designs. These design solutions represent a growing acceptance that we have only one system of complex, sustainable systems over centuries to millennia: ecosystems. Self-organized, adaptive and holistic ecosystems are based on the intricate patterns and connections between the living, biotic elements and the non-living, abiotic factors of a place. Ecosystems manifest themselves in many types with myriad properties, but people have played a significant role in their ecosystems for at least a millennium. Designing with an awareness of the history of natural systems, including the human role in them, allows us to see a future in which human-dominated ecosystems are also healthy and highly functioning.

Moving Toward an Ecologically Rich Future

What has not yet been reckoned with is that humanity has a particular life history strategy. Unlike most species, our human life history is about modifying the environment around us to fit our needs. Most species adapt to the environment they find themselves through the process of evolution. If the environment is unfitting, they move or they die. Not people – people change the environment to make it more fitting. We build buildings, we cultivate land, and we divert waterways. We exterminate species that are incompatible with our notion of a preferred lifestyle, and we breed and promote species that are compatible and useful to us.

This unique life history that has allowed us to modify our environments also allows us to

develop building and to manage our environment in ways that will provide us with an ecologically rich future. Standard building practices have become an institutionalized norm, although they often ignore the issue of sustainability in favor of aesthetics and convenience. However, when we examine ecological history, we find an enormous range of aesthetic and ecological possibilities on land that may initially have presented few. For example, to dam a river whose floodplains control an annual nutrient cycle for nearby farmland, while encouraging industrial farms to occupy land further away from the water's edge ignores the deep ecological history of the area. This strategy leads to the need for chemical fertilizers to replace the natural nutrient cycles provided by



Mannahatta, circa 1609 and 2009.

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the river, and this in turn may contaminate local water supplies. Allowing the river's floodplains to do their job saves time, energy, resources and the environmental damage related to rainwater runoff. When we ignore the natural systems within which we build, we deny our ability to choose ecologically sound futures based on strategies and ideals which can be sustained over many generations.

Aside from embracing the human connection to nature, design within a deep ecological context makes efficient sense, because nature has evolved efficient methods unmatched by conventional human designs. Failing to embrace the historical ecology of a site often passes up vital opportunities to reduce the materials, energy and effort that go into maintaining our human habitats. When 111 Eighth Avenue, on the west side of Manhattan, was constructed, its design failed to consider the water sources that were readily available to the building. As a result, tenants invested unnecessary money, time and energy into the building's maintenance. We can see how this scenario, along with similar case studies, unfolded as designs began to bear deep ecological history in mind.

Resource Integration: 111 Eighth Avenue

Often regarded as the emblem of vigorous urbanization, it's easy to forget that New York City's Manhattan Island exists within an ecosystem that continues to shape and affect the design of its structures. The importance of understanding the underlying ecosystems of human environments is a lesson that the owners of 111 Eighth Avenue learned firsthand. A nearly three million square foot property occupying a city block on Manhattan's west side, the owners of 111 Eighth Avenue sought to renovate the 78 year-old structure with the goal of reducing its environmental footprint [Taonic Investment Partners, n.d.].

A building assessment, conducted to analyze building resource consumption, revealed first that 111 Eighth Avenue was using twice as much water as a building of its size ordinarily consumes. Secondly, the pumps that were supposed to pump water intermittently out of the basement were constantly pumping. Motivated to ask penetrating questions to uncover root causes, additional questions unearthed the source of the basement's ground water.

The answer was inextricably linked to Manhattan's ecological history. Before Manhattan was covered by pavement and skyscrapers, it had been abundant in natural water sources with over twenty ponds, sixty miles of streams and an estimated three hundred springs [Sanderson, 2009]. These streams did not merely disappear when they were filled, piped or paved over in what a 1907 New York Times article referred to as a "mad haste to extend the city" [*The New York Times*, 1907]. Despite being buried, the ponds, brooks and streams of Manhattan continued flowing, forming a unique water web beneath the island surface [*The New York Times*, 1907]. By investigating the Mannahatta project maps, it was discovered that 111 Eighth Avenue's foundation was laid in the path of one of Manhattan's buried streams. It has been against this stream, which enters the basement at a rate of roughly 80-100 gallons per minute or 45 million gallons per year – more than the building's total annual water use, that the pumps have been waging a perpetual battle for the last 80 years.

