BEAUTIFUL RVA

BENEFITS OF URBAN GREENING LITERATURE REVIEW

EXECUTIVE SUMMARY

There is currently no comprehensive literature review that explores the many environmental, economic, civic, psycho-social-cultural and public health benefits associated with urban greening, public horticulture and beautiful placemaking initiatives. As an essential component of the Beautiful RVA Community Greening Toolkit, the following document will fill this gap and act as a reference guide to support urban beautification initiatives in Richmond, Virginia.

Following a long history of success, urban greening and similar programs have become important tools for communities to fight climate change, poor public health and neighborhood blight. Investing in parks, gardens, street trees and other types of greening has been empirically shown to lower energy use and pollution, keep cities cool, increase property values, make healthier communities and form meaningful social bonds—among many other benefits. Although urban greening should not be considered a panacea for all of the world's problems, increasing access to green space in cities will undoubtedly help local populations become more healthy, resilient and sustainable.

Beautiful RVA

History Of Urban Greening

Greening efforts in cities fall into two broad categories: ornamental streetscaping and landscaping, or food-producing gardens. These classifications are not mutually exclusive, and often produce the best results when used to complement each other. Both practices are also long-proven ways to improve the lives of urban populations.

Before cities in the 19th and 20th centuries began to rely on heavy industry and mechanized transportation, localized urban food systems were common all the way back to ancient civilizations (Barthel and Isendahl, 2013). Modern urban agriculture, however, traces its roots to "vacant-lot cultivation associations" of the 1890s that helped beautify unkempt inner-city properties (Poulsen, et al., 2014). Since then, gardening has long been used by Americans as a way to become self-sustainable during major crises, including the Great Depression and World War II (Okvat and Zautra, 2011).

High-quality green spaces can provide more than just food. The City Beautiful movement arose at the turn of the 20th century in response to rapid industrialization and poor living conditions in urban areas. The movement's advocates called for large-scale public investments in monumental civic architecture, beautiful open spaces and attractive streetscapes (Carlino, 2009). These amenities were an attempt at revitalizing cities for their own populations, but similar efforts today are also aimed at attracting tourists and new residents.

What Can Urban Greening Solve?

As global temperatures rise with the onset of anthropogenic climate change, many regions will see more intense summers and heat waves. These events lead to increases in heat strokes and other heat-related illnesses, especially among the elderly and other at-risk populations (Bowler, et al., 2010). The effect is an even larger concern in cities, where buildings and paved surfaces trap heat, creating an "urban heat island." As a result, cities are often several degrees warmer than their less-dense surroundings. We need ways to make our cities cooler.

Due to an overabundance of automobile exhaust and industrial effluent, urban areas also suffer from increased rates of pollution and associated health problems, such as asthma. When combined with poor diets and highly sedentary lifestyles, especially among suburban youth, a major public health crisis is apparent. We need ways to make our communities more healthy and active.

Large parts of many cities suffer from abandonment and depopulation. Although the complex reasons behind this phenomenon are beyond the scope of this document, the consequences of vacant lots are clear: they drag down property values, facilitate crime and contribute to neighborhood blight (Heckert and Mennis, 2012). We need ways to make these urban areas more attractive and livable.

Benefits of Urban Greening

ENVIRONMENTAL

Traditionally, greening advocates have focused on the ornamentation of public spaces to make their communities beautiful and livable. Areas with well-maintained greenery appeal to tourists, retailers and permanent residents alike. More recently, however, the environmental value of trees and other plants has become the center of urban greening advocacy (Seamans, 2013). The extensive range of services that greenery provides to urban environments is discussed below.

ROLE OF GREEN INFRASTRUCTURE

Green infrastructure planning refers to programs and policies intended to preserve and enhance ecologically important areas, especially in urban environments. Successful green infrastructure planning provides natural linkages between neighborhoods, promotes biodiversity and encourages citizens to become involved in the protection of local landscapes (Lynch, 2015). In order to create livable and sustainable communities, local governments should identify and protect areas of high ecological and cultural importance. By doing so, these valuable green spaces will continue to provide a wide variety of natural benefits.

