

# **“Trees and People”—A research design for evaluating the outcomes of neighborhood and nonprofit urban forestry: Does planting trees improve neighborhoods?**

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## **ABSTRACT**

In this document, we will propose a research design to answer the following questions:

1. Do the institutional designs of urban nonprofit tree-planting programs and neighborhood tree-planting projects affect planted-tree success?
2. Does participation in a tree-planting project have social effects on neighborhoods and individuals?

Using data from nonprofit urban tree-planting programs in 5 eastern U.S. cities, we propose to evaluate both ecological and social outcomes of these programs at the neighborhood, individual, and tree level. Outcomes of interest are tree success and whether or how tree planting increases community capacity. Practically, nonprofits hope that their trees survive and grow, and that their tree-planting programs strengthen familiarity and trust among neighbors; increase community capacity to be resilient in the face of external shocks to the community; improve understanding of the benefits of urban trees and awareness of ecological surroundings; and initiate future instances of community collective actions to improve social, public health or environmental conditions in the neighborhood. In short, we propose to examine how people influence trees and how trees influence people. Our research is informed by the Model of Urban Forest Sustainability (Clark et al. 1997) and the social-ecological systems (SES) framework (e.g., Ostrom 2009).

**To evaluate tree outcomes**, we propose a post-test only with stratified random selection of tree-planting neighborhoods and stratified systematic random sampling of trees within neighborhoods. Within selected neighborhoods, we sample fifty percent of planted trees and gather data for each sample tree according to the [Planted Tree Re-Inventory Protocol](#). **To evaluate social outcomes**, we propose a post-test only with non-random treatment and comparison groups and with stratified random sampling and estimate outcomes using propensity score matching and instrumental variables techniques. We use the same sample of neighborhoods as the tree design and match these neighborhoods to comparison neighborhoods using a suite of covariates to create a similar-looking comparison group. Within neighborhoods, we select a random sample of residents and over-sample participants. We include several mechanisms to reduce selection bias including propensity score matching and two-stage least squares.

We will begin pilot research this summer and the full project with all cities in Spring 2014.

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## 1.0 OVERVIEW

In this document we propose an evaluation of nonprofit urban tree-planting throughout the United States. This research evaluates ecological effects that institutional designs have on the success of newly planted urban trees and in social effects that tree-planting projects have on urban neighborhoods and individuals. Outcomes of interest include the success of new trees (survival and growth) and whether or how tree planting increases community capacity. Tree-planting organizations, tree-planting project leaders, and neighborhood groups use different strategies to manage tree planting and subsequent maintenance. For example, some neighbors water trees together while others assign watering of single trees to individuals. We expect that variation in these strategies may explain variation in tree success. Practically, nonprofits hope that their trees survive and grow, and that their tree-planting programs strengthen familiarity and trust among neighbors; increase community capacity to be resilient in the face of external shocks to the community; improve understanding of the benefits of urban trees and greater awareness of an individual's ecological surroundings, and initiate future instances of community collective actions to improve social, public health or environmental conditions in the neighborhood. To this end, we present a proposal to evaluate both ecological and social outcomes of nonprofit tree-planting programs at the neighborhood, individual and tree level. In short, we propose to examine how people influence trees and how trees influence people.

We propose to evaluate the influence of people and institutions on tree outcomes through a post-test only design with stratified random selection of tree-planting neighborhoods and stratified systematic random selection of trees within neighborhoods. Within selected neighborhoods, we will sample every other tree (50% of planted trees) and gather data for each sample tree according to the Planted Tree Re-Inventory Protocol (Vogt *et al.* 2013).

We propose to evaluate the influence of tree planting on social outcomes through a post-test only design with non-randomized treatment<sup>2</sup> and comparison groups and with stratified random selection of individuals within neighborhoods. We use the same sample of neighborhoods as the tree design and match these neighborhoods to comparison neighborhoods using a suite of covariates to create a similar-looking comparison group. Within neighborhoods, we select a random sample of non-participating residents and over-sample tree-planting participants. Because we are unable to randomly assign treatment (tree-planting) to neighborhoods and we are unable to randomly assign participation in tree planting to individuals, we include several mechanisms to reduce selection bias.

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<sup>2</sup> A note on the use of the word “treatment” in this research design: We have couched the social component of our research in the context of a program evaluation, in which the “treatment” is a neighborhood or individual's participation in tree planting and watering activities. We frame the tree outcomes component of the research less as a program evaluation. There is no comparison group of trees that do not receive some management. Instead, we take advantage of variation between management strategies. We can use observed differences in management strategies across neighborhood to compare tree outcomes between groups of trees that experience different levels or types of management (e.g., collectively-watered trees versus individually-watered trees—see T2a and T2b Table 1 in below; also see Mincey and Vogt [*in review*] for prior research on collective and individual watering). We use similar methods to examine both components of our research, but we can more explicitly talk about the evaluation of neighborhood- and individual-level social outcomes using the language and metrics of program evaluation (e.g., a treatment-on-the-treated estimator).

To statistically address non-random selection of individuals in participating neighborhoods, we use propensity score matching and two-stage least squares.

In this document, we state our outcome variables and research questions (Section 2.0), briefly review key literature that motivates these questions (Section 3.0), and describe our proposed research design (Section 4.0) and timeline (Section 5.0).

## 2.0 OUTCOMES AND RESEARCH QUESTIONS

We propose to predict ecological and social outcomes at the level of the tree, individual, and neighborhood.

We estimate two outcomes of tree success, (a) tree survival and (b) tree growth, in order to answer the following research questions:

- (1) Does the *institutional design of the urban nonprofit tree-planting* affect planted-tree success? Are there certain institutions that work better in certain neighborhood contexts?
- (2) Does variation in *post tree-planting management strategies at the neighborhood-level* affect planted-tree success? Are there certain management strategies that appear to work better in certain neighborhood contexts?

We estimate four outcomes at the neighborhood and individual level: (a) the level of tree-specific environmental knowledge; (b) the level of neighbor familiarity in the neighborhood, (c) the level of trust neighbors have for one another; and, (d) the level of collective activity. These outcomes will help us answer the following research questions:

- (1) Does *neighborhood participation* in a tree-planting project have social effects on the *neighborhood*? (*unit of analysis: neighborhood; treatment-on-the-treated estimator*)
- (2) Does a *neighborhood's participation* in a tree-planting project have social effects on *an individual resident* in that neighborhood? (*unit of analysis: individual; intent-to-treat estimator*)
- (3) Does an *individual's participation* in a tree-planting project (planting and/or watering trees) have social effects on *that individual*? (*unit of analysis: individual; treatment-on-the-treated estimator*)

## 3.0 LITERATURE REVIEW

Our research is motivated by the idea of the urban forest as a social-ecological system (Table 1). This idea combines the model of urban forest sustainability (Clark *et al.* 1997) with the social-ecological systems (SES) framework of Ostrom and colleagues (*e.g.*, Ostrom 2009). The Clark and

colleagues (1997) model of urban forest sustainability argues that a sustainable urban forest requires a healthy vegetative resource (i.e., the trees), adequate management, and a supportive community. Similarly, the SES framework purports that resource systems are best understood as linked systems of human and natural components, or *social-ecological systems*. In a social-ecological system, according to the SES, the attributes of the resource, the governance system, and the community influence the outcomes of resource management (Ostrom 2009). To this end, our variable selection is informed by research on urban tree maintenance and tree growth physiology, studies of common pool resource management, and theories of adaptive capacity and social capital. We draw from the fields of new institutional economics, urban forest management and arboriculture, and urban studies and sociology. Below, we outline key points from these fields as they relate to how people might influence tree outcomes and how trees and tree planting might influence social outcomes.

**Table 1: The urban forests as social-ecological-systems framework**

Social-Ecological Systems Framework (Ostrom 2009)	Model of Urban Forest Sustainability (Clark <i>et al.</i> 1997)	Urban Forests as Social-Ecological Systems
Resource System Resource Units	Healthy Vegetative Resource	Biophysical Resource (Trees and Surrounding Environment)
Users	Supportive Community	Community (Neighborhood)
Governance System	Adequate Management	Institutions and Management

### 3.1 Institutions and ecological outcomes, or *how people might influence trees*

Research on natural resource management and, in particular, collectively managed resource systems, has revealed that institutional design affects observed ecological and social outcomes and the long-term persistence of a resource system (*e.g.*, Gibson, McKean, and Ostrom 2000; Ostrom 1990, 2005; Ostrom, Gardner, and Walker 1994). Institutions refer to the rules, norms and strategies that govern interactions between individuals and groups of people, and between people and the environment (Ostrom 2005). In the case of urban trees, we consider institutions to be the strategies, rules and norms related to tree planting and subsequent management, including watering, pruning, mulching, and, eventually, removal.