One Eleven Eighth Avenue was spending tens of thousands of dollars annually to purchase millions of gallons of potable water from the city to supply its cooling towers, while also spending money in energy costs to pump water out of its basement. In addition, the cost of water was expected to rise – water rates in New York City



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Deep ecological mapping, circa 1609 and 2009. Investigating the Mannahatta project maps revealed that of 111 Eighth Avenue's the foundation was laid in the path of one of Manhattan's buried streams, explaining the origin of the 45 million gallons of groundwater entering the basement each year.

have increased 48% since 2003, with an annual increase of over 10% for the past three years [Atelier Ten, 2009]. The solution may be to use the groundwater and stormwater as the water supply for the cooling towers, reducing the amount of purchased water by 40.1 million gallons per year. In addition, 111 Eighth Avenue is connected to Con Edison's steam system which is used for heating, hot water, and absorption cooling. The resulting condensation emerges too hot to be poured safely into the sewer and must first be cooled. Currently, the cooling of steam condensate is achieved through the use of purchased potable water; this is another source for which the ground water would be aptly suited. Not only could finding a use for this previously overlooked water resource reduce building operating costs, it also may have the ecological benefit of easing the burden on wastewater treatment facilities and reducing the amount of embodied carbon emissions. A dramatic reduction in potable water demand has the upstream benefit of reduced water extraction from upstate ecosystems. The project reinforces that what we often view as environmental problems are in fact environmental resources.

These measures alone stand to reduce 111 Eighth Avenue's potable water consumption by 75%. However, these solutions would have been obscured if not for the deep questioning, holistic view, and recognition of the importance of ecosystems that comes from studying the ecological history of place. As the intersection of ecology and design becomes increasingly accepted, there remains a need to better understand the expression of ecology through design. Deepening the environmental benefit, while serving to reintegrate humans and their ecosystems, can also lead to understanding the functions provided by those ecosystems.



Restoring Ecological Functions: Lloyd Crossing

In 2004 the Seattle based design firm, Mithun, undertook redefining a piece of planning. On the east side of the Willamette River in Portland Oregon, near the convention center, is a neighborhood known as Lloyd Crossing. It is a sixteen-block area that is characterized by a mixture of parks, parking lots, low rise and high rise buildings. The City of Portland designated Lloyd Crossing as the target area for a study of urban water and energy issues. The study proposed to investigate how far energy and water savings could be pushed. Rather than picking nebulous targets, the study would use numbers from the ecological history of the site. In predevelopment conditions the site had been native forest. The challenge for Mithun was to identify strategies to further develop the site while bringing it back to a water runoff regime that would be the same as what it was when Lloyd Crossing was native forest and to a carbon balance equivalent to that of the native forest.

The goal was not to restore native forest across the sixteen block of urban fabric, but instead to restore the equivalent of the original ecosystem functions. With respect to water, Mithun designed a series

of measures to capture rainwater on the buildings and streetscape. That water would be used in the operations of the buildings and for irrigation of street plantings and landscaping. Water would be reintroduced into groundwater, and greywater/blackwater would be captured treated and reused.

Existing buildings in Lloyd Crossing would need to become much more energy efficient in the Mithun plan for meeting the carbon balance challenge. Then, as new buildings are added to the area, a renewable energy driven district system would help bring the site back to the carbon balance of a native forest.

Both the water balance and carbon balance exercises in the Lloyd Crossing project will take decades to implement, but by understanding the deep ecological history of that site, the goals are very clear and grounded. Sometimes, it is possible to both restore ecosystem function and a piece of the actual ecosystem.

Currently, the local government is still working to identify funding to implement Mithun's scheme for Lloyd Crossing.



Photo courtesy of Mithun

Lloyd Crossing in Portland, Oregon, is the target area for a study that proposed to investigate how far energy and water savings could be pushed using numbers based on the ecological history of the site.



