Growing Water

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The Growing Water project addresses a report from the United Nations that two out of three people in the world will face water shortages by 2025, a situation that will inevitably lead to global conflict. Access to clean water is fundamental to the lives of healthy human beings. While the United States is by and large considered to have adequate water resources, water scarcity and droughts occur regularly throughout the country. Water shortages are even routinely reported in cities adjacent to the Great Lakes, which hold 20 percent of the Earth's fresh water and 95 percent of the fresh water in the United States.

Global climate change as well as local environmental issues is an additional concern to those in charge of fresh water resources in Chicago and the Great Lakes basin. In April 2007, a United Nations climate panel gave notice that continued climate change "could diminish North American water supplies and trigger dispute between the United States and Canada over water reserves already stressed by industry and agriculture." Even in the comparatively water-rich Great Lakes region, global warming could create "more frequent droughts, urban flooding and a scramble for water from the Great Lakes, which border both the United States and Canada."

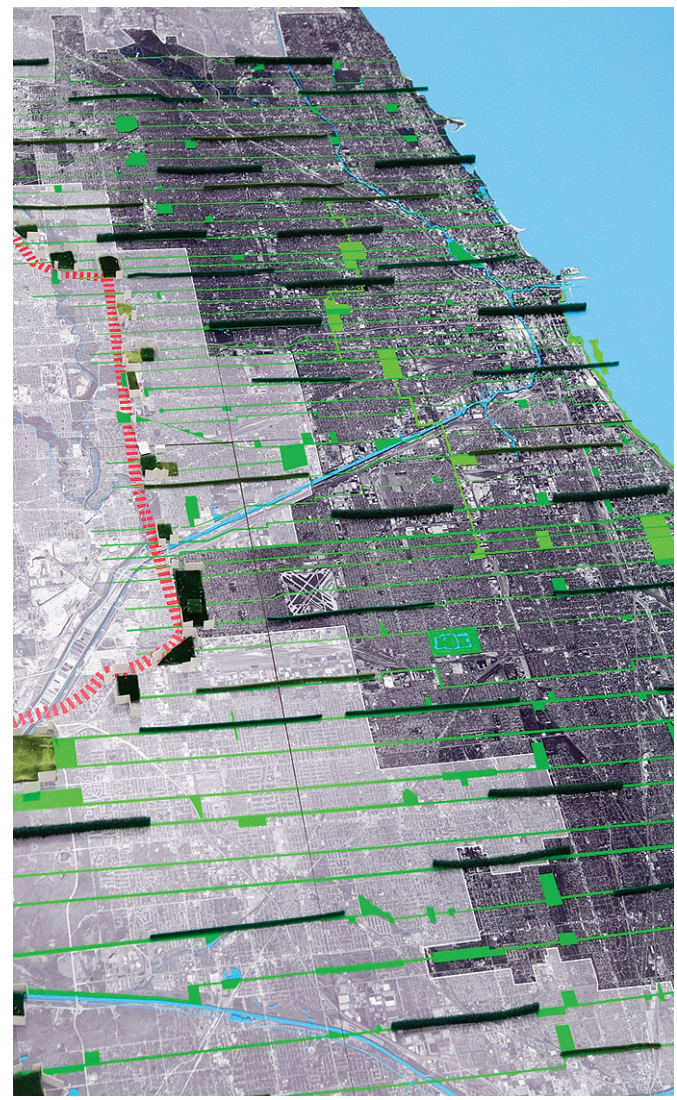
The Growing Water project conceptualizes unprecedented uses of local water relative to local land use and land conservation, and envisions ways that Chicago can become an model for addressing urban water scarcity and pollution. In the very near future, clean water will be both the Chicago region's, and the world's, most valuable resource: the new oil.

The Facts of Water in Chicago

A subcontinental ridge separates most of Chicago from its suburbs: all surface and groundwater east of the divide naturally flows into Lake Michigan; all surface and groundwater west of the divide flows toward the Mississippi River and ultimately the Gulf of Mexico. With this split in mind, the Growing Water project was inspired by three historic Chicago engineering feats: the reversal of the Chicago River, the Deep Tunnel, and the city's boulevards and parks.