Previous research has articulated institutional features that have been associated with sustainable outcomes in collectively-managed natural resources as eight Design Principles (see Ostrom's *Governing the Commons* [1990] and elsewhere [*e.g.*, Cox, Arnold, and Villamayor Tomas 2010; Ostrom 2005]). Research in rural forests managed by communities has revealed that forests are relatively sustainable when those who use and benefit from the forest can design their own rules to govern forest use, and when those users effectively monitor and enforce these rules (Gibson, McKean and

Ostrom 2000; Design Principle 2: “Congruence between...rules and local conditions and Design Principle 4A: Monitoring [Cox, Arnold, Villamayor Tomas 2010]). Research by two of the authors of this proposal found that several of the Design Principles are relevant in the context of urban tree planting (Mincey and Vogt *in review*). In their study of successful neighborhood tree-planting and management facilitated by the urban greening nonprofit Keep Indianapolis Beautiful, Inc., Mincey and Vogt (*in review*) found that the nonprofit supported the development of tree-watering strategies and rules that fit local neighborhood context (Design Principle 2: “Congruence between...rules and local conditions” [Cox, Arnold, and Villamayor Tomas 2010]), and that the nonprofit recognized the autonomy of the neighborhood to create their own rules (Design Principle 7: “Minimal recognition [by higher authorities] of rights to organize” [Cox, Arnold, and Villamayor Tomas 2010]). These results suggest that the design principles are relevant to urban tree planting. Our proposed analyses will allow us to examine whether variation in these design principles across non-profits affects urban tree success.

There is some evidence that rules, norms, and strategies are related to tree outcomes, and more generally, environmental outcomes in urban areas. Mincey (2012) found that rules of the city and neighborhood and homeowners associations relating to tree management may influence tree species composition at the individual property level. Robbins and Sharpe (2003) found that norms related to yard aesthetics and care and an individual’s fear of neighborhood sanctions motivate individual yard maintenance efforts and found that this motivation led to better yard appearance. Mincey and Vogt (*in review*), in their Indianapolis study, found that tree survival was higher in neighborhoods in which individuals responsible for watering trees were monitored (Design Principle 4A: Monitoring [Cox, Arnold, and Villamayor Tomas 2010]). Additionally, research from the field of arboriculture tells us that tree management strategies at the time of planting can influence tree success. For instance, decisions made at the time of planting can influence tree growth and survival, including tree size at the time of planting (*e.g.*, Lambert *et al.* 2010; Neal and Whitlow 1997; Struve *et al.* 2000; Watson 2005); the type of planting packaging (*e.g.*, Gilman and Beeson *et al.* 1996; Lambert *et al.* 2010); the season of planting (Soljfeld and Hansen 2004); and tree species (Vogt and Watson *manuscript in progress*).

Here, we propose to examine the effect of both nonprofit and neighborhood-level institutions. Generally, nonprofit institutions include strategies related to decision making at the time of planting, while those at the level of the neighborhood are related to post-planting tree care and maintenance.

### **3.2 Tree-Planting and social outcomes, or *how trees might influence people***

Extensive work in the field of urban studies and urban sociology suggests that neighborhood characteristics like community cohesion and collective efficacy serve an important role in an individual’s well-being (Sampson 2012; Gieryn 2000). Scholars of adaptive capacity and resilience also find that characteristics of a geographic community also predict its ability to absorb and recover from an external shock. These two very different bodies of research have both found that, in short, neighborhoods matter. Here, we propose to examine the effect that neighborhood-level tree-planting projects have on indicators of *community capacity* as well as effects on individuals.

Community capacity reflects a community's potential for addressing change (Goodman *et al.* 1998). The concepts of *resilience* and *adaptive capacity* can contribute to our understanding of community capacity. Resilience scholars define “resilience” of ecological and social systems as the ability of a system to absorb shock and recover from a disturbance and return to a previous state (Gunderson and Holling 2002). Adaptive capacity is related to resilience, and is the ability of a community to respond to and manage endogenous and exogenous change or disturbance, including, if necessary, changing and *adapting* in response to disturbance (Gunderson and Holling 2002).

We cannot observe adaptive capacity or resilience, but we can observe indicators of a community that suggest it will be adaptive or resilient when change occurs. Previous research suggests broad categories of factors that help predict community capacity, community resilience and adaptive capacity. Goodman and colleagues (1998) describe the following indicators of community capacity: participation and leadership; skills; resources; social and inter-organizational networks; sense of community; understanding of community history; community power; community values; and, critical reflection. Magis (2010) defines the dimensions of community resilience as: community resources; development of community resources; engagement of community resources; active agents; collective action; strategic action; equity; and, impact. Buckle and colleagues (2001) also present a list of relevant factors that indicate the state of general resilience and vulnerability of communities that includes: people with the willingness to take on leadership and community worker roles; active community and social groups; and skills and effective skill exchange and sharing. Adger (2003) finds that adaptive capacity is highly linked to trust and reciprocity and to the strength of relationships between individuals.

Research in the area of adaptive capacity and resilience is very broad and the aforementioned indicators of these constructs are complicated and hard to measure. It is often qualitative or normative and sometimes untested. It is also difficult to avoid selection bias in measuring these concepts; for example, it is likely that there is selection in tree-planting neighborhoods—that is, neighborhoods with higher capacity seek out tree-planting projects. For these reasons, we propose indicators that are easier to measure and that we think might be subject to variation because of tree-planting projects. The brief section that follows connects these broad indicators of community capacity to the specific indicators used in this analysis.

Our first three outcomes serve as indicators of community capacity: the level of neighbor familiarity in the neighborhood, the level of trust neighbors have for one another, and collective activity. Neighbor familiarity serves as an indicator of community ties. Neighborhood ties have been found to be linked to civic involvement (Lewicka 2005). We use collective action as a third indicator of community capacity. Collective actions are those undertaken by a collective, or group, toward some sort of mutually- or jointly-beneficial outcome (Adger 2003; Ostrom 2005; Ostrom 2009). Previous research shows that collective action builds social capital (connections), trust, and reciprocity among individuals (Adger 2003; Ostrom 1996). Collective activities might build community resilience indirectly through enhancing social ties. In addition, tree planting, as a type of collective activity, might offer an opportunity for individuals to build skills or to develop leadership capacity. Thus, collective action serves as an outcome on its own and as an indicator of potential change in

neighborhood connections, trust, and skills. Our third indicator is thus whether tree-planting leads to the initiation of future instances of community collective actions to improve social, public health or environmental conditions in the neighborhood.

The first three indicators discussed might apply to any collective activity in a neighborhood, and are therefore not specific to tree-planting projects. There is also substantial evidence that trees themselves provide a suite of services to a neighborhood. For example, trees help mitigate urban heat island effects by shading and evapotranspiration (EPA 2008), and help manage stormwater and water quality (Nowak 2006). It is therefore also of interest whether tree-planting projects increase understanding of urban trees and their benefits or awareness of ecological surroundings. We include an indicator of the level of tree-specific environmental knowledge as an outcome.

While previous research has considered neighborhood capacity and the effect of collective action on this capacity, to our knowledge, no studies have explicitly analyzed the effects of tree-planting programs on community adaptive capacity or future collective action. Elmendorf (2008) cites an extensive theoretical literature from urban planning and community development research and outlines the theoretical linkages between trees and tree planting and community capacity and capacity building. The empirical research most similar to the work proposed here is that by Sommer and colleagues (Sommer *et al.* 1994a, 1994b; Summit and Sommer 1998). Their research found that individuals involved in tree planting were more satisfied with trees planted in their yard (Sommer *et al.* 1994a) and that they were more satisfied with planting decisions (like tree location and the quality of maintenance) than non-participants (Summit and Sommer 1998). Interestingly, these same researchers found that individuals who planted trees in a group (*i.e., collectively*, though the authors do not use this term) were generally more satisfied with the outcome than those who planted alone (Sommer *et al.* 1994b). Outside of this research, little systematic work has evaluated urban tree-planting projects based on their social outcomes.

## 4.0 RESEARCH DESIGN

### 4.1 Introduction

In this section we introduce our study cities, the treatments of interest for the social outcomes of the research, our proposed methods for sample selection, the sources from which we will draw our data, how we operationalize outcome variables, and finally the analytic methods that we will employ.

One unique feature of this research is that we will have data on both trees and people. We can take advantage of this feature by conducting our social research in the same neighborhoods in which we conduct tree research and use the social data to predict tree outcomes. We can use neighborhood-level characteristics in both our social and tree analyses. Although experimental, random assignment of tree-planting on neighborhoods would provide a better estimate of the effect of the treatment (tree-planting) on social outcomes, this is not how nonprofit tree-planting organizations operate in

practice. We restrict our social design to a post-test only, non-randomized design with matching comparison neighborhoods.

We should note upfront that without random assignment of tree-planting, tree-planting neighborhoods and the individuals in those neighborhoods may be systematically different from non-tree-planting neighborhoods *before* the tree planting occurs. These differences could arguably lead to the request for a tree-planting project. Additionally, individuals who participate in tree planting and watering may be very different from those individuals that do not participate. Thus, substantial selection bias may exist. For these reasons, throughout the design that follows we indicate methods to reduce the selection bias that comes from non-random assignment of tree-planting projects.

## 4.2 Study Sites

We will study the tree-planting projects of urban greening nonprofits in five cities in the eastern United States. These nonprofit organizations are Forest ReLeaf of Missouri (St. Louis, MO), Greening of Detroit (Detroit, MI), Keep Indianapolis Beautiful, Inc. (Indianapolis, IN), Pennsylvania Horticultural Society (Philadelphia, PA), and Trees Atlanta (Atlanta, GA).<sup>3</sup> All five organizations have tree-planting programs in which they work with local community groups (groups of neighbors; neighborhood, homeowners or condominium associations; business associations; other nonprofits; churches, *etc.*) to help organize tree-planting events, and sometimes also subsequent tree maintenance activities. the institutional design of tree-planting activities in these organizations vary, ranging from simply providing groups with free or reduced-cost trees (*e.g.*, Forest ReLeaf of Missouri) to helping neighborhoods select precise locations for each tree and organizing a day for planting (*e.g.*, Keep Indianapolis Beautiful, Inc.). The programs also vary in the type of decision-making autonomy provided to local neighborhoods as well as in the type and frequency of post-planting tree maintenance assistance provided. This range of activities undertaken by the organizations is accompanied by within-organization variation linked to differences in the manner in which individual nonprofit employees (tree-planting project managers) and neighborhood tree-planting project leaders conduct and organize tree-planting activities. We will be able to exploit these differences in the institutional design of tree-planting and maintenance activities to compare tree outcomes.