Reconnecting to the Larger Ecosystem: California Academy of Sciences

Using a systems theory foundation allows us to shift our perceptions to multi-faceted solutions to complex problems, instead of simplistic engineering solutions that typically generate additional problems. If the traditional goal of sustainable design is akin to the medical school *maxim primum non nocere* or 'first do no harm', sustainable design influenced by understanding deep ecological history has greater aspirations - to either maintain a sustainably functioning ecosystem or, if the ecosystem is degraded, to restore that ecosystem through active human intervention. Take for example the issue of energy efficiency in buildings. In designing a new building in a benign climate, one could simply build a tightly sealed building. This building could use a state of the art ventilation system to create a closely controlled interior climate that meets the minimum standards necessary for maintaining human health while blindly ignoring the natural climate. On the other hand, the California Academy of Sciences established an example of taking a more holistic approach when the time came to rebuild their facilities.

The California Academy of Sciences, a world-class natural sciences research, educational and cultural organization, needed to rebuild after the 1989 *Loma Prieta* earthquake rendered most of the San Francisco based Academy's buildings structurally unsound. Guided by deep ecological history, the resultant LEED Platinum building – arguably the world's greenest museum – deftly handles the unique challenges faced by the building's need to house a variety of dissimilar items, organisms, and spaces by tapping into the local climate instead of working against it.

The building is comprised of a naturally ventilated pavilion, with climate control mechanisms used

to spot control where necessary – an ideal, low energy solution. A roof form with seven domed structures was chosen in the design strategy because the domes lend themselves well to the creation of microclimates, and as a nod to the region's dunescapes and to the organization's history. When the California Academy of Sciences was founded 150 years ago, the current site in Golden Gate Park was a native dune ecosystem. The undulating vegetated rooftop features a series of oculus vents that, depending on temperature and climate variation as tracked by sophisticated microprocessors, open and close to maintain an ideal indoor temperature in each given microclimate. The roof's design allows for outside cool air to readily flow into the building's main pavilion, while hot air on the exhibit floor easily flows out of the domes' automated skylights, passing through and warming the rain forest exhibit before exiting [Steen, 2008].

Contrary popular belief, modest temperature fluctuations that accompany natural ventilation do not lead to patron discomfort. This is mostly due to the design of a transparent building façade allowing its human inhabitants constant awareness of outside weather conditions. Humans can tolerate colder and warmer temperatures than traditionally specified when they have a connection to the outdoors. This outdoor connection both makes natural ventilation a viable option and provides a concrete example of the biophilic connection between humans and their ecosystems within the built environment.

The 2.5 acre green roof was designed as a partial reconstruction of the native dune ecosystem of the site in order to connect the building to the region's deep ecological roots. This was enhanced by featuring nine native plant species, four perennial and five annual. To properly understand the ecosystem of the roof



structure, Rana Creek, the landscape ecologists for the project, built a mock-up of the roof dome forms to determine which of 29 dune plants would best acclimate to each exposure.

Like any ecosystem, the flora have continued to evolve as birds and bees have dispersed foreign pollen and seeds onto the site, providing an outdoor laboratory for students and scientists [Steen, 2008]. The roof minimizes stormwater runoff by absorbing more than 2 million gallons (98%) of the site's annual rainfall similar to the conditions of the native dune ecosystem, while also providing additional insulation to further reduce the building's energy consumption. The outrigger edge of the roof features glass encased photovoltaic panels, casting a dappled light below which adds to the building's predominantly day lit lighting scheme while also generating 15% of the building's electricity. In addition, by integrating the climate control mechanisms the building achieves excellent energy efficiency despite the diversity of spaces and exhibits. Waste heat, for example, is captured from the chillers used to refrigerate the penguin exhibit and is used to heat the rainforest and coral reef exhibits.

In many modern buildings air is brought in, chilled for one need and then heated to meet a different need. This kind of inefficiency not only results in a tremendous waste of energy, it also represents an unnecessary expense in building energy costs. These follies arise because architects, design engineers, and systems engineers too often operate independently, instead of collaboratively, puzzling together a fragmented system rather than an integrated one. To create a building as sustainable as the California Academy of Arts, the silos which typically bracket the disciplines were dismantled. Working together, the design team developed a holistic solution that did more than mark the check-boxes of sustainability. Without



Photo courtesy of Terrapin Bright Green

The 2.5 acre green roof at the California Academy of Sciences was designed as a partial reconstruction of the native dune system and features nine native plant species, as well as two active bee hives.

compromising the modern standards for comfort, the building – particularly the roof – manages to evoke a feeling of being alive that most people sense only when striding beneath a forest canopy or standing on the edge of a cliff. It is this sense of vitality, created by the ecological approach that sets the California Academy of Arts building apart.

