Nature and the Hopeful City: White Paper

by Kathleen Zarsky, Biomimicry Specialist, LEED®AP, BD+C
Systems Director, HOLOS

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> Wilderness is the raw material out of which man has hammered the artifact known as civilization...the shallow-minded modern who has lost his rootage to the land assumes that he has already discovered what is important.
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> ~Professor Aldo Leopold, 1948

Nature in spring in Austin is the perfect time to contemplate our natural environment. All of our senses are stimulated with everything from bursts of colors, fragrant blossoms, bird song, variable weather and temperature, and longer days to soak it all in. The rhythms of life seem amplified in spring, as nature's adornments revive our souls. For a brief while, we feel childlike abandon in our awe of nature's beauty and processes.

Our wonder and appreciation of nature has been exceedingly dulled, if not replaced, however, with pressing societal objectives, the celebration of urban architectural forms, and consumerism, all of which disconnect humans from nature. Our loss of awe and wonder stems in large part from a dismantling of the natural world in the places we inhabit. The very qualities of place that led to our first settlements have been substituted with designs for human comfort and operational efficiency. As a result, we are less dependent on biodiversity, using technology to attempt greater control over our environments.

It is projected that by 2050 approximately 70% of the world's population will be living in cities, most of which consist of an urban fabric where the total area of hardscape surfaces significantly outweigh the total area of living system surfaces. We can all sense and even measure the detrimental results of many of our design decisions on our health and well-being, the quality of our air and water, resource depletion, and disaster preparedness among other things.

At a time when what we need most is **hope**, this paper makes the case for cities to rethink designs and decision making to create conditions conducive to all of life by looking to nature. Nature's role and our connection to it are explored in five broad areas: What does it mean for Austin to be **resilient, regenerative, livable, just and inspiring?**

Resilience is the capacity of a city to survive, adapt and develop no matter what kinds of chronic stresses and acute shocks are experienced. Nature deals with change through robust interactions that can be leveraged to maintain and rebound critical functions that are unique to place. For any given place, there are a multitude of ecological services at work, including cleansing of the air and water, provisioning of edible and otherwise useful biomass, self-replication, raw material production, regulation of pests and diseases, and so forth. While these free services can vary year-to-year, the inherent redundancy and ability to reorganize in nature is worth emulating. The ecological system does not have to return to its original state in order to be resilient. The most important factor of note is the system's ability to perform its core function with comparable form and behavior patterns intact. People have often thought of change as impending loss, but what nature has taught us is that change and disturbance can be the mechanisms for new possibilities.

A **regenerative** city exhibits a restorative relationship with the natural systems from which it draws resources for sustenance. Nature offers a treasure trove of strategies that can help us reduce our impact on the ecosystems that we forgot we depend upon, but more importantly, these strategies can restore our symbiotic relationship with them. Our city designs often ignore carrying capacity as a limiting factor to growth, but nature reminds us how to *design for function* at appropriate scales by applying the context of operation, behavior and role for each organism and challenge faced. Nature uses anatomy, configuration and composition to *derive structure*. *Permeability* in nature allows system movement, porosity and penetration. Nature *manages pressures with flexibility*, creating malleable, bendable or pliable forms and surfaces. Nature uses *interstitial spaces* like voids, hollows and nothingness to its advantage. Nature's *surfaces mediate* energies and climates of a site. Energy's *shape is characterized by feedbacks*, fluctuating external variables, and hence fluctuating boundaries and shapes, dynamism and succession. Nature uses *patterns and gradients* to optimize interactions and benefits.

One of the best ways to foster a sense of hope is to simply create **liveable** experiences that restore our vital bond with nature. Harvard biologist E.O. Wilson proposed the definition of biophilia that says we must acknowledge and design for the "innately emotional affiliation of human beings to other living organisms" (including living systems). We have cognitive and behavioral reactions to nature that ensure self-preservation, so surely the way that nature is experienced in cities can and should be linked to our well-being. We should encourage Austin to become a Biophilic City, so that the scale of nature integration benefits of all inhabitants.

There is mounting research on the benefits of nature to human health (see Resources list provided at the end of this paper). The scale and range of nature design strategies and frameworks is also growing. The nature-health component of livable cities is a human centric model that can seem to describe nature as an amenity solely for our benefit. Nature, at times and in limited applications, may be nothing more than window dressing for the sake of health benefit or productivity, but the aspiration should be to think of the multi-faceted benefits of healthy natural ecosystems integrated within cities.

Accessibility to quality nature experiences is a remedy for any city striving to be **just** for all life. An aerial assessment of Austin is all it takes to visualize the inequitable distribution of nature. Views and sounds of nature, abundance of trees and vegetation, watercourses, and access to green spaces are disproportionately located to the west. Austin should have an abundance of diverse natural systems in close proximity to its inhabitants. Additionally, the opportunities to experience these places should also be diverse and open to interpretation, such that strolling, hiking, bicycling, exploring, imaginative play and gathering are all available.