## 4.3 Treatments

In this study there are several treatments<sup>4</sup>, and they occur at different units of analysis. Table 2 below displays a summary of the treatments. Tree-planting projects occur at the neighborhood level. There are two treatments at this level: *N.PLANT*, a neighborhood is the location of a tree-planting project, and *N.WATER*, a neighborhood is responsible for watering the trees itself, rather than letting the nonprofit be responsible for watering. *N.WATER* has several possible variations, three of which we've observed in preliminary research in Indianapolis and can name a priori (Mincey and

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<sup>3</sup> We are in negotiations with a sixth nonprofit to join as another partner organization in this research.

<sup>4</sup> See fn. 2 above.



Vogt *in review*): *N.WATER.A*, a neighborhood implements a collective watering strategy in which individuals in the community meet together to water the trees; *N.WATER.B*, a neighborhood implements an individual watering strategy in which individuals are responsible for watering individual trees usually adjacent to their house; and, *N.WATER.C* a neighborhood hires and pays an individual or business to water the planted trees. (Note that there could be other neighborhood watering strategies that we will have to list as we become aware of them through our research.) When the neighborhood is the unit of analysis, the estimated treatment effect is a treatment on the treated. It might also be the case that comparison neighborhoods that are not in our treatment group have found tree-planting projects outside of the nonprofit of interest, but this will be a rare event. If it is the case that other neighborhoods have compensated by seeking out tree-planting outside of the nonprofit, our estimated effect sizes will be smaller than anticipated.

There are several treatments at the individual level that apply only to the social outcomes. These treatments apply to individuals within tree-planting neighborhoods: *i.plant* is participation of an individual in the actual tree-planting day; *i.water* is participation of an individual in tree watering. Again, watering participation can be in several types, including: *i.water.a*, the individual regularly watered trees with others in the neighborhood or *i.water.b*, the individual watered trees individually.

Table 2: Treatments

Unit of Analysis	Name	Treatment	Description
Neighborhood	<i>N.PLANT</i>	Tree-planting Project	The neighborhood participated in a tree-planting project
	<i>N.WATER</i>	Neighborhood Watering	The neighborhood has responsibility for watering the trees
	<i>N.WATER.A</i>	Collective Watering	Individuals in the neighborhood water trees together, as a group
	<i>N.WATER.B</i>	Individual Watering	Individuals in the neighborhood water trees individually
	<i>N.WATER.C</i>	Hired Watering	The neighborhood hires and pays someone to water the trees
Individual	<i>i.plant</i>	Tree-planting Participation	Individual participated in planting trees
	<i>i.water</i>	Tree Watering Participation	Individual participated in watering trees
	<i>i.water.a</i>	Tree Watering Participation: Collective	Individual watered trees with others in the neighborhood
	<i>i.water.b</i>	Tree Watering Participation: Individual	Individual watered trees alone or with other members of his/her household

#### 4.4 Sample Selection

The array of treatments described above necessitates three comparison groups for the social design:

- (C1) Individuals who live in tree-planting neighborhoods ( $N.PLANT=1$ ) but did not participate in tree planting or watering ( $i.plant=0$  and  $i.water=0$ )—*non-participants in tree-planting neighborhoods*;
- (C2) Neighborhoods that did not have a tree-planting project ( $N.PLANT=0$ )—*matching, non-tree-planting neighborhoods*); and,
- (C3) Individuals who do not live in tree-planting neighborhoods ( $N.PLANT=0$  and  $i.plant=0$ )—*non-participants in non-tree-planting neighborhoods*).

In order to make comparisons between treatment and comparison groups, we have to select our sample from two types of neighborhoods (tree-planting and non-tree-planting) and three types of individuals (tree-planting participants, and non-tree-planting participants in both tree-planting and non-tree-planting neighborhoods). This section describes how these groups are selected.

*Selection of treatment neighborhoods:* The sample treatment population is comprised of all neighborhoods that have conducted a tree-planting project with 20 or more planted trees with the partner nonprofit between 2009 and 2011. Twenty planted trees is a reasonable number of trees for a single neighborhood planting and a minimum size at which we might expect to see a neighborhood-level effect of the tree planting. A tree-planting project occurring 3 to 5 years before data collection insures that the trees are outside a critical 2-year establishment period (during which we expect aboveground trunk growth to be exceedingly slow). A tree-planting between 3 and 5 years before data collection also helps increase the likelihood that individuals involved in the tree planting will be still living in the neighborhood and will remember details about the planting. Nonprofits will provide a list of these neighborhoods. We will take a stratified random sample of neighborhoods to obtain 25 neighborhoods in each city.

*Selection of comparison neighborhoods:* We will select comparison group neighborhoods by matching. The geographic boundaries of tree-planting neighborhoods will be considered the U.S. census tracts that contain a planted tree from that project. In these neighborhoods that contain more than one census tract, we will combine the census tract data to create a unique “neighborhood” value, weighting each tract’s contribution to an indicator by population. A comparison neighborhood will be a single census tract. The population of possible comparison neighborhoods is all census tracts within the city’s boundaries that are not treatment neighborhoods (i.e., in which the nonprofit has not planted trees<sup>5</sup>). Tracts will be matched on characteristics available from census data, land use data, and data from each city on the neighborhood associations in the city.<sup>6</sup>

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<sup>5</sup> Note that even though our sample treatment population includes only those neighborhoods in which the nonprofit and the neighborhood worked together to organize a planting of 20 or more trees between the years of 2009 and 2011, potential comparison neighborhoods will only include those neighborhoods within a city that *have never* planted trees with the nonprofit. This ensures that comparison neighborhoods will be as close as possible to an experimental “control” population.

<sup>6</sup> Tracts will be matched on proportions (e.g., the proportion of residents that are white) to control for differences in population.

We will employ a matching technique to reduce selection bias. As discussed in section 4.0, tree-planting projects were not randomly assigned to neighborhoods. Instead, neighborhood groups sought out trees and nonprofit employees selected recipients. We can use matching to construct a comparison group of non-participating neighborhoods that is relatively similar to the treatment group of participating neighborhoods. Neighborhoods (census tracts) will be matched on the following: the proportion of individuals over 25 with a bachelor's degree or higher, the percent of individuals that are non-white, the median household income of the tract, and the proportion of vacant houses in the tract.

*Selection of treatment individuals:* For each tree-planting project selected, the nonprofit organization will provide a list of individuals that planted trees and live in the neighborhood. We will send a survey to each of these individuals. In some cases, this will result in over-sampling of participants.

*Selection of comparison individuals:* There are two groups of comparison individuals: those that live in treatment (tree-planting) neighborhoods and those that live in comparison (non-tree-planting, matching) neighborhoods. Non-participating individuals from tree-planting and non-tree-planting, matching neighborhoods will be randomly selected using an address-based sampling service using the United States Postal Service Delivery Sequence File. Sample selection will be conducted by an outside vendor through the Indiana University Center for Survey Research Design.

*Selection of trees:* Within selected tree-planting neighborhoods, we sample every other tree (50% of planted trees) and gather data for each sample tree according to the [Planted Tree Re-Inventory Protocol](#) (Vogt *et al.* 2013; see also 4.5 Data Sources below).

## 4.5 Sample Size

In each city, we will randomly select 25 tree-planting neighborhoods from the population of all neighborhoods in which at least one project with 20 or more trees occurred between 2009 and 2011. We will survey 50% of the trees in selected neighborhoods. Informed by our preliminary tree research with Keep Indianapolis Beautiful, Inc., we anticipate sampling an average<sup>7</sup> of 30-35 trees in each of the 25 neighborhoods for each city, for a total of 4,500-5,250 trees.

We would like to receive at least 10 returned surveys from each treatment or comparison group per neighborhood. If we assume a response rate of 30% (see section 4.5.2 below for more details on survey research design) and 6 partner cities, we need to send approximately 13,750 surveys. This number will vary depending on the total number of participants recorded in the nonprofit records. We consider this sample size the minimum necessary to say anything about the neighborhoods in our study. A sample size of at least 10 surveys per each group increases our confidence that our aggregation reflects the characteristics of the group (participants or non-participants) or

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<sup>7</sup> Based on an average of 65 trees per project for Keep Indianapolis Beautiful, Inc. tree-planting projects with 20 or more trees planted between 2006 and 2009.

neighborhood (tree-planting or matching). Additionally, in order to demonstrate any potential differences in individual characteristics as a result of participation in tree planting and examine within-neighborhood variation, we need a large enough sample of participants and non-participants within tree-planting neighborhoods to be able to compare these two groups.

## 4.6 Data Sources

The data for this study will come from a number of sources. The following section describes these data sources and what information they provide.

