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Nature

Seeing Green: Planted and Vegetated Roofs in Chicago

Chicago is an historic city. It's known as the windy city, and it is also known as the gritty, corrupted city of Upton Sinclair's *The Jungle*. Chicago's stock yards, sports teams, and gangsters are as infamous as its winters. It certainly isn't the first American city you would expect to have become a pioneer in the innovation of urban green space and sustainable design. Yet an aerial photograph of Chicago quickly reveals the truth of the matter: the roofs of Chicago are teeming with green plants, birds, and insects. For the better part of a decade the City of Chicago has been both leading the way in green roofs and encouraging private citizens and companies to join their efforts in several ways. Green roofs provide a number of benefits that Chicago is in a unique position to take advantage of, including energy cost reduction, air quality remediation, and green space expansion opportunities.

There are two types of green roofs: extensive and intensive. Both types are constructed of a series of membranes, which keep plant roots and moisture from penetrating to the structure, a drainage system, growing medium, and finally plants. The differences in the two types of green roofs are their soil depth and the intensiveness of their upkeep. An intensive green roof is essentially a roof garden, and can contain flowers, fruit trees, or produce. The soil layer can be up to 36 inches deep, and while it can support shrubs and small trees (Stromberg 22), the upkeep required to maintain its plantings is extensive and time consuming, as it's name implies. An extensive green roof is much more shallow, with a layer of growing medium only 2 to 6 inches thick, and native plantings of grasses, herbs, and succulents, that once established require very little watering or maintenance. Intensive roofs can be very heavy when their soil is saturated, weighing up to 120 lbs. per square foot, and can demand load and structural requirements that existing buildings may not be able to support. Extensive roofs weigh much less when their growing medium is saturated, 40lbs per square foot or less, making them more conducive to an existing building retrofit (Kravitz 32, 33).

Green Roofs are clearly not a simple system, and one would think it would take a great deal of strong research and data for a municipal government to so enthusiastically back a

program like Chicago has. For Chicago's Mayor, Richard Daley, one visit to Germany in 1999 was all it took (Taylor, 3). He observed that the green roofs already in place in Germany helped solve two chronic problems for all municipal governments: storm water management, and energy costs. When he returned from his trip the first order of business was to install a green roof on 97-year old City Hall (Walker, 108) that was completed in 2001 (Kravitz 27). Mayor Daley has a deep personal belief that there can be a synergy between city and nature. "Growing up, I always heard people say that to enjoy nature; you had to leave the city. But I believe you can stay in the city and enjoy nature, even though you have high rises and skyscrapers." He also stressed the importance of government's responsibility to lead and pave the way for the private sector to embrace green roofs (Walker, 108).



City Hall "Before"

The local government of Chicago made green roof technology an attractive option to builders, developers, and private citizens through a number of examples and incentives. First and foremost the city of Chicago demonstrated that green roofs were practical as a retrofit to an existing building and that they could provide energy saving benefits. The 97 year old roof of City Hall was retro fitted with an intensive green roof garden, planted with native grasses, sedums, herbs, and other regional botanicals. The benefits in temperature reduction and energy savings from the City Hall project have been measured extensively. When compared to a traditional black tar roof on a nearby county municipal building, the roof garden lowers the temperature of the City Hall roof by at least 50 degrees, and saves roughly 9,300 kwh, or \$3,600 of electricity per year (egov.cityofchicago.org...).



City Hall "After"

Once Mayor Daley and his team had proven that green roofs worked the way they were designed to and added aesthetic beauty to the city, they devised a number of incentive programs

to encourage the private sector. One inducement utilized to encourage green roof projects was an expedited permitting process, with a dedicated team of reviewers. Anyone who applied for a building permit for a project with a green roof is guaranteed to spend half to a third of the usual 90-100 days waiting for their permit application to be reviewed. The city also waives the fee for processing the applications. Density bonuses, allowing more units than would typically be built on a site, are awarded to developers who build projects with green roofs within the central downtown commercial district. The owners of buildings with green roofs are granted a reduction on their annual storm water management fees. Developers who receive city assistance or construct municipal projects are required to include a green roof in the design (Taylor 2, 3).

A series of grant programs have also been established to assist in overcoming the initial financial hurdles of additional cost and labor over traditional roofing systems. These programs have recently been supplemented with federal stimulus funds. In 2005 and 2006 the City of Chicago gave out a total of 60 \$5,000 grants to residential and small commercial green roof projects across the city ([egov.cityofchicago.org...](http://egov.cityofchicago.org)). In 2005 there were a total of 120 green roof projects either completed or being developed that amounted to a total of close to 2 million square feet of vegetated roof tops (Stromberg 22). By 2008 those numbers had nearly doubled (Walker 108), demonstrating that the early grants awarded and other incentives helped the concept of green roofs gain a strong foothold. To further expand this growth, in 2007 Chicago offered an additional \$500,000 in grants that could be awarded in increments up to \$100,000 per project (Kravitz, 28).

