



**TreePeople**

# **Cooler and Healthier:**

***Reducing Heat-Health Risk Using  
Urban Forestry & Stakeholder Engagement***

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# Cooler and Healthier:

## Reducing Heat-Health Risk Using Urban Forestry & Stakeholder Engagement

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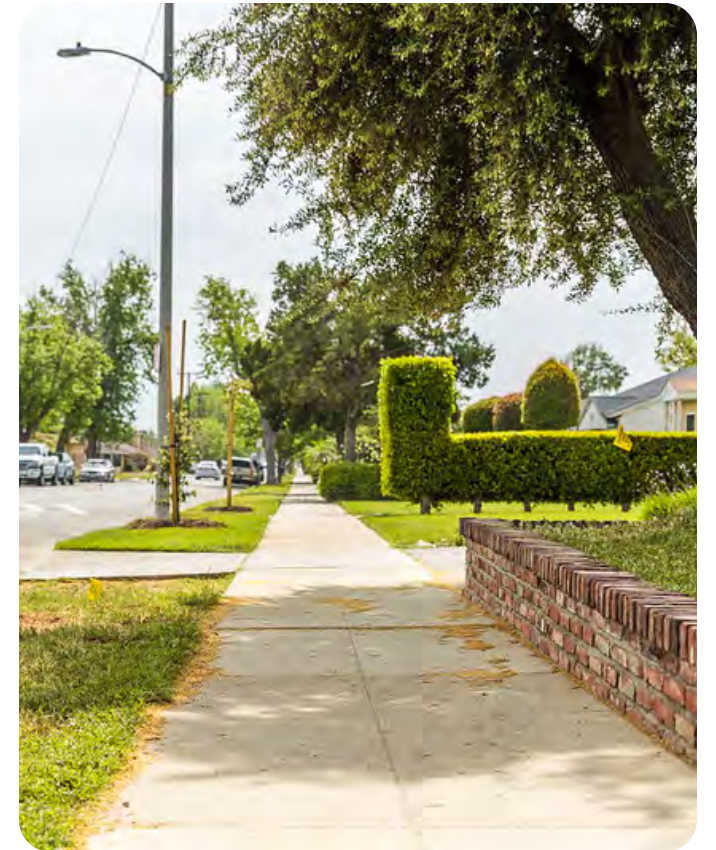
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# Introduction

Heat exposure is a public health hazard that burdens disadvantaged communities most heavily, and heat-related illness and death will increase with the climate crisis in the absence of measures to reduce the urban heat-island effect. Urban forests serve as critical infrastructure to protect against heat, but significant barriers stand in the way of growing robust urban forests to protect from heat. In arid and semi-arid regions like Southern California, tree planting managers must contend with the question of how trees will be watered during a multi-year establishment period. Leveraging current and prior work conducted by the project team and their partners, this study investigated these barriers by employing novel community engagement strategies and using a holistic research and implementation approach to explore boosting tree stewardship in the City of San Fernando located within Los Angeles County, CA.

We used the behavior change framework of Community-Based Social Marketing (CBSM) to understand resident beliefs, attitudes, knowledge, and behaviors related to tree stewardship, heat risk perception, and related neighborhood norms. We conducted preliminary surveys which informed a community engagement program strategy aimed at increasing community stewardship of trees and heat mitigation strategies. We implemented this community-based intervention and then collected observations in the field, including soil moisture and tree health measures. We then returned to program participants for a final survey to gauge changes in tree- and heat-related beliefs, attitudes, knowledge, and behaviors as a result of the program. Results provide culturally appropriate recommendations for policy and programs for heat mitigation through tree stewardship.







## Methods

### Building on a Pilot Study in Huntington Park, CA

This project used the CBSM framework. CBSM provides an alternative to the commonly used approach of fostering pro-environmental behaviors through campaigns aimed at increasing awareness through media efforts. A growing body of scientific research demonstrates that provision of information rarely results in the adoption of such behaviors (McKenzie-Mohr 2011). Based on social science research demonstrating behavior change can be effectively achieved through initiatives delivered at the community level and focused on removing barriers to an activity while simultaneously enhancing its benefits, CBSM has been used as an effective alternative to traditional education campaigns (McKenzie-Mohr et al., 2011; Schultz & Tabanico, 2008).