The role of deep ecological thinking is not limited to building design, however. Understanding the deep ecological history of an environment can also have a profound impact on the biodiversity of an area. A team of designers and ecologists in Iowa discovered that embracing the deep ecological history of their property invoked long-forgotten indigenous knowledge that inextricably linked them to the nutrient cycles of the earth.

Humans as Part of the Ecosystem: Timberhill Savanna Assessment

Older methods for environmental management do little to address our need for reconnection. Traditional conservation prescribes methods such as fencing a piece of land and removing human influences. In doing so it both reinforces the idea that humans are harmful to nature and, ironically, may harm the nature they seek to protect. Humans have the capacity not only to damage nature but



to create mutually beneficial relationships with our environment. Research has shown that, in areas where indigenous people survive via their traditional ways, the biodiversity and overall environmental health of the region are better than in nearby regions that are left untouched [Dowie, 2005].

Jerry Wilhelm and Laura Rericha, of Conservation Design Forum, and the authors of the Timberhill Savanna Assessment, show one such case in their analysis of woodland in Leon, Iowa where letting “nature take its course” harmed the biological diversity and ecosystem services the land provided.

When William and Sybilla Brown, owners of the Timberhill property, first moved into their thickly wooded property, they were immediately aware that something was amiss. Ms. Brown, a native of the Bavarian countryside, had expected to find mushrooms and other woodland delicacies in abundance. Instead, she found that the mushroom population on her property seemed “anemic”. On the advice of Pauline Drobney, of Neal Smith National Wildlife Refuge, and against the forestry policies of the area, the Browns began a combined program of thinning and burning.

Although Native Americans had maintained the forest’s productivity through annual burning and thinning, encouraging the growth of sedges and the production of large amounts of soil organic matter for thousands of years, European settlers labored under the assumption that nature was best left to its own devices. The result was that the original savanna of the area gave way to thickly wooded areas that were too shaded to sustain many of the organisms often found in woodland. This increased tree growth resulted in decreased soil organic matter once provided by the fibrous root systems of prairie grasses, loss of nutrients in runoff, and increased vulnerability to drought.

The Browns harnessed this traditional knowledge of burning the land to thin tree growth so that light would reach the forest floor. After a ten year period of annual burnings, Wilhelm and Rericha observed that light exposure aided the growth of the original prairie grass fields, whose root systems greatly reduced the amount of soil erosion. Because these root systems also drastically improved the soil’s ability to store water, the ground became too wet to support a heavily wooded area. This light exposure also created habitats for myriad insects and small animals, as well as lower-lying plant life. For example, the research team noted that birds at Timberhill preferred the well-lit interiors of the renewed grasslands, where they prospered from the abundance of food and nesting locations in the luxuriant ground layer growth. The newly stabilized soil organic matter as a result of the prairie grass root systems also gave way to increased insect abundance and fungal growth, including the mushrooms that the Browns loved [Wilhelm and Rericha, 2007].

The Timberhill Savanna case study displays the often overlooked role that humans play within their natural ecosystem. Due to an anthropogenically-induced ecological process, the land has maintained (and recently regained) an increased abundance of biological diversity.

Biophilia as a Design Principle

The tie to the savanna ecosystem is deep; evolutionary psychologists call it genetic memory. The Savanna Hypothesis put forth by Gordon Orians and Judith Heerwagen postulates that since humans evolved on the savannas of Africa, we should tend to have a predilection for places that have similar conditions. Visual preference surveys from cultures around the world support this hypothesis. Lawns, parks, orchards and golf courses are all typically savanna analogs [Heerwagen and Orians, 1993]. But this is not just a western



cultural phenomenon. This tie can be found in the language of the American Indians, the Objway people in the Midwest used annual fire to maintain the prairies and savannas. Their word for prairie, *Mshkode*, translates to the burnt over bare place, their word for a closed canopy forest, *Wanaqua*, connotes a scary place, and their word for the savanna forest, *Mtiqwaaki*, means the beautiful place. This deep tie to nature is called biophilia.