HEAT ABATEMENT AND ENERGY SAVINGS

Many people enjoy the shade provided by trees for recreation and relaxation, but tree shade is also an effective tool to combat the urban heat island effect. Shaded pavement can be as much as 34°F cooler than non-shaded pavement during summer months, and a 10 percent increase in urban tree canopy across a city can lower ambient air temperatures by 2°F (Wolf, 2008). A separate review of 47 academic articles found an overall average temperature reduction of 0.94°C within urban green spaces compared to their developed surroundings; during the night, this difference increases to 1.15°C (Bowler, et al., 2010).

When planted near buildings, trees provide shade and reduce energy consumption (Roy, Byrne and Pickering, 2012). On average, just four trees planted adjacent to a residential house provide enough shade and wind protection to help reduce cooling and heating usage by 25 percent (Akbari, 2002). In turn, lower energy consumption helps limit the amount of greenhouse gases and pollutants released by fossil fuel-burning power plants.

POLLUTION REDUCTION

A wide body of research confirms trees' ability to directly remove pollutants from the atmosphere by adsorbing particles into the stomata of their leaves. The most common pollutants include carbon monoxide, sulfur dioxide, nitrous oxides, ozone and fine particulate matter. For example, researchers estimate that just one tree in Los Angeles, California, can offset 18 kilograms of atmospheric carbon annually (Akbari, 2002).

Overall, an estimated 711,300 tons of pollutants are removed by urban trees in the United States; the economic value of this sequestration is roughly $3.8 billion (Nowak, Crane and Stevens, 2006). Dense vegetation also physically absorbs sound waves from passing traffic, lowering background noise levels, making communities more livable (Islam, et al., 2012). Evergreen trees are particularly useful for this purpose because they retain their leaves throughout the entire year. Increasing tree canopies in cities can therefore be an effective tool for filtering urban atmospheres and meeting local air quality and noise regulations.

Furthermore, green infrastructure improvements have been found to decrease total stormwater runoff by up to 90 percent, and remove between 50 and 95 percent of common harmful pollutants found in stormwater (Kennedy, Haas and Eyring, 2008). The Street Edge Alternative program in Seattle, Washington, reduced impervious surfaces by 11 percent and planted over 1,000 new trees and shrubs—leading to a 98 percent reduction in total runoff (Kennedy, Haas and Eyring, 2008).

ECONOMIC

Urban parks provide many unique services, including economic benefits. These economic benefits are generated in three different ways: by parks' providing places of rest and relaxation for workers, by attracting tourists to beautiful green spaces and by increasing park-adjacent property values (Crompton, 2001). This third benefit, known as the "proximate principle," effectively makes urban parks capital-generating real estate. Beyond property values, green spaces have measurable paybacks for public infrastructure.

INCREASES IN PROPERTY VALUE

The benefits of parks and other beautiful spaces on urban property values have been documented for over a century. Upon completion of Central Park in New York City, its designer Frederick Law Olmstead demanded that detailed financial and tax records be kept to track the park's effects on property values. While the park cost the city over $800,000 to develop, increases in the tax bases of surrounding neighborhoods eventually led to the city's reaping $4.41 million in additional revenue each year (Crompton, 2007). In a review of 30 empirical studies on the effects of the proximate principle, all but five demonstrated improvements in property values. On average, those increases were roughly 20 percent, and up to 10 percent for properties as far as three blocks away from the park (Crompton, 2001).

In a study across several towns in the Netherlands, researchers found that the price of homes adjacent to a garden and water features was 11 percent above average, while homes simply in view of a park had values 6 percent above average (CABE Space, 2004). A survey of residents in Dallas, Texas, whose backyards abutted a public greenway found that more than half of all homeowners considered the park an asset, and beneficial to their property values—even if it meant less private space (CABE Space, 2004). In Portland, Oregon, the presence of street trees in front of residential lots helped increase home market values by $8,870, and lowered time-on-market by 1.7 days (Donovan and Butry, 2010).