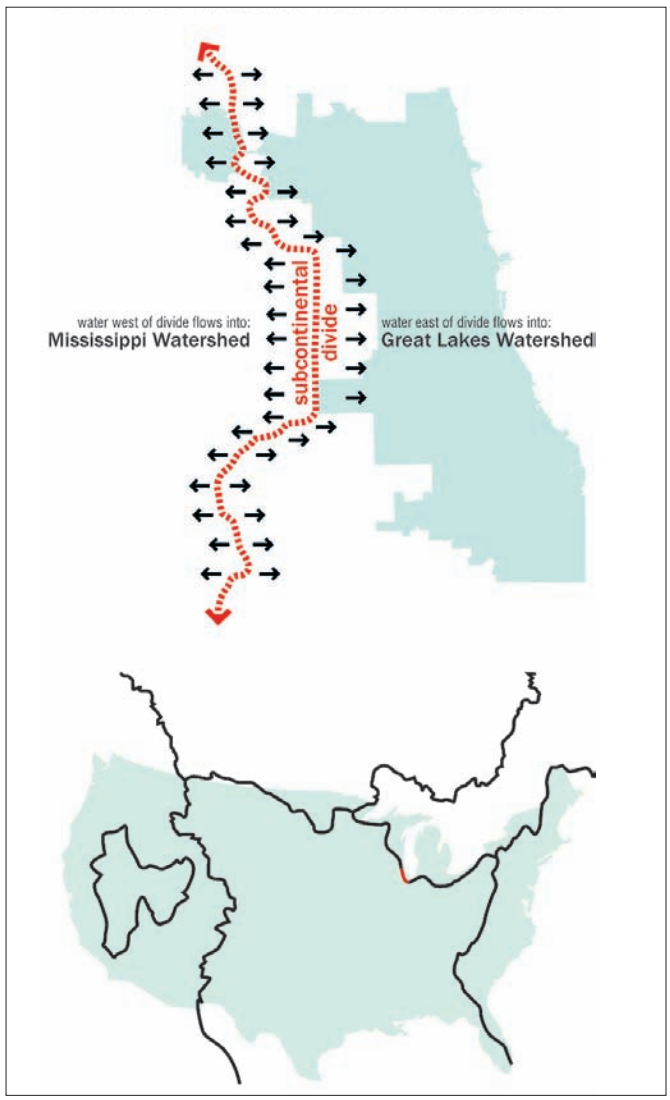
The Chicago River. In 1892, ground was broken for the 28-mile Chicago Drainage Canal (also known as the Sanitary and Ship Canal). At 25 feet in depth and 306 feet at it widest point, it was larger than the Suez Canal and the Panama Canal. New machines to move earth were invented to complete the project, establishing the "Chicago School of Earth Moving." On January 2, 1900, Chicagoans awoke to discover that the flow of the Chicago River had been permanently reversed, away from Lake Michigan, making the river the first to flow away from its mouth.[1]

The Deep Tunnel. In the 1970s, a team of engineers sought to solve the persistent problem of flooding and water pollution in Chicago. Their solution was one of the largest engineering schemes ever proposed: a 109-mile system of huge underground tunnels that would intercept combined sewer and stormwater overflow in the city and convey it to



Above: Montage showing the location of new eco-boulevards in the Chicago area. Photo by Michelle Litvin.

Opposite: Maps showing the location of the subcontinental divide to the west of Chicago and the major drainages of the continental U.S.



large storage reservoirs and treatment plants, from where it would be sent onward, over the subcontinental divide to the Mississippi drainage. Today, the Deep Tunnel has a holding capacity of 15.6 billion gallons of wastewater.

Boulevards and parks. In 1837, Chicago adopted the motto "Urbs in Horto," or "city set in garden"; however, the city's early growth was so rapid and widespread that little or no provision was made for public parks. In a later effort to fulfill the promise, several large public parks were built and connected to one another via green boulevards. In 1893, the system was dubbed the "Emerald Necklace." Similar boulevard systems were later developed in Boston, Kansas City, and Washington, D.C.

