Urban Forestry & Urban Greening 22 (2017) 105–110

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug

Short communication

Importance of urban street tree policies: A Comparison of neighbouring Southern California cities

Andrejs Galenieks

Institute for Health Policy and Leadership, Loma Linda University Health, 11209 Anderson Street, Loma Linda, CA 92350, USA

ARTICLE INFO

Article history:
Received 3 October 2016
Received in revised form 26 January 2017
Accepted 7 February 2017
Available online 9 February 2017

Keywords:
Built environment
City planning
Complete streets
Urban forestry
Urban planning

ABSTRACT

Research points to numerous benefits provided by urban street trees including qualitative and quantitative public health, economic, and environmental advantages for a city and its residents. As with other key aspects of city management that help develop municipal success, urban forestry requires foresight, commitment and planning that lead to effective policies and strategies. Good street tree management based on effective policies can maximise street tree benefits. Poorly conceived policies or the absence of effective policies can lead to the opposite result. A case study of the neighbouring cities of Loma Linda and Redlands, California illustrates this difference. The urban tree care and protection policies in these two cities have evolved differently. The differences may be attributable to contrasting municipal commitments to preservation and to best-practice management principles. Based on a comparative analysis of street tree policies of the two cities, it can be concluded that a local culture favouring tree protection and reflective guidelines and policies can result in proactive and successful management of an urban forest. Such policies also include provision for gathering data essential for strategic tree planting, care and removal.

1. Introduction

Cities can be thought of as complex environments with many common and also unique factors influencing their successes or failures. Results are typically related to the state of local economy, social cohesion and safety, city identity, infrastructure and the health and well-being of its residents. Despite the nature of economic, environmental and social influences, a city leadership's level of engagement plays an important role in shaping outcomes. This is particularly visible when studying the history of municipal policies and political engagement relative to a city's built environment.

Urban street trees provide various benefits to cities and their residents, to the perceived quality of cities and quantifiable economic and environmental value. It is well documented that urban street trees improve local and regional air quality, increase property values, reduce heat island effects, reduce heating and cooling energy use, provide scale, texture and create more aesthetically pleasing and memorable spaces (Donovan and Butry, 2010; Nowak et al., 2014). Several studies have also shown that exposure to green spaces and natural elements have multiple health benefits ranging from positive effects on memory for healthy individuals and patient populations to improved mental health and recovery times after surgical procedures (Beyer et al., 2014; Ulrich, 1984).

The inclusion of natural environment, including street trees, in urban settings can aid psychological and physiological restoration by improving mental health, reducing blood pressure and anxiety, reducing mortality, reducing physician-assessed-morbidity, reducing physical inactivity and promoting physical activity with greater cardiovascular benefit as compared to other settings (Bratman, 2015; Bratman et al., 2015; Kardan, 2015; Maas, 2009). Mood disturbances and self-esteem are also positively affected when physical activity, regardless of intensity level, is based in an environment where trees are present (Pretty, 2007).

According to McPherson et al., street trees lining California's streets provide over $1 billion in benefits to the State and its residents (McPherson et al., 2016). While cities and regions show variances, for every $1 invested in tree planting or maintenance, communities see a $5.82 return, on average – a gain that does not take into account the additional, well-studied psychological and physiological benefits to humans (McPherson et al., 2016). Such returns on investment are not one-time occurrences, but rather a continual cycle of direct and indirect benefits to the local economies, safety, air quality and health of a city and its residents.

Among the number of health benefits stemming from urban greenery, studies have shown that residents report higher health perception and significantly fewer cardio-metabolic conditions

E-mail address: agalenieks@llu.edu

http://dx.doi.org/10.1016/j.ufug.2017.02.004
1618-8667/

in communities with a higher density of street trees than peers residing in areas with lower street tree density. Greater health associations have been observed along streets in contrast to parks and areas less frequently encountered, suggesting the importance and benefit of planting and maintaining urban street trees (Kardan, 2015).

After controlling for socio-economic and demographic factors, it has also been shown in Toronto, Canada that having just 10 more trees per block (a density increase of just 4%) is associated with improved health perception comparable to an increase of $10,200 in personal annual income or being seven years younger. An increase of 11 more trees per block can decrease cardio-metabolic conditions comparable to an increase of $20,200 in personal annual income or being 1.4 years younger (Kardan, 2015). Perception of health is typically higher for families with a higher median income and position of affluence. According to Kardan, that link disappears when less affluent families are living on a street with higher street tree density.

Despite such statistics, the national trend for urban tree cover indicates a statistically significant decline throughout cities between 2001 and 2009. Reduction in tree cover was observed at an average rate of 0.27% of city land per year, or approximately 4 million trees in urban US areas (Nowak, 2012).