### 4.6.1 *Planted Tree Re-inventory Protocol*

Trees in selected neighborhoods will be inventoried according to the Planted Tree Re-inventory Protocol developed during preliminary research for this project with Keep Indianapolis Beautiful, Inc. (Vogt *et al.* 2013). This Protocol gathers data on several categories of variables about planted trees including tree-level variables (identifying information, size, canopy, trunk, and condition), local environment variables (near-tree variables, planting area characteristics, and proximity to other things), management variables (pruning, mulching, and staking), and social or community variables (evidence of care). Appendix A provides the entire list of variables from the Protocol, and the complete Protocol is available online ([http://www.indiana.edu/~cipec/research/bufrg\\_protocol](http://www.indiana.edu/~cipec/research/bufrg_protocol)).

### 4.6.2 *Social survey*

A general survey will be distributed to a random sample of individuals in all treatment and comparison groups. This survey will gather individual-level data on our outcome variables (tree knowledge, familiarity with neighbors and neighborhood trust), as well as a suite of other covariates about the individual and his/her perception of the neighborhood. Some of these indicators will be aggregated to a neighborhood-level measure (*e.g.*, community efficacy; see Sampson, 2012). The social survey will have two forms: a general form distributed to individuals in the comparison neighborhoods, and a long form distributed to individuals in the treatment neighborhoods. The long form will contain both the general form and a participating neighborhood supplement. The supplement will contain a number of questions to measure an individual's level of participation in tree planting and watering as well as the individual's perceived outcomes of the planting project. See Appendix B for a draft social survey.

### 4.6.3 *Semi-structured interviews with neighborhood and tree-planting project leaders*

Semi-structured interviews will be conducted with at least one individual in each neighborhood. Ideally, this is a leader in the neighborhood (and/or tree-planting project, for tree-planting neighborhoods). Tree-planting neighborhood leaders will be asked to provide additional details about the planning and implementation of the tree-planting project; to describe any neighborhood- or block-level organization (including collective activities) and the relationship of the tree-planting project planners to the official neighborhood organization; to evaluate the tree-planting project, and

to identify any external factors that contributed to the success or failure of the project. Non-tree-planting project leaders will be asked similar questions about neighborhood collective activity and organization. See Appendix C for the list of interview questions for tree-planting project used in preliminary research with KIB that will be modified for this research.

#### *4.6.4 Semi-structured interviews with nonprofit project managers*

We will interview all tree-planting project managers at each nonprofit. These interviews will provide information on the nonprofits tree-planting program as well as some particular details about each sample project and project neighborhood. See Appendix C for a draft list of interview questions, modified from that used in preliminary research with KIB that will be expanded for this research

#### *4.6.5 U.S. Census 2010, U.S. Census Bureau*

Data on neighborhood-level covariates will be gathered from the 2010 U.S. Census tract-level data. These covariates will be used to match treatment and comparison groups and used as control measures in regression analysis. This census data is appropriate to use for matching because it will have been gathered around the time the tree-planting project occurred.

#### *4.6.6 City governments*

We will obtain maps of study neighborhoods, data on neighborhood associations in the city, and miscellaneous spatial data (*e.g.*, roads and building locations and attributes) from city governments.

### **4.7 Outcome Variables**

We have identified several relevant outcome variables. Here we propose two outcome measures for the ecological study and four outcome measures for the social study, although there are more potential outcome measures and it is likely that additional outcome measures will emerge with continued interaction with the nonprofits and during the development of the social survey.

#### *4.6.1 Tree outcomes*

Our outcome of interest is tree success. We measure tree success in two ways: survival and growth. Survival and its converse, mortality, are commonly mentioned in urban forestry studies, though specific estimates of typical survival rates within the first few years after planting are rare (Nowak *et al.* 1990, Roman and Scatena 2011). Our measure of survival is a binary indicator of whether the planted tree was still alive at the time of re-inventory.

Growth rates are measured a number of different ways in the urban forestry literature, including change in tree height (*e.g.*, Jutras *et al.* 2009; Stoffberg *et al.* 2008), amount of new shoot growth at the ends of branches (*e.g.*, Solfeld and Hansen 2004), change in diameter at breast height (dbh, 1.37 m or 4.5 ft above ground level; *e.g.*, Nowak *et al.* 1990), and the width of annual growth rings as obtained from tree cores (*e.g.*, Iakovoglou *et al.* 2001). Our measure of growth is the log of the

average annual caliper increase between the time of planting and of the re-inventory. Caliper is a measure of the diameter of a tree 15 cm (6 in) above the first lateral root. We chose to measure increase in caliper rather than another growth metric because many trees are sold from nurseries as a particular size in caliper, and so caliper-at-planting is part of the purchasing records maintained by tree-planting organizations.

#### 4.6.2 Social outcomes

We propose four outcomes of interest. These outcomes are the level of tree knowledge, a measure of familiarity with neighbors, the level of trust individuals have in their neighbors and instances of post-planting collective action. Data will come primarily from the individual survey (Appendix B), with survey measures qualitatively verified using information obtained via semi-structured interviews with nonprofit employees and neighborhood leaders (Appendix C). Table 3 describes how each of these indicators will be measured at the individual and neighborhood level.

**Table 3: Measurement for Outcome Variables**

Outcome	Measurement for Individuals	Measurement for Neighborhoods
<b>Tree Survival</b>	Binary indicator of whether the planted tree was still alive at the time of re-inventory	The percent of all planted trees surviving at the time of re-inventory
<b>Tree Growth</b>	Log of the average annual caliper increase between time of planting and time of re-inventory	Average annual caliper growth for all planted trees in neighborhood.
<b>Tree Knowledge</b>	A count of how many tree-related questions an individual answered correctly out of four questions	The mean score of all respondents in a neighborhood on the tree knowledge count
<b>Neighbor Familiarity</b>	An indicator from 1-4 of how many adult neighbors the respondent knows by sight in the neighborhood	The percent of respondents in a neighborhood indicating they know at least “about half” of their neighbors
<b>Neighbor Trust</b>	A score along a five point Likert scale of how much the respondent trusts people in his/her neighborhood	The mean score of all respondents in a neighborhood on the trust Likert scale
<b>Collective Action</b>	A count from 0-3 of the number of different types of activities that an individual has participated in with neighbors in the last year	The mean score of all respondents in a neighborhood of the collective action count The frequency of collective activities reported by respondent in interview with tree project leader

## 4.8 Analysis

We will use both quantitative and qualitative methods to analyze our data.

### 4.8.1 Regression Analysis

We will primarily use econometric techniques to answer our research questions; both ecological and social outcomes will be estimated by utilizing the suite of independent factors to be examined relative to one another and categorized by our framework (Table 1). We seek to estimate tree outcomes and neighborhood-aggregated tree outcomes based on variation in institutional features, and controlling for variation in biophysical and community characteristics. We seek to estimate neighborhood-level and individual-level social outcomes from neighborhood and individual participation in tree planting and individual participation in tree watering. Model specification will vary across the type of dependent variable. For presence/absence variables logistic regression will be used. For those models where the unit of observation is the individual respondent or tree, we can employ fixed effects to account for variation across neighborhoods.

#### *4.8.1.1 Tree-level outcomes*

We will use ordinary least squares regression with fixed effects to examine tree growth and a logistic model with fixed effects to examine tree survival. Both models use the variables gathered via the Planted Tree Re-Inventory Protocol to control for biophysical growing conditions (*e.g.*, planting area width and length) to examine the effect of institutional factors (*e.g.*, watering strategy, evidence of mulching, *etc.*) on tree success, using tree species (genus, or family) or neighborhood as fixed effects. We will use information from semi-structured interviews with nonprofit employees and neighborhood leaders to develop more refined indicators of institutional variation and use information from surveys to classify neighborhood-level norms.

#### *4.8.1.2 Neighborhood-level tree outcomes*

Individual tree data will be aggregated to neighborhoods to examine factors at the neighborhood-level that may contribute to overall tree survival rates. Aggregating tree survival data to neighborhoods allows us to explain the ecological success of tree-planting projects, rather than just that of individual trees.

#### *4.8.1.3 Neighborhood-level social outcomes*

To address questions about neighborhood-level outcomes without panel data we can only use one difference, between treatment and comparison groups. We will draw from neighborhood-level indicators from the U.S. Census and interview transcripts and from aggregated responses from the individual survey. The treatment is whether a neighborhood participated in a tree-planting program. The initial matching technique to select the comparison neighborhoods will help to reduce selection bias. We will also include other covariates that might be correlated with our outcomes of interest. Here we will just briefly highlight some important covariates. For tree knowledge, we will control for the general level of environmental knowledge in a neighborhood (also gathered from the social survey). For neighborhood familiarity and for trust, we will control for other social indicators like perceived safety and generalized trust. In all models we include average demographic characteristics of the respondents.

#### *4.8.1.4 Individual-level outcomes*

We draw from the same sources for individual-level analysis as we do for neighborhood-level analysis. We can measure two different effects: treatment on the treated and intent to treat. The

treatment-on-the-treated estimate measures neighborhood variation between individuals who participated and individuals who did not. The intent-to-treat estimate compares individuals in participating neighborhoods with those in comparison neighborhoods.