Eco-Boulevards in Chicago

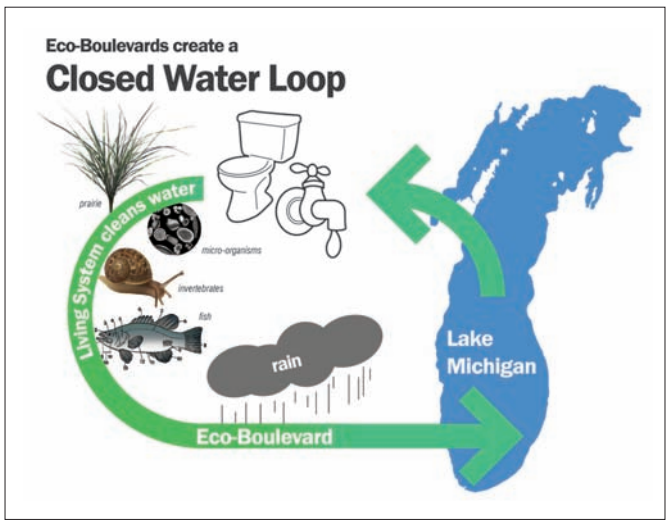
Chicagoans routinely discard, literally "flush down the drain," more than one billion gallons of fresh water (extracted from Lake Michigan) per day. This water never replenishes the Great Lakes basin. As if it had no value, it is sent (after treatment) via the reversed Chicago River into the Mississippi drainage and the Gulf of Mexico. To reclaim this precious resource, the Growing Water project envisions making Chicago a model for recycling, or increasing its water supply, by creating fifty "eco-boulevards" deployed democratically throughout the city.

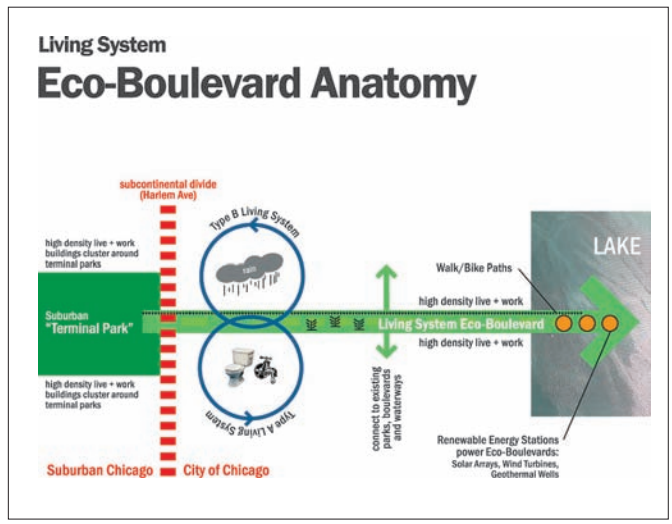
Essentially, the eco-boulevards would be long strips of publicly owned land transformed from gray infrastructure (roadways and sidewalks) to restored green infrastructure. Green infrastructure is any network of open spaces and conservation land—parks, wetlands, preserves, bioconduits, and native landscapes—that naturally manages stormwater and improves water quality. Proponents of green infrastructure encourage community engagement in the conceptualization, design, planting, and upkeep of greenway systems. In this case, the system of green-infrastructural eco-boulevards in Chicago would radically increase the environmental health of the city and the well-being of the Great Lakes ecosystem by returning the water extracted from it by the city.

Organized by UrbanLab, the Growing Water team proposes that over the next several years Chicago institute the eco-boulevard concept in order to enhance Chicago's grid of parks, green boulevards, and waterways to help the city save, recycle, and produce 100 percent of its own water. Eco-boulevards would function as a giant "living machine," naturally treating 100 percent of Chicago's wastewater and stormwater. Treated water would be harvested or returned to Lake Michigan to replenish Chicago's most vital natural resource. Eventually, the eco-boulevards would create a closed water loop within the city.

Living machines are ecological treatment systems that make use of natural bioremediation processes to remove contaminants from sewage, storm water, and other wastewater sources. At the scale of a city, a living machine can be thought of as green infrastructure.