The Philadelphia Horticultural Society launched a Vacant Land Management Program in 1995 to transform abandoned lots into pieces of green infrastructure. Where greening was implemented along commercial corridors, property values rose 23 percent, and 30 percent in designated business improvement districts (Watcher, Gillan and Brown, 2008). Residential property values for homes near vacant lots went from 20 percent below average to 17 percent above average after greening interventions. Home values also rose 9 percent when new trees were planted throughout a neighborhood, and 23 percent when comprehensive streetscape improvements were completed.

PUBLIC INFRASTRUCTURE SAVINGS

Traditional "gray" infrastructure uses sewers, culverts and other civil engineering methods to divert, collect and process stormwater runoff in a manmade system. This approach is costly, time consuming and energy intensive. According to the Federal Energy Management Agency (FEMA), floods still result in over $1 billion in property damages every year across the nation, and pollutants in stormwater lead to 5,000 cases of serious illness (American Society of Landscape Architects, 2012). Green infrastructure alternatives, which include bioswales, rain gardens and other low-impact solutions, emphasize the preservation and restoration of existing natural areas, along with the installation of new vegetation to manage water flow.

A review of nine unique green infrastructure projects in California found that these ecologically sensitive methods were often less expensive, easier to implement and just as effective as their traditional counterparts (Downing, Blumberg and Hallstein, 2013). Natural floodplains and wetlands, when properly protected and maintained, can also adapt to changing

environmental conditions much more quickly than hardscaped infrastructure. The cost associated with managing these green spaces is usually offset by their many ancillary benefits, including wildlife preservation, outdoor recreation, air quality improvements and increases in adjacent property values.

In Bellingham, Washington, two parking lots were retrofitted with green infrastructure improvements at 75 to 80 percent lower cost than a comparable gray solution (Kennedy, Haas and Eyring, 2008). Furthermore, research in Portland, Oregon, found infrastructure costs were $4,000 to $5,000 lower for each acre of developed land that chose bioswales over traditional sewer pipes (Kennedy, Haas and Eyring, 2008). In flood-prone Napa, California, residents led a grassroots effort for the city to invest in the natural protection and reclamation of the floodplain, rather than build a large floodwall. Although this option had a greater upfront cost, property values in the city rose by 20 percent, and flood insurance rates dropped by 20 percent (Hirsch, 2008).

When faced with increasing pollution levels in their sources of drinking water, New York City had two options: either build a new system of filtration plants, which would cost between $6 and $8 billion, or invest in land conservation and reclamation programs throughout the upstate watershed, where much of the pollution originated. The city chose to spend $1.5 billion on the latter, primarily through the purchase of conservation easements along vulnerable waterways. These protected easements acted as natural filters, drastically reducing the amount of pollution reaching the city's drinking water intake (Hirsch, 2008). By protecting these headwaters from polluted urban and agricultural runoff, New York City made its water significantly cleaner while saving billions in tax dollars.

PLACEMAKING AS ECONOMIC DEVELOPMENT

Cities set themselves apart by having unique and attractive public spaces. Placemaking is a measured attempt to create these spaces in urban environments to encourage socialization, promote cultural programming and invigorate civic pride. Successful placemaking initiatives are not all the same; they can be accomplished with many different leaders, stakeholders and mechanisms. The redevelopment of Discovery Green in Houston, Texas, by a public-private partnership created a large-scale urban park that more than one million people visit annually. Park guests enjoy many community-driven events and programs, which give locals a sense of stewardship and encourage many suburbanites to revisit the city (Silberberg, et al., 2013).