Treatments at the individual level are also not randomly assigned, so we have to take some measures to address selection bias of individuals within participating neighborhoods. Here we propose two methods to address selection: (1) use a two-stage least squares approach and (2) match treatment and comparison individuals within participating neighborhoods. We present these as potential options—their usefulness depends upon the data we obtain through survey administration. In these models we can control from individual demographic characteristics, as well as individual levels of general environmental knowledge, and general levels of trust toward groups of individuals outside of the neighborhood. We will use several different model specifications to check for robustness.

#### 4.8.1.4.1 Instrumental variables approach

One way to address selection bias at the back end is to use Two-Stage Least Squares. We have identified several potential instrumental variables based on face validity, and can assess their strength more thoroughly when the data are gathered. We are looking for instruments that are correlated with an individual's participation in tree planting and/or watering but not with our outcome variables, *except for through the individual's participation*. Table 4 presents potential instrumental variables. Options within one model (*e.g.*, Tree Watering on Tree Knowledge) are listed by expected strength.

**Table 4: Potential Instrumental Variables**

Outcome	Participation in Tree Planting	Participation in Tree Watering
<b>Tree Knowledge</b>	Neighbor familiarity	Neighbor familiarity
	Membership/leadership in Neighborhood Assn.	Membership/leadership in Neighborhood Assn.
	Busy on the day of planting	Renter
	Renter	Length of time as a neighborhood resident
	Length of time as a neighborhood resident	
<b>Neighbor Familiarity</b>	Busy on the day of planting	Environmental knowledge
	Environmental Efficacy	Environmental Efficacy
<b>Neighbor Trust</b>	Busy on the day of planting	Environmental Efficacy
	Environmental Efficacy	
<b>Collective Action</b>		

#### 4.8.1.4.2 Matching within neighborhoods

We can also match individuals within neighborhoods using propensity scores to craft similar looking treatment and comparison groups. Matching will occur after survey collection, and so we will have a



wealth of individual data on general trust, engagement in the community, individual environmental knowledge and more. See Appendix B for the draft survey.

#### 4.8.1.4.3 Model Specifications

Our observations of individuals are clustered within neighborhoods. We can control for neighborhood-level covariates by including details of the tree-planting project, census tract indicators of average socio-demographic features and aggregate responses about the neighborhood from the survey. To test the robustness of our model, we can also use a fixed effects model that examines within-neighborhood variation.

#### 4.8.2 *Qualitative analyses*

[To be described in detail at a later date. We realize that qualitative data will lend important context to theoretical explanations of quantitative results; however we are not prepared to present this component of the design at this time. Suggestions on qualitative analytical methods are welcome.]

## 5.0 POSSIBLE EXTENSIONS

It might be the case that through conducting this research a nonprofit organization is particularly enthusiastic and interested in the research. If this is the case, it might be feasible with further funding to conduct an experiment in which the nonprofit randomly selects communities (perhaps among applicants) to receive tree-planting programs. A survey could be administered before and after the tree-planting project in treatment and control communities. This design, though on a smaller scale, might be able to increase our confidence in causal statements. This research would not immediately coordinate with the tree data collection; however after several years, a follow up study could be conducted in which both tree outcomes and social outcomes are assessed. A pre-post study could also be conducted without an experimental design. Another possibility is that through interviewing nonprofits, one reveals they have strict eligibility criteria upon which we could conduct a regression discontinuity design.

## 6.0 TIMELINE

**May, 2013** Obtain IRB Approval

**May-December, 2013** Pilot Survey in Indianapolis

- Test survey instruments
- Coordinate with research team analyzing tree data

**January-May, 2014** Data Preparation and Gathering

- Finalize surveys and interview instruments based on pilot results
- Select neighborhoods and individuals in treatment and comparison groups

- Gather any necessary data from cities and nonprofits, including conducting interviews with nonprofit employees
- **April-May, 2014:** Administer survey instrument according to the Dillman Method (Dillman, 2000)

**May-July, 2014** Survey Data Processing, Tree Data Collection, Neighborhood Interviews

- Input survey data into electronic database and transcribe interviews
- Code open ended survey questions and interview data
- Conduct interviews with neighborhood tree project leaders
- Collect tree data according to the Planted Tree Re-Inventory Protocol

**July, 2014-April, 2015** Data Analysis

- Analyze data according to the proposal above

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## APPENDIX A: PLANTED TREE RE-INVENTORY PROTOCOL OVERVIEW

Table A1: Variables contained in the Planted Tree Re-Inventory Protocol

Variable	Name	Page # in Protocol Booklet
<b>Biophysical Variables</b>		
<i>Tree-Level Variables</i>		
Identifying Information		
V1	Tree ID#	24
V2	Location	24
V3	Species	25
Size		
V4	DBH	27
V5	Caliper	28
V6	Total Height	31
V7	Height to Crown	31
Canopy		
V8	Crown Dieback	32
V9	Crown Exposure	35
V10	Chlorosis	37
Trunk		
V11	Root Flare	40
V12	Lower Trunk Damage	41
Tree Condition		
V13	Other Damage	42
V14	Overall Tree Condition	43
<i>Local Environment Variables</i>		
Near Tree		
V15	Utility Interference	45
V16	Building Interference	45
V17	Fences Interference	45
V18	Sign Interference	45
V19	Lighting Interference	45
V20	Pedestrian Traffic Interference	45
V21	Road Traffic Interference	45

Variable	Name	Page # in Protocol Booklet
V22	<i>Ground Cover At Base</i>	45
V23	<i>Ground Cover Under Canopy</i>	45
Planting Area Characteristics		
V24	<i>Planting Area Type</i>	48
V25	<i>Planting Area Relative to Road</i>	51
V26	<i>Planting Area Width</i>	52
V27	<i>Planting Area Length</i>	54
V28	<i>Curb Presence</i>	54
Proximity to Other Things		
V29	<i>Number of Trees In 10-m Radius</i>	56
V30	<i>Number of Trees In 20-m Radius</i>	56
V31	<i>Number of Trees In Same Planting Area</i>	56
V32	<i>Distance To Road</i>	57
V33	<i>Distance To Building</i>	57
Management Variables		
V34	<i>Pruning</i>	60
V35	<i>Mulching</i>	62
V36	<i>Staking</i>	64
Social/Community Variables		
V37	<i>Water Bag</i>	66
V38	<i>Bench</i>	66
V39	<i>Bird Feeder</i>	66
V40	<i>Yard Art</i>	66
V41	<i>Trash/Debris</i>	66

## **APPENDIX B: DRAFT SOCIAL SURVEY**

*See pages 25-38.*

*Note that the final survey will be substantially shorter than the draft presented here (goal length: 8 pages).*



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**Section 1: This section asks about your experience where you live now.**

- 1.** How long, in years, have you lived *at this address*?

Years

- 2.** How long, in years, have you lived *in your present city*?

Years

- 3.** Which of the following best describes where you live?

- a. House ☐
- b. Apartment ☐
- c. Condominium ☐
- d. Other (*please describe*) ☐

- 4.** Which of the following best describes where you live?

- a. Own your own place of residence ☐
- b. Rent from a private individual or company ☐
- c. Live in public housing ☐

---

**Section 2. Please answer these questions based on your personal perspective.**

- 5.** Please check “yes” if the item listed gives you a sense of community and “no” if the item does not give you a sense of community.

Yes                      No                      No strong feelings                      Not Applicable

- |  |                          |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Your old or new friends                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          |
| b. The people in your neighborhood                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          |
| c. Living in your city                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |                          |
| d. Your place of worship                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. The people you work with or go to school with     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. People who share your ethnic background           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. The people you have met online or on the computer | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- 6.** How much influence do you think someone like you can have over the following?

A lot of influence                      Some influence                      Very little influence                      No influence

- |                                  |                          |                          |                          |                          |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. National government decisions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Local government decisions    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. The environment               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- 7.** Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?

- a. People can be trusted ☐
- b. You can't be too careful ☐
- c. Not sure/ I don't know ☐

8.	Generally speaking, would you say that you can trust the following groups a lot, some, only a little, or not at all?	Trust them a lot	Trust them some	Trust them only a little	Trust them not at all	Don't know	Not Applicable
a.	People in your neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b.	People you work with	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	People at your church or place of worship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	People who work in the stores where you shop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e.	The local news media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
f.	The police in your local community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### Section 3: Please answer these questions about the neighborhood in which you live.

By **neighborhood**, we mean the area around where you live and around your house. It may include places you shop, religious or public institutions, or a local business district. It is the general area around your house where you might perform routine tasks, such as shopping, going to the park, or visiting with neighbors.

<p>9. In what year did you first move into this neighborhood?</p> <div style="border: 1px solid black; width: 80px; height: 40px; margin: 10px auto;"></div>	<p>11. On the whole, do you like or dislike this neighborhood as a place to live?</p> <p>a. I like it a lot <input type="checkbox"/></p> <p>b. I like it <input type="checkbox"/></p> <p>c. I neither like nor dislike it <input type="checkbox"/></p> <p>d. I dislike it <input type="checkbox"/></p>
<p>10. Have you ever lived in another residence in the same neighborhood? (check one)</p> <p>a. Yes <input type="checkbox"/>      b. No <input type="checkbox"/></p>	

12.	Please indicate whether you agree or disagree with each of the following statements.	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a.	This is a close-knit neighborhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	People in this neighborhood generally don't get along with each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	People in this neighborhood do not share the same values.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	People in this neighborhood can be seen walking or jogging in this neighborhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e.	People around here are willing to help their neighbors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f.	If there is a problem around here, the neighbors get together to deal with it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g.	People in this neighborhood can be trusted.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h.	There are many opportunities to meet neighbors and work on solving community problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i.	Residents informally manage neighborhood affairs more than through the Association itself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j.	The yards in this neighborhood look nice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k.	The yards in this neighborhood are well maintained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**13.** How many adults do you recognize or know by sight (not necessarily by name) in this neighborhood?

