



## Original article

# Branching out to residential lands: Missions and strategies of five tree distribution programs in the U.S



Vi D. Nguyen<sup>a,b,1</sup>, Lara A. Roman<sup>b,\*</sup>, Dexter H. Locke<sup>c</sup>, Sarah K. Mincey<sup>d</sup>,  
Jessica R. Sanders<sup>e</sup>, Erica Smith Fichman<sup>f</sup>, Mike Duran-Mitchell<sup>g</sup>, Sarah Lumban Tobing<sup>h</sup>

<sup>a</sup> University of California, Berkeley, 130 Mulford Hall, Berkeley, CA, 94720, United States

<sup>b</sup> USDA Forest Service, Northern Research Station, Philadelphia Field Station, 100 N. 20th St., Philadelphia, PA, 19103, United States

<sup>c</sup> Graduate School of Geography, Clark University 950 Main Street, Worcester, MA, 01610-1477, United States

<sup>d</sup> School of Public and Environmental Affairs, Indiana University, MSBII 134, 702 N. Walnut Grove Ave. Bloomington, IN, 47405, United States

<sup>e</sup> Casey Trees, 3030 12th St NE, Washington DC, 20017, United States

<sup>f</sup> Philadelphia Parks & Recreation, 1515 Arch St. 10th floor, Philadelphia, PA, 19102, United States

<sup>g</sup> New York Restoration Project, 254 W 31st St. 10th Floor, New York, NY, 10001, United States

<sup>h</sup> City of New York Department of Parks and Recreation, 1234 Fifth Ave., New York, NY, 10029, United States

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## ABSTRACT

Residential lands constitute a major component of existing and possible tree canopy in many cities in the United States. To expand the urban forest on these lands, some municipalities and nonprofit organizations have launched residential yard tree distribution programs, also known as tree giveaway programs. This paper describes the operations of five tree distribution programs affiliated with the Urban Ecology Collaborative, a regional network for urban forestry professionals. We analyzed the programs' missions, strategies, and challenges as reported through surveys and interviews conducted with program staff. The programs were led by nonprofit organizations and municipal departments in New York City, NY; Baltimore, MD; Philadelphia, PA; Providence, RI; and Worcester, MA. These organizations focused their tree distribution efforts on private residential lands in response to ambitious tree canopy or planting campaign goals. We assessed these programs through the framework of urban forests as social-ecological systems and discuss the programs' biophysical, social and institutional contexts. Programs face principle-agent problems related to reliance on individual tree recipients to meet goals; their institutional strategies meant to ameliorate these problems varied. Differing organizational and partner resources influenced the programs' abilities to perform outreach and follow-up on tree performance. Programs attempted to connect with diverse neighborhoods through free trees, targeting areas with low existing canopy, and forging partnerships with local community groups. Given tree recipients' demand for smaller flowering or fruiting trees, as well as lack of resources for tree survival monitoring on private lands, program leaders appeared to have turned to social measures of success – spreading a positive message about trees and urban greening – as opposed to biophysical performance metrics. We conclude with suggestions for outcomes monitoring, whether those outcomes are social or biophysical, because monitoring is critical to the sustainability and adaptive management of residential tree programs.

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## 1. Introduction

To support growing urban populations with the ecosystem services provided by trees, many cities across the United States (US) have set ambitious tree planting and canopy cover goals

(Young and McPherson, 2013). These ecosystem services span environmental, economic, and social benefits including provision of shade (Donovan and Butry, 2009), reduction of stormwater runoff (Inkiläinen et al., 2013), increased property values (Conway et al., 2016; Sander et al., 2010), landscape aesthetics (Summit and McPherson, 1998), and deepened civic engagement through tree planting (Fischer et al., 2015). While practice and research in urban forestry have historically focused on street and public park trees, private residential lands in the US possess both a substantial portion of the urban land cover (Nowak et al., 1996) and

\* Corresponding author.

E-mail address: [lroman@fs.fed.us](mailto:lroman@fs.fed.us) (L.A. Roman).

<sup>1</sup> Presently Prineville Bureau of Land Management, 3050 N.E. 3rd Street, Prineville, OR, 97754, United States.

extensive potential for planting (O’Neil-Dunne 2009, 2011, 2012). Thus adding tree canopy to residential properties is essential to meeting urban greening goals.

In light of this, some municipalities and nonprofit organizations have undertaken tree distribution programs as a means to expand the urban forest on private residential lands. Tree distribution programs are defined here as those that offer free or reduced-cost trees to residents for planting on private properties, often in yards; when the trees are free these programs are sometimes called giveaway programs (Roman et al., 2014). For example, in a new program coordinated by the Arbor Day Foundation across the US, over 135,000 free yard trees have been distributed to over 76,000 homeowners in just the past five years (P. Smith, pers. comm.). This program and a 20-year old program in Sacramento, CA aim to provide tree shade to reduce summer energy use, and are sponsored by utility districts (Roman et al., 2014). Residential planting initiatives could also serve municipal goals for green stormwater infrastructure and climate change mitigation (Mason and Montalto, 2015).