Humans need nature, and not merely as a resource base, or a practical method of streamlining design of the built environment. The *biophilia* hypothesis introduced by biologist Edward O. Wilson suggests that humans have an innate need for nature. It is supported by studies showing that existing in spaces devoid of nature makes us more aggressive, fuels depression, slows cognitive function, increases hyperactivity and reduces self-discipline. In contrast, nature feeds and renews us. Hospital patients with views of green spaces heal faster than patients with a view of a wall [Ulrich, 1984]. A study out of the University of Michigan found that participants who took a walk through nature scored 20% better on tests of memory and cognition than participants who took a walk through a city [Lehrer, 2010]. Similarly, the Japanese practice of *Shinrin-yoku*, which loosely translates to “taking in the forest atmosphere” or “forest breathing” has been found to reduce blood sugar levels in diabetics, reduce the presence of stress markers such as cortisol, decrease blood pressure, and increase the amount of cancer fighting enzymes present in our bodies [Tsunetsugu, Park and Miyazaki, 2009]. On the surface these benefits appear not simply psychological, but rather, biochemical. Early city planners knew this intuitively. Says journalist Richard Louv, “The industrialists who pushed for the creation of New York’s Central Park weren’t concerned with gas prices. Their priority was worker productivity, linked to the health benefits of nearby nature” [Louv, 2008].

In spite of all this, we often isolate ourselves from the natural world. On average we spend 90% of our time indoors and away from the very natural systems that we need to renew ourselves [Leech, 1996]. Our use of design technology has become less of a buffer against the meanest elements of the natural world and more of a tool of separation from natural systems. In fact, this separation from the natural world fulfills an element of twentieth century ambition. As man’s scientific understanding developed mid-century, opportunities to control the larger environment overwhelmed our understanding of how to work within it. Within the context of an institutionalized industrial norm, ignoring nature simply became easier.

By divorcing ourselves from natural systems, many of us have developed a chronic case of what Louv has termed nature deficit disorder. Key symptoms include reduced alertness, decreased creativity, a general sense of malaise and a nagging sense of having been uprooted. This literal separation makes it easier to mentally separate from nature, to view ourselves as existing apart from natural systems. Studies have shown that a child’s access to nature can improve their cognitive development throughout their formative years, as well as their creativity as an adult [Wells, 2000]. A wealth of evidence suggests the negative effect on well-being of separating humans from nature, and this makes an even stronger argument for design inspired by deep ecological history. An ecologically sound future not only ensures that we can sustain ourselves with a more intelligent use of resources, but will ensure a connection to nature that will benefit the mind and body.

Conclusion

Designs that marry deep ecological history with contemporary green building strategies improve not only the functionality of the building, but the health and wellbeing of entire communities. This



dual benefit is the beauty of embracing deep ecological thinking. The California Academy of Sciences breathes with its larger environment, saving energy and precious resources. One Eleven Eighth Avenue paves the way for other buildings to use readily available resources to reduce stress on urban infrastructure. The Timberhill property in Iowa shows how the forgotten active relationship of humans and ecosystems can provide habitats and increase species diversity.

But while these examples showcase the practicalities of deep ecological design, they also improve the health and wellbeing of entire communities. The California Academy of Sciences sustains a connection between future generations and the nature around them. Since the Academy's building literally brings nature indoors, children who come there to learn about nature also experience it firsthand. The innovative design of 111 Eighth not only reduces the stress on urban water resources, but also highlights in the mind of the public the presence of the abundant water resources that were once available on the island of Manhattan, and how this must have shaped the island's ecology. The Browns, against the wishes of Iowa's forestry policies and conventional recommendations, resurrected traditional knowledge to show their ties to the land. These are important lessons for society to carry into the future.

In history classrooms all across the country, students sit under posters warning that "those who cannot remember the past are condemned to repeat it." This is meant to warn against repeating past mistakes, but when applied to ecological history the past offers hope. If we understand the ecological history of place we can choose to live in a community where man and nature interact in a mutually beneficial manner. We can live by lessons that evolved over many generations in order to appreciate the function of the savannah

ecosystem to our food web and the filtration ability of the forest to provide clean air to breath. For us, ecological history provides a vastly hopeful outlook.

This essay is a supplement to "Manhatta & The Mtigwaaki: Learning from Ecological and Indigenous History", presented by Bill Browning, Eric Sanderson and James Patchett at the Greenbuild Conference in Chicago, November 17, 2010.

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