- a. No adults ☐
- b. A few ☐
- c. About half ☐
- d. Most of them ☐

**14.** How many children do you recognize or know by sight (not necessarily by name) in this neighborhood?

- a. No children ☐
- b. a few ☐
- c. About half ☐
- d. Most of them ☐

**15.** For each of the following, please tell me how likely it is that people in your neighborhood would act in the following manner.

Very Likely      Likely      Neither Likely nor Unlikely      Unlikely      Very Unlikely

- a. If a group of neighborhood children were skipping school and hanging out on a street corner, how likely is it that your neighbors would do something about it?
- b. If some children were spray-painting graffiti on a local building, how likely is it that your neighbors would do something about it?
- c. If a child was showing disrespect to an adult, how likely is it that people in your neighborhood would scold that child?
- d. If there was a fight in front of your house and someone was being beaten or threatened, how likely is it that your neighbors would break it up?
- e. If someone on the block was letting trash pile up in their yard or on their steps, how likely is it that a neighbor would go to that person and ask that they clean up?
- f. If a suspicious stranger was hanging around the block, how likely is it that some of the neighbors would notice this and warn others to be on guard?
- g. Suppose that because of budget cuts the fire station closest to your home was going to be closed down by the city. How likely is it that neighborhood residents would organize to try to do something to keep the fire station open?
- h. If you left your wallet on the counter of a convenience store in this neighborhood, how likely is it that you would get it back with all of its contents?
- i. If you parked your car on the street and accidentally left the lights on, how likely is it someone would try to find you and tell you about it?

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**16.** We are interested in how your neighborhood has changed over the past five years (even if you have not lived here the entire time). Please indicate whether you think the neighborhood has gotten better, stayed about the same, or gotten worse *over the past five years*.

Gotten Better      Stayed the Same      Gotten Worse

- a. Personal safety
- b. The way the neighborhood looks
- c. The people living in the neighborhood
- d. The feeling of community in the neighborhood

- |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

17. All things considered, what do you think this neighborhood will be like in a few years from now?

- a. It will be better ☐
- b. It will stay the same ☐
- c. It will be worse ☐

18. How often do you do the following in your neighborhood?

Often      Sometimes      Rarely      Never

- |  | Often                    | Sometimes                | Rarely                   | Never                    |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a. I smile, nod or wave at people I pass on the street.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. I visit/talk with neighbors in our homes or on the street.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. I attend public social events organized <i>in this neighborhood</i> . | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

19. In the last year, have you done any of the following activities?

Yes, I have      No, I have not

- |  | Yes, I have              | No, I have not           |
|--|--------------------------|--------------------------|
| a. Worked with neighbors on a project to improve personal safety in the neighborhood (e.g. participate in a crime watching).     | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Worked with neighbors on a project to improve the environment in the neighborhood (e.g. pick up trash, plant flowers).        | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Worked with neighbors to organize a social activity.  | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Participated in a charity or public service activity (e.g. walk in the Walk for Hunger, volunteer at a soup kitchen).         | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Participated in politics (e.g. sent a letter to an official, called a representative, attended a meeting; helped a campaign). | <input type="checkbox"/> | <input type="checkbox"/> |

#### Section 4: This section asks about organizations in your neighborhood.

20. Is there a group in the neighborhood that manages neighborhood affairs?

- a. Yes ☐
- b. No (*please skip to Section 5*) ☐

21. What kind? Please check all that apply.

- a. A neighborhood association ☐
- b. A homeowners association ☐
- c. A condominium association ☐
- d. A block group or block club (on my block) ☐
- e. Other (*please specify*): ☐

22. Please return to question 21 and circle which group has the most influence on your life.

23. What is that group's name?

24.	How strongly do you agree or disagree with these statements about your Association (NA or HA)?	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
a.	The Association is effective at managing neighborhood affairs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	The Association has helped enforce rules in the neighborhood. People know they will get in trouble if they do not follow rules.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	The Association represents the views of most residents who live in my neighborhood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	The Association closely monitors how neighborhood residents take care of their yards and trees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25.	Have you ever done the following activities?	Yes, I have.	No, I have not.
a.	Attended a meeting of the block or neighborhood group about a neighborhood problem of neighborhood improvement.	<input type="checkbox"/>	<input type="checkbox"/>
b.	Held any titled position in your neighborhood or homeowners association.	<input type="checkbox"/>	<input type="checkbox"/>
c.	Offer suggestions to your neighborhood/homeowners association.	<input type="checkbox"/>	<input type="checkbox"/>

### Section 5: This section asks you about the outdoor environment in your neighborhood.

26.	Who performs landscaping activities on your property? (e.g. mowing, tree pruning) <i>(Check all that apply)</i> .	
a.	I do.	<input type="checkbox"/>
b.	Someone in my household does.	<input type="checkbox"/>
c.	Someone I hire.	<input type="checkbox"/>
d.	My landlord takes care of it (does it him/herself or hires someone).	<input type="checkbox"/>
e.	No one does.	<input type="checkbox"/>

27.	How important are the following to you?	Very important	Somewhat important	Not important	Not Applicable
a.	The appearance of your yard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	The appearance of your neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

28.	Have you ever done any of the following activities in your neighborhood or in another neighborhood by yourself or with others? <i>(Check all that apply)</i> .	Yes, in my yard	Yes, in my neighborhood	Yes, outside my neighborhood	No
a.	Plant tree(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	Water tree(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	Pick up trash	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	Take care of trees (e.g. prune, mulch)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e.	Plant/maintain flowers/bushes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f.	Rake leaves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g.	Shovel snow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h.	Mow grass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29.	When you maintain your yard (e.g., pull weeds, mow grass, etc.), why do you do so? Please indicate, during the last year, how often were you motivated by the following?	Always/ almost always	Sometimes	Never
a.	A sense of duty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	My yard looked like it needed it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	A neighbor reminded me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	Others in the neighborhood were maintaining their yards so I thought I should	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e.	I was following the rules given to me by the neighborhood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f.	I wanted to make sure my yard looked nice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Section 6: The following are some basic questions about you as are commonly asked in many public opinion polls.** As with anything on this survey, you can choose to skip any question, but the more complete answers you give, the more complete the final research will be.

30. Including yourself, how many people live in your household?  (If 1, skip to question # X)

31. How many are under the age of 18?

What age are you?

a. < 18 ☐ b. 18-24 ☐ c. 25-34 ☐ d. 35-44 ☐ e. 45-54 ☐ f. 55-64 ☐ g. 65+ ☐

32. Which of the following categories best describes the highest educational level you completed and got credit for? (Check one.)

- a. Less than high school ☐
- b. High school or GED equivalent ☐
- a. Some college or technical training ☐
- b. College graduate ☐
- f. Some graduate training ☐
- h. Post graduate or professional degree ☐

33. What is your current employment status? (Check one).

- a. Working full-time for pay ☐
- a. Working part-time for pay ☐
- a. Full-time volunteer ☐
- a. Homemaker ☐
- a. Unemployed or laid off ☐
- a. Full-time student ☐
- a. Not employed/Retired/ Disabled ☐

34. Which of these better describes your gender?

- a. Male ☐
- b. Female ☐

35. What is your family status? (Check one).

- a. Married ☐
- b. Divorced ☐
- c. Married-like relationship ☐
- d. Separated ☐
- e. Widowed ☐
- g. Never married ☐

36. What race/ethnicity do you consider yourself to be? (Check all that apply).

- a. Black/African American ☐
- b. White Caucasian ☐
- c. Hispanic ☐
- d. Asian ☐
- e. Pacific Islander ☐
- f. Alaskan Native/Native American ☐
- g. Other (Please specify): ☐

37.

38. Do you consider yourself an environmentalist?

- a. Yes ☐
- b. No ☐

39. During 2013, what was your yearly household income before tax? Your best estimate is fine. Please include salaries, wages, pensions, dividends, interest, and all other income.

- a. Under \$15,000 ☐
- b. \$15,001-\$25,000 ☐
- c. \$25,001-\$50,000 ☐
- d. \$50,001-\$75,000 ☐
- e. \$75,001-\$100,000 ☐
- f. Greater than \$100,000 ☐

40. During the last seven days did you attend a regular, weekly worship service at a church/synagogue (e.g. mass or Sunday morning services)? Do not include watching a service on TV or listening to one on the radio.

- a. Yes ☐
- b. No ☐

41. Recall that in 2012 there was a presidential election between Mitt Romney and Barack Obama. Did you vote in this election?