The rapid growth of green on Chicago's skyline has a number of benefits, to the city and its residents. Green space is more plentiful for city residents to enjoy, and benefit from. The University of Illinois completed a study that established a link between green space and well being, as well as green space and crime reduction (Bellows 2). Many of the roof top gardens are open to the public. Some of these public green roofs include Millennium Park, the Peggy Notebaert Nature Museum, the Chicago Center for Green Technology, and Soldier Field ([egov.cityofchicago.org...](http://egov.cityofchicago.org)). Green roofs provide a much-needed urban habitat for birds, butterflies, and insects (Stromberg 23). There is a roof top victory garden above Chicago's True Nature Foods, designed by local Hampton-Avery architects (Bellows 1), that provides True Nature's customers with some of the most local produce they can get. Aside from quality of life benefits that green roofs provide to the residents of the city, they also offer tangible heat island

effect reduction and building insulation, both of which lead to lower energy costs and reduced carbon emissions in the upper atmosphere.

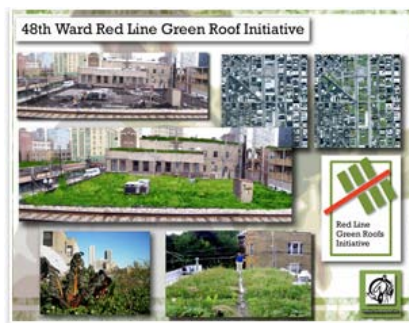
Green roofs are designed to collect rain water and filter it while slowing its journey into the sewer system. This helps to prevent sewage overflow events that can threaten human and environmental health (Stromberg 22). Green Roofs can retain as much as 100 percent of a 1 inch rainfall, depending on the type and thickness of the growing medium (Kravitz 28).

Cities are often associated with a stigma of smog and polluted air, and Chicago is no exception. Green roofs are capable of removing a large amount of the pollution and carbon emissions of a city from the air. Plants remove carbon and produce oxygen through their process of photosynthesis, reducing the carbon a city contributes to the green house effect. About 10 square feet of grass roof can remove just under a half pound of airborne particulates” from the air every year (Stromberg, 23). A 2008 study by researchers Yang, Yu, and Gong revealed that 19.8 hectares of green roof in Chicago removed a total of 1675 kg of pollutants from the air in one year. The pollutants were 52% O₃, 27% NO₂, 14% PM₁₀, and 7% SO₂. The research revealed that the pollutant removal levels varied seasonally, with the highest quantity of pollutants removed in May when they photosynthesis process was the most active, and the lowest in February when the plants were under snow cover. On average, one hectare of green roof in Chicago removes 85kg of pollutants from the air annually (Yang, Yu, Gong 1, 4). Such dramatic increases in air quality through pollutant removal can only lead to healthier city residents.

The Green Roof enterprise in Chicago serves as the perfect compliment to some of the other green initiatives currently going on around the city. Since he was elected 19 years ago, Mayor Daley has overseen the planting of 500,000 trees, and is still counting. Other projects include a wetlands reconstruction and modernization project at O’Hare Intl. Airport, and a ground-up recycling center that boasts the city’s first solar wall. Chicago claims The Center for Green Technology as the world’s first LEED Platinum municipal structure (Walker 110). The Red Line Green Roofs Project brings an additional level of environmental benefit to the city by beautifying an elevated commuter line with green roofs and encouraging riders to take public transportation (Bellows 1).

The 48th ward in Chicago is ground zero for the Red Line Green Roofs project. The ward’s council woman, Alderman Mary Ann Smith had been very interested in implementing a green roof project in her district since she took a trip to Europe around the same time as Mayor

Daley to view green roof projects there. Smith has partnered with Hampton-Avery, who were responsible for the True Nature Foods rooftop victory garden, and Michael Repkin to envision 50,000 sq ft. of green roof spreading out before the commuters who ride the red line daily through her district. The venture is in the planning and fundraising stages right now, but the parties responsible are optimistic. The Federal Stimulus program is particularly generous to sustainable development and greening projects, and Smith's office is applying for funding through the Department of Energy's Energy Efficiency and Community Block Grant Program (Bellow 1, 2, 3). Another goal of the project is to increase usage of the city's elevated rail public transit system, and thus further enhances the 48th Ward's sustainability, safety, and quality of life.



Red Line, Green Roofs Initiative

Chicago represents a truly unique combination of strong willed individual leaders who are eager to see green roofs succeed as part of a larger green picture, a need for the services green roofs can provide, and a policy infrastructure that encourage the use of green roof technologies. Green roofs provide tangible benefits to the city, like storm water management, reduction of the heat island effect and consequently energy costs, and air quality improvement. But their intangible benefits are perhaps just as, if not more, important to note. Residents of the city of Chicago have unprecedented access to public green space and the myriad of flora and fauna supported by these public green roofs, and are happier, healthier, and safer for it. The city's crown of green roofs is still growing, and enhancing Chicago's green reputation.

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