In suburban Menlo Park, California, one family recognized the absence of free-form play spaces for neighborhood children. As a result, the family decided to redevelop their front yard into a "Playborhood" where kids can explore a large playhouse, tend a garden and explore a map of the community painted on the driveway. The Playborhood has become a vital resource for children to learn independently in an otherwise automobile-dependent neighborhood with few truly public spaces (Silberberg, et al., 2013).

Since people clearly want to be in and near green spaces, their presence also helps drive economic activity in commercial areas. Public areas that incorporate greenery and other landscaping improvements help attract and retain visitors, and experience up to 40 percent more commercial activity (CABE Space, 2004). A recent research report from the Scotland Forestry Commission found that municipal investments in green space garnered £4.2 in private expenditures for every public pound spent, helping drive economic development (Saraev, 2012). Cities with twice as many public leisure amenities (historic districts, well-maintained parks, scenic views, etc.) as other areas experience population growth 2.2 percent higher than average, and predicted employment rates in these high-amenity cities are 2.6 percent higher (Carlino, 2009).

PUBLIC HEALTH

The direct and indirect benefits of urban greening for public health are impressive. As this section reviews in detail, public gardens and green spaces can have immediate effects on a person's well-being, and help them stay healthy for years to come. Access to nature has also proven to be highly beneficial to a person's mental health.

PHYSICAL ACTIVITY

A community garden or other type of green space improves not only a neighborhood's aesthetic value, but also the health of nearby residents. By analyzing the real-time stress responses of pedestrians who walked routes along both greened and non-greened vacant lots, researchers found that being near greened sites contributed to heart rates five beats per minute lower than when near vacant lots (South, et al., 2015). Because they capture atmospheric pollutants and encourage outdoor exercise, parks have been shown to reduce public health costs up to several hundred dollars per person (Saraev, 2012).

Large gains in personal health are also evident when citizens deliberately set aside time to participate in greening efforts. A detailed study of volunteers at the Fletcher Wildlife Garden in Ottawa, Canada, found that they had significantly lower stress levels, lower blood pressure and better overall cognitive performance (Sander-Reiger and Etowa, 2014). There is also research indicating that office workers with views of natural areas are more productive and get sick less often (Wolf, 2008).

INCREASED ACCESS TO HEALTHY FOOD

Supermarkets and farmer's markets with fresh, healthy foods are not always available to every neighborhood. Urban agriculture is therefore one way to provide citizens with fruits and vegetables that might otherwise be difficult to obtain. A study of community gardening in Baltimore, Maryland, found that the fresh food grown by residents was enjoyed by not only those who actively tended the garden, but also needy populations from across the city who received donations of surplus food from the gardens (Poulsen, et al., 2014). Creating direct, local links between food production and consumption helps strengthen food security in particularly vulnerable areas (Barthel and Isendahl, 2013).

IMPROVING CHILDHOOD DEVELOPMENT

Youth between the ages of 8 and 18 currently spend an average of 6.5 hours per day indoors in front of a screen—a phenomenon researchers have named "nature deficit disorder" (Driessnack, 2009). This is an alarming trend, because children who spend more time outdoors have been shown to have better cognitive functions (problem-solving, self-discipline, etc.) and less emotional hardships.

Children in urban communities with high-quality green spaces experience lower levels of blood pressure, and children raised in areas with higher natural biodiversity have stronger immune systems and fewer allergies (Chawla, 2015). Pregnant mothers living in areas with high levels of greenery also have reduced risks for low birth weights (Chawla, 2015).

In neighborhoods with ample trees and greenery, parents have reported less severe symptoms of ADD and ADHD in their children (Chawla, 2015). For young children, proximity to nature provides a buffer against depression and other mental health problems (Chawla, 2015). Even in urban areas with few completely green spaces, an increased prevalence of street trees encourages outdoor activity among youth (Chawla, 2015).

PSYCHOLOGICAL

Many people in urban areas travel long distances to experience nature for a reason: being outdoors lowers stress and promotes a personal "sense of vitality" (Weinstein, et al., 2015). Increasing green spaces in and near cities makes nature more accessible to people unable to travel outside of urban areas to experience the outdoors for recreation. Even after controlling for socioeconomic status and other demographic factors, people who spend more time in nature are more likely to create strong, sustainable communities (Weinstein, et al., 2015).