- a. Yes ☐
- b. No ☐
- c. I don't remember ☐

42. Generally speaking, do you usually think of yourself as a Republican, a Democrat, an Independent, or something else?

- a. Republican ☐
- b. Democrat ☐
- c. Independent ☐
- d. Other (please specify): ☐

**Section 6: Below are questions about the environment. Try to answer each question. Don't feel bad if you have trouble coming up with these; most people cannot answer all the questions. If you do not know an answer, just move on to the next one.**

43. Please list **up to 5** benefits of trees you can think of and *circle the one that is most important*.

44. Please list **up to 5** costs/drawbacks of trees you can think of and *circle the one that is the most important*.

45. Where does most of the garbage in the U.S. end up?

- a. Oceans ☐
- b. Incinerators ☐
- c. Recycling centers ☐
- d. Landfills ☐
- e. Don't know ☐

47. There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea?

- a. Multiplicity ☐
- b. Biodiversity ☐
- c. Socio-economics ☐
- d. Evolution ☐
- e. Don't know ☐

46. How is most of the electricity in the U.S. generated?

- b. By burning oil, coal, and wood ☐
- c. With nuclear power ☐
- d. Through solar energy ☐
- e. At hydro-electric power plants ☐
- f. Don't know ☐

48. Trees produce oxygen and consume carbon dioxide. This is an example of:

- b. Decomposition ☐
- c. Photosynthesis ☐
- d. Respiration ☐
- e. Mineralization ☐
- f. Don't know ☐

What is NOT a purpose of mulching a tree?

- a. To keep water in the soil ☐
- b. To hold the tree up ☐
- c. To prevent weeds from growing ☐
- d. To protect the tree from human damage ☐
- e. Don't know ☐

51. Which of the following is the most proper way to water a newly planted tree?

- a. Water the roots every month ☐
- b. Spray the leaves with water once a week ☐
- c. Water the roots once a week ☐
- d. You don't need to water the tree. Rain provides enough water. ☐
- e. Don't know ☐

52. You may have noticed that global warming/climate change has been mentioned in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result. What do you think? Do you think that global warming is happening?

- a. Yes ☐
- b. No ☐
- c. Don't know ☐

53. Assuming global warming is happening, do you think it is... (Choose one).

- a. Caused mostly by human activities? ☐
- b. Caused by both human activities and natural changes? ☐
- c. Caused mostly by natural changes in the environment? ☐
- d. None of the above because global warming isn't happening. ☐
- e. Don't know ☐
- f. Other (please specify): ☐

54. How much do you think each of the following actions would reduce global warming if they were done *worldwide*?

	A lot	Some/ A little	Not at all	Don't know
a. Stop eating beef	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Placing a large tax on all fossil fuels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Stop punching holes in the ozone layer with rockets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Banning aerosol spray cans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Insulating buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Driving less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Reducing toxic waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Reducing tropical deforestation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Planting trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Switching from fossil fuels to renewable energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



56.

Have you ever participated in any kind of *neighborhood* effort related to tree planting or tree management and planning? (check all that apply).

- a. Yes, in this neighborhood. ☐
- b. Yes, in another neighborhood. ☐
- c. No. ☐

57.

Besides tree planting, have you ever participated in any kind of *neighborhood* effort related to improving the local environment like picking up trash or planting flowers? (Check all that apply).

- a. Yes, in a neighborhood where I was living. ☐
- b. Yes, in another neighborhood. ☐
- c. No. ☐

**Thank you for taking the time to respond to this survey!**

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## Part 2: Experience with Tree Planting

Our records show that within the last five years, your neighborhood has planted trees in the neighborhood with [insert nonprofit]. The questions in the rest of this questionnaire apply to tree-planting and watering projects that your neighborhood did with [insert nonprofit]. Please answer ONLY with regard to your experiences with this non-profit organization. If you did not participate, you will be asked to skip some questions in this part.

---

### Section 7: This section asks about your general involvement in tree planting with [insert nonprofit].

58.	Please answer "yes" or "no" to the following questions. If you do not remember, please check "I don't remember."	Yes	No	I don't remember
a.	Were you offered a tree (or more than one tree) by the non-profit for planting on your property or in front of your house? (For example, you might have received a door hanger, a letter or a phone call that asked if you wanted a tree. This might have come from a neighbor who then told the non-profit.)	<input type="checkbox"/>	<input type="checkbox"/> (Please skip to e)	<input type="checkbox"/> (Please skip to e)
b.	Did you tell the non-profit that you wanted a tree planted on your property or in front of your house? Also answer yes if you told a neighbor who then told the non-profit.	<input type="checkbox"/>	<input type="checkbox"/> (Please skip to e)	<input type="checkbox"/> (Please skip to e)
c.	Did you tell the non-profit what type (species) of tree you wanted? (e.g. Maple, Dogwood, a fruit tree)	<input type="checkbox"/>	<input type="checkbox"/> (Please skip to e)	<input type="checkbox"/> (Please skip to e)
d.	Was the tree that was planted the type that you requested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e.	Was a tree from the non-profit planted on your property or in front of your house?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f.	There was a day that the non-profit, neighbors and maybe some other volunteers came and planted trees in your neighborhood. Did you hear about this tree planting day while or before it happened?	<input type="checkbox"/>	<input type="checkbox"/> (Please skip to Section 8)	<input type="checkbox"/> (Please skip to Section 8)

59. How did you find out about the tree planting day? (Check all that apply, then circle your most important source of information about the planting day).

a.	An advertisement for the planting	<input type="checkbox"/>
b.	A mailing or notification on my door	<input type="checkbox"/>
c.	An email	<input type="checkbox"/>
d.	At a meeting of our neighborhood association, homeowners association or other community group	<input type="checkbox"/>
e.	From someone who know about the project	<input type="checkbox"/>
f.	I am on the board/I helped to plan	<input type="checkbox"/>
g.	I never heard about it	<input type="checkbox"/>
h.	Other (please specify):	<input type="checkbox"/>

60. Please return to question 59 and circle your most important source of information about planting.

---

**Section 8: This section asks about your involvement with the tree-planting day in your neighborhood.**

**60.** Did you help **plant trees** in your neighborhood for the tree planting project?

- a. Yes ☐      b. No ☐ (*please skip to section 9*)

**61.** Here is a list of reasons people have given for participating in things like tree planting. Why did *you* choose to help **plant trees**? (Check all that apply and circle the most important reason.)

- |  |                          |
|--|--------------------------|
| a. I knew someone who was participating.   | <input type="checkbox"/> |
| b. A tree was being planted at or near my house.                                 | <input type="checkbox"/> |
| c. I wanted to meet people in the neighborhood.                                  | <input type="checkbox"/> |
| d. I wanted to increase the number of trees in the neighborhood.                 | <input type="checkbox"/> |
| e. I felt it was my duty as a resident of this neighborhood to contribute.       | <input type="checkbox"/> |
| f. I found it exciting/interesting/fun.  | <input type="checkbox"/> |
| g. I wanted to learn more about trees.   | <input type="checkbox"/> |
| h. I wanted to increase my property's value.                                     | <input type="checkbox"/> |
| i. Trees are good for the environment.   | <input type="checkbox"/> |
| j. The trees were inexpensive/free.  | <input type="checkbox"/> |
| k. I did not want to say no to someone who asked.                                | <input type="checkbox"/> |
| l. I thought it would improve how the neighborhood looked.                       | <input type="checkbox"/> |
| m. I participated in another community greening project and thought it was good. | <input type="checkbox"/> |
| n. Other ( <i>please specify</i> ):  | <input type="checkbox"/> |

**62.** Please return to question 61 and circle the most important reason you planted trees.

**63.** My participation planting trees was worth it.

- a. Yes ☐      b. No ☐

**Section 9: This section asks about your involvement with watering the trees planted in your neighborhood.**

- 64.** Did you help **water trees** in your neighborhood for the tree planting project on a day after planting?  
c. Yes ☐ d. No ☐ (Please skip to section 10)

- 64.** Here is a list of reasons people have given for participating in things like tree watering. Why did *you* choose to help **water trees** (check all that apply and circle the most important reason.)

- |  |                          |
|--|--------------------------|
| a. I knew someone who was participating.                                   | <input type="checkbox"/> |
| b. A tree was planted at or near my house.                                 | <input type="checkbox"/> |
| c. I wanted to meet people in the neighborhood.                            | <input type="checkbox"/> |
| d. I wanted to make sure the trees survived.                               | <input type="checkbox"/> |
| e. I wanted to finish what I started.                                      | <input type="checkbox"/> |
| f. I felt it was my duty as a resident of this neighborhood to contribute. | <input type="checkbox"/> |
| g. I found it exciting/interesting/fun.                                    | <input type="checkbox"/> |
| h. I did not want to say no to someone who asked.                          | <input type="checkbox"/> |
| i. I thought it would improve how the neighborhood looked.                 | <input type="checkbox"/> |
| j. I participated in another greening project and thought it was good.     | <input type="checkbox"/> |
| k. Other (please specify):   | <input type="checkbox"/> |

- 65.** Please return to question 64 and circle the most important reason you watered trees.

- 66.** Did you ever sign an agreement committing to water a tree (or trees)?  
a. Yes ☐ b. No ☐

- 67.** Which trees did you water? (Check all that apply.)

- |                                     |                          |
|-------------------------------------|--------------------------|
| a. Trees at or in front of my house | <input type="checkbox"/> |
| b. Trees on my block                | <input type="checkbox"/> |
| c. Trees in a common area           | <input type="checkbox"/> |
| d. Somewhere else (please specify): | <input type="checkbox"/> |

- 68.** In the FIRST YEAR after the trees were planted, how frequently did you water tree(s)?

- |                                    |                          |
|------------------------------------|--------------------------|
| a. Every week or almost every week | <input type="checkbox"/> |
| b. Once or twice a month           | <input type="checkbox"/> |
| c. Once or a couple of times total | <input type="checkbox"/> |

In the SECOND YEAR after the trees were planted, how frequently did you water tree(s)?