In the Growing Water proposal, there would be two types of living machines. Type A would use aquatic and wetland ecological processes to treat wastewater naturally; these processes would be carried out in reactor tanks in indoor greenhouse conditions. Greenhouses would also contain stray odors from the processing of black water.[2] Type B would consist of marshes, wetlands, prairies, and forests that would use low-energy processes to biologically





filter stormwater. As a living machine, Chicago could use these processes to treat 100 percent of its wastewater and stormwater using micro-organisms, small invertebrates, fish, and native plants.[3]

According to the Growing Water plan, eco-boulevards would be arrayed across the city, replacing fifty east-west roads and sidewalks (also known in Chicago as the "public way"), and reaching from Lake Michigan to the subcontinental divide. The ten-mile-long, 66-foot-wide eco-boulevards would ultimately connect and expand Chicago's existing natural landscape. Spacing the thin green ribbons every half-mile assures they would be within a fifteen-minute walk of a majority of city residents. The eco-boulevards would also stitch together nearly every possible open space, natural land area, and public conservation zone. The vast majority of north-south vehicular, bicycle, and pedestrian pathways that cross the eco-boulevards would remain to provide the maximum number of connections within the Chicago grid system.

The design of each eco-boulevard would differ to meet the needs of its adjoining neighborhoods. For example, eco-boulevards could function as open hardscape plazas and public spaces when adjacent to commercial zones. And when next to residential neighborhoods, they could function as public parks and play, game, and leisure greenway surfaces. The Growing Water team anticipates that while several eco-boulevards would replace roads and sidewalks entirely with green infrastructure, others would contain a healthy balance of gray and green infrastructure (especially along commercial roadways, where vehicular mobility is vital). The eco-boulevards would remake the city in the image of its motto, "Urbs in Horto."

Left: The goal is to create a loop returning clean water to Lake Michigan.
Right: The functions of an eco-boulevard.

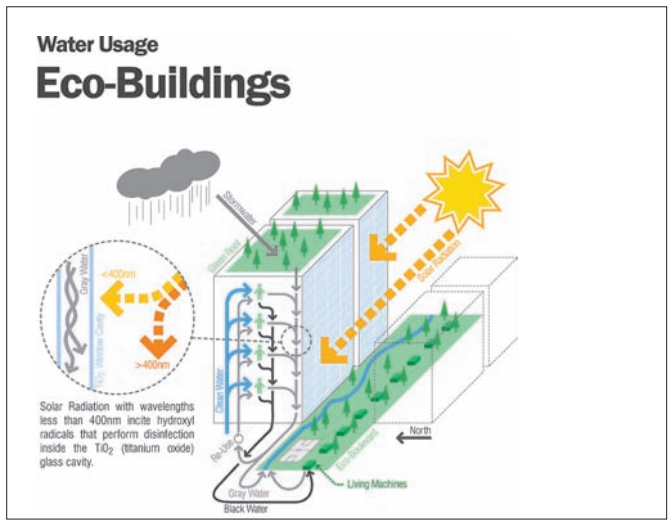
Additional Benefits of Eco-Boulevards

Social. The project would evenly spread the amenity of open green space throughout the city, stitching together historically divided ethnic and economic enclaves. The new public space would create additional space for socialization and play, such as walking or biking trails, sports fields, and fishing and swimming holes. Additionally, planting beds would be provided for city residents to micro-farm organic fruits, vegetables, and flowers.

Environmental. Beyond a sustainable water system and a healthy natural environment, the project would significantly reduce the urban heat-island effect, increase organic filtration of pollutants and carbon dioxide in the air, filter pollutants and heavy metals out of rainwater, and increase biodiversity by adding to insect, invertebrate, bird, and wildlife habitat.

Sustainable. Renewable energy stations would power the eco-boulevards. These would be prominently positioned within and at the ends of the eco-boulevards (on small peninsulas in Lake Michigan). Power could be harnessed from the sun, wind, water, solid biomass, and geothermal energy from the lake.

Economic. On a local level, the fingers of open space—the eco-boulevards—would raise adjacent land values significantly, especially in economically depressed areas.



A steady, sustainable, safe water supply would allow the city to achieve a level of economic growth that other, less water-endowed cities would be unable to match.

Regional. The eco-boulevards would become social and economic attractors: high-density spaces for living and working would develop along them, extending out from the city to the suburbs beyond. Eco-boulevards would typically extend beyond the western edge of Chicago, to the subcontinental divide, where they would be marked by "terminal parks." These large green spaces would be surrounded by residential and work complexes to accommodate suburbanites, who, as water becomes a more expensive and contested resource, would seek to move back to the east side of the subcontinental divide.