A city that prioritizes an abundance of nature and nature experiences must also seek to educate about nature and biodiversity. Equal opportunities for everyone to learn about the richness of the places they live through schools, parks, clubs, programs and projects serves to reinforce the connection and ultimately renewed valuation of nature. Create places in neighborhoods that people want to be, with vegetation.

One source of **inspiration** to help us adapt and live in balance with Earth's complex systems is *This Is How Much An Urban Forest Is Worth*, a study conducted by researchers from Texas A&M Forest Service published in Conservation Magazine. Ecosystem services provided by trees were modeled and quantified. Air pollution removal, reduced emissions and stormwater runoff, reduced energy use for buildings,

and sequestration of carbon were but some of the beneficial services outlined in the study. These are all clearly important benefits, but wouldn't it be equally beneficial to understand more about how trees do these things? For example, trees employ a variety of branching designs that reduce wind stress. Trees break up water droplets to lesson erosive impacts. Trees hold water in their canopies, with some literally combing water out of the air. Could we look to how tree foliage density, leaf thickness, leaf texture and color all interact to enhance the cooling effect for the tree to also cool our environments?

The bottom line is that organisms cannot afford to decorate themselves with functionless features. Everything has been optimized and serves a purpose. Nature's lessons challenge the way we currently think about design, to conceive optimized forms with surfaces as gills or deposition layers, as habitat for pollinators, as imperfect and changing but always beautiful. In addition, higher integration of ecological systems in our urban fabric can help create adaptable building and city conditions. Nature offers us hope, by promoting human health and helping us find new ways to define, inspire and manifest resilient and adaptable living cities.

Resources:

100 Resilient Cities provides resources and support to selected cities that want to develop and implement resiliency strategies: http://www.100resilientcities.org/

International Living Future Institute serves a movement of cultivating restorative ecosystems in which thriving communities benefit the biosphere as a whole: http://living-future.org/ilfi/ideas-action

Biophilic Cities Network supports cities where nature is at the forefront of design and planning decisions and people are encouraged to develop deeper connections with the nature all around them: http://biophiliccities.org/

14 Patterns of Biophilic Design is Terrapin Bright Green's research publication: http://www.terrapinbrightgreen.com/reports/14-patterns/

BiomimicryTX is a local community of change makers promoting innovation inspired by nature: https://www.facebook.com/BiomimicryTX/

The Biomimicry Institute empowers people to create nature-inspired solutions for a healthy planet (BiomimicryTX is one of the first regional networks): http://biomimicry.org/

AskNature is an online library that features free information on over 1,800 natural phenomena and hundreds of bio-inspired applications: http://www.asknature.org/

Families in Nature connects children and their families to nature and to each other through time spent learning, playing and volunteering outdoors: http://familiesinnature.org/

Austin Trail Directory: http://www.austintexas.gov/page/trail-directory

Falling Fruit facilitates the connection between people, food and the natural organisms growing in neighborhoods: https://fallingfruit.org/

Capital Area Master Naturalists educates the public about the natural work in and around Austin, and provides community programs and projects that increase appreciation: http://camn.org/

The Natural Capital Plant Database is searchable by plants based on selected criteria to creating ecological analogs: http://permacultureplantdata.com/

This is How Much a Forest is Worth is an article in Conservation magazine highlighting a study conducted on Austin's urban forest: http://conservationmagazine.org/2016/03/much-urban-forest-worth/

Janine Benyus at SXSW Eco 2015 - The Great Reunion: Seeds of A Biomimetic Future https://vimeo.com/142184482

Kathy Zarsky *is the Systems Director at HOLOS, a sustainability consultancy whose core tenet is systems thinking and collective intelligence. She is a sustainable and regenerative building advisor, process mapper, biomimicry and biophilia practitioner, educator, and speaker. As a systems and strategy designer, Kathy's work has focused on the dynamic relationship between people and the built environment at multiple scales. Her goal is to enable solutions that lead to a greater natural ecology through exploration of design and systems using biomimicry and biophilia frameworks.*

In 2011, Kathy became one of the world's first Biomimicry Specialists, bringing unique perspective and innovative thinking to design challenges. That same year Kathy founded BiomimicryTX, one of a growing number of global network affiliates of the Biomimicry Institute. Since that time, she has led partnership efforts with SXSW Eco, organized a biomimicry design challenge focused on water with Southern Methodist University, spoken at conferences around the country, written education curricula and developed resources for camp and school programs. Her latest undertaking is exploring biomimicry and biophilia applications with a global technology company.

A newly minted collaboration negotiating services as a Platform Partner for the Rockefeller Foundation's 100 Resilient Cities Initiative is next on Kathy's growing list of biomimicry engagements. This collaboration will develop a framework based on the mechanisms important to transformative capacity. She is also slated to speak at Austin's Earth Day Festival and then at Living Future in Seattle in May about the role of biomimicry in architecture.