- |                                    |                          |
|------------------------------------|--------------------------|
| a. Every week or almost every week | <input type="checkbox"/> |
| b. Once or twice a month           | <input type="checkbox"/> |
| c. Once or a couple of times total | <input type="checkbox"/> |

- 69.** Who did you water trees with most of the time?

- |   |                          |
|---|--------------------------|
| a. I watered trees with my household or by myself | <input type="checkbox"/> |
| a. I watered trees with my neighbors              | <input type="checkbox"/> |

70.	On the days that you watered trees, <i>why</i> did you water? Please indicate, of all the days that you watered, how often were you motivated by the following.	Always/ Almost always	Sometimes	Never
a.	A sense of duty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	The tree(s) looked like it(they) needed water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	A neighbor reminded me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d.	Others in the neighborhood were watering that day/had watered recently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e.	I was following the rules given to me by the non-profit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f.	I had signed an agreement promising to water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g.	I wanted to make sure the trees survive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h.	Other ( <i>please specify</i> )	<input type="checkbox"/>	<input type="checkbox"/>	

71. Where did you get the water you used to water trees?

a.	Tap water from my house (spigot or sink)	<input type="checkbox"/>
b.	A neighbor's house	<input type="checkbox"/>
c.	Pond	<input type="checkbox"/>
d.	Fire hydrant	<input type="checkbox"/>
e.	Rain barrel	<input type="checkbox"/>
f.	Other ( <i>please specify</i> ):	<input type="checkbox"/>

72. How did you get water from its source to the tree(s)? (check all methods that you used most frequently)

a.	By hand (in buckets, watering cans or other container)	<input type="checkbox"/>
b.	Hose	<input type="checkbox"/>
c.	Vehicle	<input type="checkbox"/>
d.	Water tank	<input type="checkbox"/>
e.	Other ( <i>please specify</i> ):	<input type="checkbox"/>

73. Is there anything else you think we should know about how you watered trees? If so, please explain:

74. My participation watering trees was worth it.

a. Yes ☐      b. No ☐

## Section 10: Outcomes

We would like to know whether the tree planting and watering project in neighborhood had any effect on you and your neighborhood. Please answer these questions even if you did not participate in the tree planting program.

75.	Please indicate whether you agree or disagree with each of the following statements.	Strongly Agree	Somewhat Agree	Neither Agree Nor Disagree	Somewhat Disagree	Strongly Disagree
a.	If my neighborhood had another tree planting/watering project, I would participate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b.	The tree planting/watering project was an overall success.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**76.** Here is a list of changes people might experience from working on a neighborhood project like tree planting. Since tree planting in your neighborhood, have you noticed any of the following *personal changes* that you think are a result of the tree planting or watering? (Check all that apply and circle the one that has changed the most).

- a. I felt a sense of accomplishment after participating. ☐
- b. I am better at communicating with my neighbors. ☐
- c. I know more about how to care for trees. ☐
- d. I know more of my neighbors. ☐
- e. I am more aware of how the neighborhood looks, like greenery, landscaping and natural vegetation. ☐
- f. I take more satisfaction/pride in my property/the property around where I live. ☐
- g. I am *more* willing to participate in neighborhood activities. ☐
- h. I am *less* willing to participate in neighborhood activities. ☐
- i. I was physically injured as a result of my participation. ☐
- j. I have noticed no personal changes. ☐
- k. Other (*please specify*): ☐

**77.** Please return to question 76 and circle the item that has changed the most.

**78.** Here is a list of neighborhood changes that people have given that might result from a neighborhood project like tree planting. Since tree planting in your neighborhood, have you noticed any of the following *changes in your neighborhood* that you think are a result of the tree planting or watering? (Check all that apply and circle the one that has changed the most).

- a. People spend more time outside. ☐
- b. People know their neighbors more. ☐
- c. People talk to each other more. ☐
- d. People take better care of their yards. ☐
- e. People are *more* willing to participate in neighborhood activities. ☐
- f. People are *less* willing to participate in neighborhood activities. ☐
- g. People have worked together on another neighborhood activity because of tree planting/watering. ☐
- h. I have noticed no changes in my neighborhood that result from tree planting or watering. ☐
- i. Other (*please specify*): ☐

**79.** Please return to question 78 and circle the item that has changed the most.

☐

**80.** Did anyone else in your household (other than you) participate in tree planting, watering, or both?

- a. Yes ☐
- b. No ☐

**Thank you for taking the time to respond to this survey!**

## APPENDIX C: DRAFT SEMI-STRUCTURED INTERVIEW QUESTIONS

### Questions for nonprofit tree-planting project managers

#### About your organization

1. How many full-time staff does your organization employ?
  - a. How many of these staff are devoted to tree-planting activities (organizing tree-planting events, selecting species to plant, meeting with neighborhoods where trees might be planted, *etc.*)?
    - i. Full-time?
    - ii. Part-time?
  - b. How many staff are devoted to non-tree-planting related community engagement or outreach activities related to neighborhood improvement, *etc.* (i.e., not marketing or fundraising efforts)?
2. How does your organization keep track of its tree-planting efforts?
3. [Additional questions on organizational design to be added here]

#### About your organization's tree-planting practices

1. Walk us through the process of selecting a neighborhood for a tree-planting project.
2. How does the project planning process work?
3. How do you select where trees go?
4. How do you select which species of trees are planted?
5. Walk us through a typical planting day.
6. What type of tree maintenance is done on the day of planting? (Mulching, pruning, root pruning, *etc.*)
7. What type of tree maintenance is done *after* that done on the day of planting, if any, and when?
  - a. Who performs this maintenance?
  - b. How are decisions made on what type of maintenance is done and on who performs the maintenance?
8. What type of follow-up is done by the nonprofit? Formal? Informal?
9. In tree-planting project selection, organization, *etc.*, are there any decisions on how things work that are left up to the individual?
10. What type of guidance do you provide to neighborhoods or individuals concerning the following types of tree maintenance: (and what form does this guidance take—*e.g.*, brochure, in person discussion, demonstration, phone, website, *etc.*)
  - a. Watering?
  - b. Mulching?
  - c. Pruning?

- d. Staking?
  - e. Other maintenance?
11. How have your organizations tree-planting planning and maintenance practices changed over the years?

About a specific neighborhood tree-planting project

1. In regard to the neighborhoods that we have studied and inventoried, can you categorize each of them in terms of the following:
  - a. Proportion/number of neighbors involved in tree planting and preservation plans
  - b. Extent of historical collective efforts
  - c. Demographic and socio-economic characteristics
  - d. Presence of strong leaders
2. Thinking about each neighborhood, please tell us how successful they were in watering and tree maintenance. What specifically helped or hindered these neighborhoods in terms of their plans for post-planting tree maintenance?
3. What guidance and advice did you provide to these specific neighborhoods regarding their plans for post-planting tree maintenance?
4. When you think about these neighborhoods, what are common characteristics that lead to success in terms of tree preservation? What are common characteristics that lead to less success/failure?

**Questions for neighborhood tree-planting project leaders**

1. First of all, do you have a neighborhood association in your [Neighborhood name]? Informal or formal?
2. Please help us understand, was the tree planting that you helped lead in your neighborhood in [YEAR] conducted by or in the name of your neighborhood association? For instance, even a smaller group did most of the work, was it discussed and approved in neighborhood association meetings?
3. Please tell us about this history of your neighborhood/neighborhood association/home-owners association. For instance, when did it form? What initiated its formation? Have there been any major problems/successes in the past?
4. How would you characterize the neighborhood? What is it like demographically and socially?
5. Has your neighborhood acted collectively in the past for any reasons? If so, what kinds of activities have these been? For instance, crime watch, street parties, *etc.*? Were most of those activities initiated/undertaken through the neighborhood association or less formally?
6. Please tell us the history of the group that initiated the tree planting with KIB (especially if they are a separate entity from the neighborhood association). How knowledgeable are most folks in that group about caring for trees?
7. How and why did the neighborhood/group get involved with KIB for tree planting?
8. How many people from your neighborhood/group were involved in the initial NeighborWoods application and planting effort?
9. How many of those people have remained involved in the tree preservation plan? Why did certain individuals stay involved and others did not?



10. Does the group or individuals manage the trees in other ways besides watering (mulching, pruning, *etc.*)? How do you fund those efforts—individually, collectively? How do you conduct/engage in those activities—individually, collectively?
11. How did your neighborhood/group come to the decision to water [collectively, contractually, or individually]? Has this strategy ever changed?
12. How many people participated in the watering?
13. How did you physically accomplish the watering plan—where does the water come from and who pays for it?
14. Do you think the tree preservation/watering plan was a success—have people really done what they agreed to do in the plan?
15. Why do you think the plan has worked/not worked? Why do people participate or not?
16. Do you think that the condition of trees is better off/worse off because of the watering plan?
17. Do you have a system of monitoring whether trees are actually being watered? If no system, how could you tell?
18. Do you have a system of sanctioning people who do not follow-through with their agreement to water? If no system, are there informal ways of dealing with those people?
19. Has there been a sense of increased collaboration regarding other neighborhood issues (crime, *etc.*) since tree planting and watering was undertaken? Why or why not?
20. Were there any other benefits or drawback from the planting and tree management?