In California, it has been shown that while street trees have increased in quantity since 1988, their density has dropped by 30% while covering only 36% of city street tree capacity, or full stocking value (McPherson et al., 2016). What this paradox suggests is that many trees are being removed without replacement due to such factors as budgetary constraints, new street construction that does not include trees, or tree removal initiatives due to invasive pests and diseases.

Despite the setbacks, cities have an opportunity to improve their urban tree coverage and density through more deliberate and strategic planting and maintenance methods. While coverage density is on the decline, strategic efforts for managing the estimated 16 million vacant tree planting sites could include a focus on policies that guide infill planting and appropriate pruning in areas of greatest need first. Exemplified by the City of Portland, Oregon, an ongoing initiative identifies where street tree planting is prioritised based on compiled geospatial data for areas of greatest heat vulnerability, heat islands and existing tree canopy (Sustainability, 2016). Research has shown that areas with intentional tree care and protection policies are able to mitigate heat island effect temperatures by up to 3.9 °C compared to areas without tree protection policies (Sung, 2013).

2. Methods used

Research was conducted primarily through scholarly literature review relevant to the presence of street trees, the effects on health and economic outcomes when street trees and corresponding policies are present and when they are absent. Primary scholarly journals included *Urban Forestry & Urban Greening* and *Landscape and Urban Planning*. Supporting and recent scholarly literature related to the discipline of urban planning, sustainability and street trees from 2005 to June 2016 was also analysed by searching for relevant keywords in major databases such as Google Scholar.

Other keyword searches were performed throughout city-level municipal codes, city-level general plans and related street tree policies and guidelines. To highlight patterns of change, regional and city-level Esri's ArcGIS Global Land Survey Landsat data was accessed as reflected in "Figs. 2 and 3".

Historical books were included in the analysis primarily for photographic and contextual records of the region. Additionally, windshield-surveys were done throughout both cities for present-day analysis. Selected research was organised and added to this paper using EndNote X7 software.

3. The case study

The neighbouring cities of Loma Linda and Redlands, selected for this case study, are both situated on the eastern end of Inland Southern California. While they both share a similarly diverse population, socioeconomic demographics, geography and California's coastal sagebrush climate, their respective built environment policies are significantly different. This has resulted in different outcomes, particularly in the urban built and natural environments. This difference is vividly illustrated in "Fig. 1" in the two cities' approaches to street trees.

3.1. Loma Linda background

Loma Linda established initial presence as a health resort destination in 1876 amidst a railroad and citrus boom. The Seventh-day Adventist Church purchased the resort land in 1905 and established a "sanitarium," a nursing school, and later a school of medicine in 1909. From the beginning, the institution that eventually became known as Loma Linda University, has had a strong emphasis on health promotion and disease prevention that includes a commitment to create a healing environment with connections to nature and physical activity (Park, 2005). Today the University and its health system of six hospitals and numerous outpatient clinics is the largest private employer in the Inland Southern California region. The city of Loma Linda, which is home to the University, was incorporated in 1970 and has an estimated population of just over 24,000 (Bureau, 2016a; Linda, 2016).

3.2. Loma Linda policies

Loma Linda developed within the realm of healthcare, religious, educational and healing arts roots, and has emphasised a commitment to open spaces and natural resource preservation. Specifically, the City's General Plan highlights adaptive reuse and preservation guiding policies for existing citrus grove trees (Sec. 3.2.1.1), preservation of oak woodland areas (Sec. 9.4.4), recognition of tree value for energy conservation and air quality measures (Sec. 3.1.1.2 and 9.8.1) (Linda, 2009). The City of Loma Linda has a 7.5 square mile boundary and for any new development requires street tree planting as directed by the approved master street tree palette. The City however does not have a current street tree inventory or tree count and does not have comprehensive guiding policies for the planting, maintenance or removal of street trees (Bureau, 2016a; Linda, 1981). Through its guidelines or its policies, the City does not currently call for prescriptive street tree care methods, nor is there a designated and codified protocol, committee, department, or management plan for the city-owned street trees of Loma Linda.

3.3. Loma Linda outcomes

Recognised as a Blue Zone, defined as a demographic or geographic area with disproportionally high longevity, the Loma Linda community has a strong emphasis on physical activity, and other health promoting factors (Buettner, 2009). Driven by the desire to preserve natural elements and open spaces for an active lifestyle, the City designated a "Hillside Conservation" area in the General Plan and the Municipal Code consisting of 1157 acres of open space in the South Hills Preserve. This area is available for public use and is a key destination for recreational physical activity in the City (Linda, 2009). While it technically allows for low density development of one dwelling unit per 10 acres, or per 5 acres conditionally,