COMMUNITY DEVELOPMENT

Public gardens have traditionally been "silent partners" in communities because their benefits and services are often overlooked (Gough and Accordino, 2013). In addition to providing beautiful and accessible green spaces, they help to educate citizens and community organizations, demonstrate sustainable urban horticulture and deliver technical assistance.

When partnerships are formed between public gardens and local governments, they build goodwill, help beautify urban landscapes, bolster environmental public services, boost economic development and build public trust in community initiatives (Gough and Accordino, 2013). The following section describes the many community-level benefits possible when citizens are able to participate in urban greening programs.

CONTRIBUTING TO GREATER GOOD

Recently, community gardening has allowed citizens to act on deep concerns about climate change and food security. Community gardens act as "socio-ecological spaces" by linking collaborative actions with environmental stewardship (Okvat and Zautra, 2011). Societies that prioritize bottom-up activism like community gardening tackle large issues more effectively and sustainably. In addition to the physical health benefits of community gardening, the practice also helps make resource-heavy urban lifestyles more environmentally friendly by encouraging citizens to grow their own food (Okvat and Zautra, 2011). For many of the volunteers at the Fletcher Wildlife Garden in Ottawa, Canada, spending time at the garden was an attempt to make meaningful contributions within the context of larger global issues—especially climate change (Sander-Reiger and Etowa, 2014).

REVITALIZING VACANT LOTS

When the complete redevelopment of an unoccupied property is economically infeasible, greening measures are a helpful alternative. Residents near a randomized selection of vacant lots in Philadelphia where greening interventions had been applied reported a significant increase in their perceptions of safety (Garvin, Cannuscio and Branas, 2013).

One of the oldest and best examples of an active urban greening group is the Philadelphia Horticultural Society, which administers the Philadelphia LandCare (PLC) program. The PLC program helps community groups revitalize neighborhoods by transforming vacant lots into community gardens, or another kind of high-quality green space. Lots adjacent to these newly greened areas saw their property values increase up to 30 percent (Gough and Accordino, 2013). These improvements were most notable in moderately distressed regions of the city (Heckert and Mennis, 2012). Reclaimed lots provide visual confirmation that the neighborhood is actively cared for, which helps attract potential new residents. The Society also helps build social capital in these neighborhoods by remaining an active community partner and assisting with garden maintenance.

CRIME REDUCTION

In theory, increased vegetation promotes outdoor activity and more "eyes on the street" to act as a deterrent to crime. Well-maintained trees may also signal to criminals that a community has an active and watchful neighborhood association. Recent research in Portland, Oregon, found a statistically significant reduction in property-related crimes for single-family homes with large trees in close proximity (Donovan and Prestemon, 2012).

RENEWING CIVIC PRIDE

Residents of Baltimore, Maryland, participating in community gardens report increased feelings of "pride and accomplishment" for their neighborhoods (Poulsen, et al., 2014). Previously vacant lots, which were once nuisances, have become assets in many ways. One example is their use as community event spaces in areas where there is no civic center (Poulsen, et al., 2014). Tree-planting initiatives that engage the community also encourage "civic environmentalism" among participants (Young, 2011). Such programs give residents a unified cause around which to rally, and provide them with the opportunity to get their hands dirty improving the neighborhood.

PREVENTING SOCIAL ISOLATION

Where gardens are installed, new neighborhood groups are often formed, either by proxy or by actual incorporation. Local gardens have also encouraged socially isolated residents and those who live on their own to become active in their neighborhoods (Poulsen, et al., 2014). Volunteers at Ottawa's Fletcher Wildlife Garden, many of whom are elderly and widowed, insisted that spending time helping others at the garden was their primary means of socialization (Sander-Reiger and Etowa, 2014).