Phasing

The eco-boulevards would be cultivated in each neighborhood, one block at a time, and each would be built to complement its community. Density around the eco-boulevards would increase as new amenities attract development.

By mid-century, the eco-boulevards would start to connect to each other, as the density of new development increased and the development around them became integral to the growing water loop. At century's end, Chicago would become a holistic living system for harvesting and returning clean water to Lake Michigan.

Energy and Clean Water

Interconnectedness between the extraction, use, reuse, and cleaning of water from Lake Michigan would be vital to the closed-water-loop concept.

Water taken directly from the lake would be filtered in several stages before being sent to consumers. "Gray" water (from sinks, showers, etc.) would be disinfected and reused for appropriate purposes—such as irrigation—in its own loop. "Black" water (from toilets) would be cleansed in greenhouse living machines.

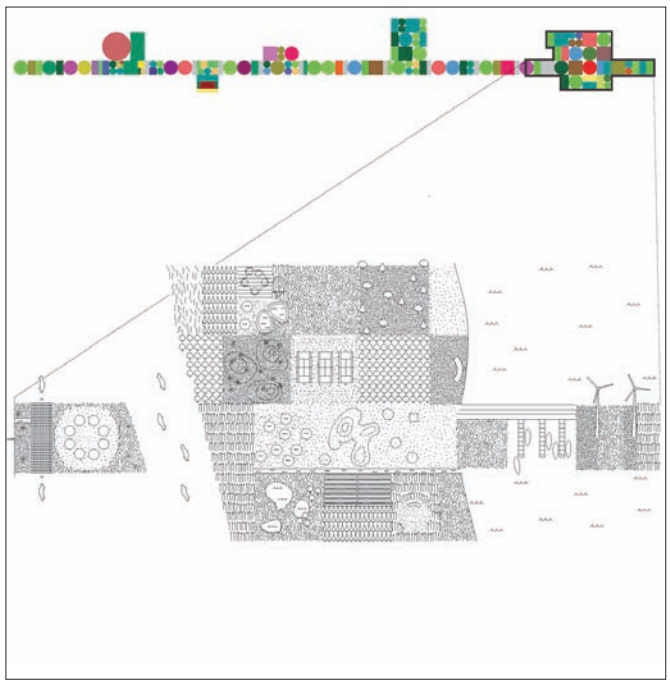
Microbial fuel cells in the living machines would harvest naturally occurring energy produced by bacteria during the cleaning process. After being cleaned in the living machines, water would be returned to Lake Michigan through a wetland flow process in the eco-boulevards.[4]

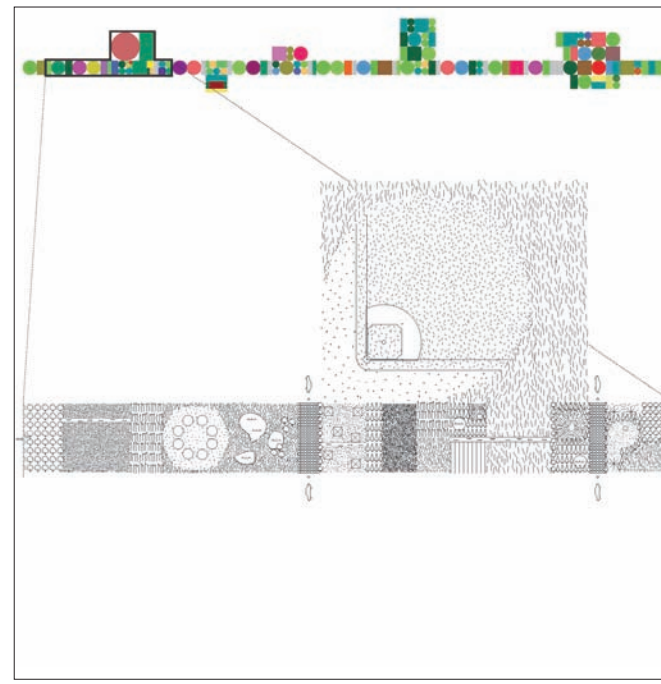
Growing Water Today

Currently, UrbanLab has partnered with the City of Chicago to further research, design, and develop aspects of the eco-boulevard project. With the Chicago Department of Transportation we are developing a series of best management practices (commonly referred to as "BMPs" by water management specialists).