The emergence of new residential tree distribution programs represents a substantial shift in urban forest management for many municipalities and nonprofits, who have traditionally concentrated their planting efforts on public lands – streets and parks (Hauer and Peterson, 2016). In those public settings, program staff and volunteers carry out tree planting, monitoring and maintenance (Young and McPherson 2013; Roman et al., 2015; Vogt et al., 2015). In contrast, residential tree distribution programs must gain the interest of and rely upon a heterogeneous mix of private residents (Summit and McPherson, 1998; Locke and Grove, 2016) to plant and maintain trees on their private properties in order to meet program goals associated with producing ecosystem services as public goods.

While there is substantial research on residential preferences, values, and norms related to yard vegetation, as well as varying residential landscape management practices and social-ecological contexts (Cook et al., 2011; Harris et al., 2012, and citations therein), there is a dearth of scholarship on residential tree programs themselves. Research on urban forestry institutions (Mincey et al., 2013; Young and McPherson, 2013) and urban environmental stewardship (Fisher et al., 2015) has largely focused on the public lands where managers traditionally operated, especially street trees. In-depth analyses of residential tree distribution programs and cross-program assessments are lacking. Currently, such information largely flows through communication among practitioners (for example, see Alliance for Community Trees [ACTrees] 2008, Turner and Mitchell, 2013), with little peer-reviewed literature on the subject and little reliance on scholarly theory for understanding program outcomes.

This is unfortunate as existing empirical data and related theory suggest there are challenges associated with the reliance on private individuals to co-produce public goods associated with urban trees (Mincey et al., 2013). Such challenges can be viewed through the lens of principle-agent relationships (PARs), in which an agent acts on behalf of a principal (Eisendhardt, 1989). This relationship focuses on the challenges of motivating the agent (in our case, residents who receive trees) to act on behalf of the principal (tree distribution program staff) when interests of both parties are not perfectly aligned and the principal has imperfect information on the actions of the agent. Institutional arrangements (rules, norms, strategies) can ameliorate problems associated with PARs by providing incentives and/or information that changes behavior but these arrangements also incur transaction costs (North, 1990).

Suggestive that PAR challenges do exist in residential tree distribution programs, in the Sacramento giveaway program, many residents did not adhere to recommended practices: 15% failed to plant their trees, and many planted trees did not receive adequate maintenance, often related to changing property ownership (Roman et al., 2014). Tree survival, a common metric of success

among urban forestry practitioners (Roman et al., 2013), has been documented to be below projected values for that program (Roman et al., 2014; Ko et al., 2014a). These losses represent sunk costs associated with distributed trees’ failure to survive to maturity and optimize benefits sought by the program staff (Mincey and Vogt, 2014). There are many potential reasons for these findings from previous research. For example, there may be little incentive for private individuals to incur associated costs of tree maintenance, particularly since environmental benefits are greatest decades after planting, when residents may have moved (Roman et al., 2014; Ko et al., 2015a). Furthermore, landscape management behaviors are rooted in community norms, lifestyles, and even resident emotions (Fraser et al., 2013; Harris et al., 2013; Grove et al., 2014) meaning that tree distribution programs should impact residents themselves in order to grow the urban forest. Supportive of such institutional solutions, survival in street tree planting initiatives can be enhanced with collective neighborhood tree care strategies by volunteers and program staff (Roman et al., 2015; Vogt et al., 2015). However, even though street tree programs can have extensive civic engagement in planting (Fisher et al., 2015), that engagement from volunteers and residents does not necessarily continue through post-planting maintenance (Moskell and Allred, 2013). Yet even with such challenges for street tree maintenance, collective strategies may be more feasible on the public streetscape than in private yards. Thus, with residential tree distribution programs entirely reliant upon residents for tree care in their private yards, it is critical to unpack program strategies for success. Moreover, understanding how these programs define success and which practices lead to success are necessary for adaptive management for sustainable urban forest systems (Clark et al., 1997).

We address the knowledge gap about yard tree programs by qualitatively analyzing the missions, strategies, and challenges of five residential tree distribution programs. Our analytical approach acknowledges urban forests as complex, adaptive social-ecological systems (SESS; Vogt et al., 2015), a framework which outlines three sets of factors that interact to produce outcomes in urban forest management: 1) the biophysical context – characteristics of the trees and the biophysical environment in which they grow; 2) the social or community context; and 3) the institutional context – the rules, norms, and strategies that structure the interactions between the community, the trees and the biophysical context. This framework, particularly when used in comparative cases, allows for identification of relatively important factors and their interactions which produce outcomes of interest (Ostrom, 2009), much needed given the dearth of scholarship on these programs and the central issue that these programs rely upon private residents to meet program goals and thus face principle-agent problems. Given our interest in the missions and operational strategies of distribution programs, our study focuses largely on describing the institutional strategies of programs, while providing relevant details about their biophysical and socioeconomic contexts, including tree species characteristics and geodemographic patterns in tree distribution. We then draw connections between these various interacting factors and relative measures of success.

## 2. Methods

### 2.1. Study design

We employed the case study method and drew cases from tree distributions programs participating in the Urban Ecology Collaborative (UEC). The UEC, formed in 2002, is a community of practice in New England and the mid-Atlantic US whose member organizations comprise government agencies, local nonprofits, and researchers (Galvin 2012; Leff, 2013). These organizations’ inter-

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