BMPs are not really practices, performed by people; instead, they are physical green infrastructures that capture and biologically clean stormwater before it has a chance to enter the sewer system. Typical BMPs consist of vegetated native landscape swales, swells, channels, and fields that hold water for a specific period to remove contaminants that would otherwise pollute a healthy ecosystem. Benefits of BMPs include stormwater harvesting for landscape and species health, and surface water and aquifer recharge.

Above: Water-use principles in eco-buildings.





As green infrastructure, BMPs are often part of a plan to reduce reliance on conventional gray infrastructure, thereby reducing urban heat-island effects and increasing biodiversity and filtration of ground and air pollutants. BMPs also provide vital water resources for Chicago's flora and fauna, which are valid users of "our" ecosystem, and are often ignored, even though their well-being underlies the health of the Great Lakes region.

Reducing the quantity of water entering the sewer system will also reduce Chicago's carbon footprint. The Metropolitan Water Reclamation District, which runs the processing plants that treat sewer water, is Chicago's largest energy consumer. Therefore, employing BMPs will also contribute directly to reducing gaseous airborne pollutants (via the energy-generation process) responsible for climate change.

Simultaneously, as community pocket parks and larger recreational landscapes, BMPs will provide public open green space for neighborhoods throughout Chicago. The goal of BMPs is to create a resource for planners, designers, engineers, and contractors to use during all phases of infrastructural development.

Above: DNA plan segments for a new eco-boulevard.

Opposite: Rendering of uses along the 31st Street eco-boulevard.

Why Chicago?

Political will is vital to positive social and environmental change. Because Chicago's environmental health is tied to that of the Great Lakes, the water-based models developed in Chicago will likely stir political will in many other cities in the region. Each of the states and Canadian provinces adjacent to the Great Lakes recently signed a compact (soon to be ratified by United States and Canadian legislators) agreeing to cooperative stewardship (such as strict water withdrawal limits) of Great Lakes waters. But water stewardship on the scale of the Great Lakes is more than simply a matter of adopting basic environmental standards. Water-reliant activities in the Great Lakes states and provinces bolster one of the largest economies in the world.

Current calculations of climate change predict a shrinking of the amount of water in the Great Lakes and a higher likelihood that conflict will emerge with regard to its use and availability. Therefore, adopting planning strategies based on green-infrastructural best-practice models will be crucial to continued socioeconomic growth in the region. Global water resources become more contested each year. In order to maintain a recognized right of stewardship over a resource as vital as the Great Lakes, the region's states and provinces need to become urban models for addressing both local and global water scarcity (and pollution).

About the Project

The project resulted from a one-week ideas competition sponsored by the History Channel. The "Design and Engineering Challenge" asked a group of architects in Chicago, Los Angeles, and New York City to conceptualize the future of their respective cities. Each of the three one-week-long regional competitions culminated in a highly staged "reality-TV-style," all-day event in which the teams assembled their projects in front of the public, TV cameras, and competition juries. Three regional winners were named: UrbanLab, in Chicago, Eric Owen Moss, in Los Angeles, and Architecture Research Office, in New York.

Thereafter, a month-long online vote was conducted with the architect Daniel Libeskind as master of ceremonies. The public declared UrbanLab's Growing Water project the national winner of the History Channel's Design and Engineering Challenge.

Notes

UrbanLab is Sarah Dunn + Martin Felsen, with Lee Greenberg, Michael Kmak, Jeff Macias, Kazuya Katagiri, Jan Rehders, Dan Nagy, and Ellen Grimes.

1. Chicago Public Library: www.chipublib.org, 2006.
2. Living Designs Group: www.livingdesignsgroup.com, 2006.
3. Living Designs Group: www.livingdesignsgroup.com, 2006.
4. Diagram derived from work in 2006 at the University of Illinois by Christina Barnas, Peter Pascua, Sean Poust, and Cameron Talischi, with Professor David Lange as advisor.

All images are by UrbanLab except where otherwise noted.