CBSM brings together knowledge from the field of social marketing with a variety of behavior change strategies drawn from social psychology, environmental psychology, and other behavioral sciences. These disciplines seek to understand

our individual and collective motivations, factors that are deeply linked to the diverse forms of knowledge, authority, and materials, as well as human and non-human capacities, and how these can be assembled to improve the socio-ecological condition of cities (Cousins, 2020). CBSM has been used by nonprofit organizations to create socially desirable behavior changes supporting areas such as safe driving and healthy lifestyles, and by government agencies to increase compliance with environmental laws, where it has been shown to be effective in increasing understanding and compliance with such laws, and in improving cost-effectiveness of programs (Kennedy, 2010). CBSM has been applied to study homeowner attitudes toward residential trees and to explore methods to encourage street tree stewardship (Dilley & Wolf 2013; de Guzman et al., 2018).

This project followed steps 1 through 4 shown in Figure 1, with study findings expected to inform decision-making by tree-planting municipalities and organizations pertaining to step 5, broad-scale implementation.

#### Step 1: Selecting Behaviors

What audience is relevant to the target? What *end-state, non-divisible* behavior best achieves the desired environmental or health outcome?

#### Step 2: Identifying Barriers & Benefits

What perceived or actual barriers and benefits does the audience have around the target behavior?

#### Step 3: Developing Strategies

What engagement strategies will boost benefits and lower barriers? (e.g., commitment, props, social norms, social diffusion, convenience, dis/incentives)

#### Step 4: Pilot Testing

Do the strategies bring expected results relative to a control group? Relative to other strategies?

#### Step 5: Broad-scale Implementation & Evaluation

If pilot proves effective, does broad-scale implementation bring expected results?

Figure 1. CBSM involves five steps

The genesis of this research builds off a pilot study led by former TreePeople staff Edith de Guzman, Rachel Malarich, and Cristina Basurto in 2017 that was aimed at addressing the need for establishment-period care by producing a replicable approach to engage residents in communities impacted by environmental injustices to actively care for young street trees planted in front of their homes. The team conducted a pilot study in the community of Huntington Park located in Los Angeles County, CA. We investigated barriers and motivators around tree stewardship — for instance, the belief that tree care is the city’s responsibility — and developed an outreach program strategy accordingly (de Guzman et al., 2018). We pilot-tested and evaluated the strategy for its effectiveness in changing behavior, testing active, in-person engagement against more passive outreach, where program materials were left at the doorstep. We found that trees at homes in the active outreach group were healthier and had significantly higher soil moisture than trees at homes in the passive outreach group, though both groups had better outcomes as compared to pre-outreach baseline conditions. Findings indicated that tree planting programs with limited resources for

maintenance may find success in fostering tree stewardship among residents through active engagement.

**For further information about the pilot study in Huntington Park upon which this program was built, see the article:**

de Guzman, E., Malarich, R., Large, L., Danoff-Burg, S. [“Inspiring Resident Engagement: Identifying Street Tree Stewardship Participation Strategies in Environmental Justice Communities Using a Community-Based Social Marketing Approach.”](#) *Journal of Arboriculture and Urban Forestry*, 44(6):291-306, November 2018.

This San Fernando study was led by Edith de Guzman, UCLA Institute of the Environment & Sustainability and Dr. Erica Wohldmann, California State University Northridge in partnership with TreePeople. The study invited the participation of households in the City of San Fernando to gauge



knowledge, attitudes and behaviors around trees, heat risk, and collective efficacy via a survey instrument. Survey findings informed a programmatic intervention designed to increase tree stewardship and increase heat-risk awareness among residents. Three intervention conditions — framed around generic messaging, public health messaging, or environmental health messaging — were administered to participating households and the intervention’s effectiveness was evaluated via in-situ observations of soil moisture and tree health. We then administered a final, post-intervention survey to gauge changes in knowledge, attitudes, and reported behaviors. The experimental design has allowed us to test the intervention and to infer whether and how framing changes attitudes and behaviors related to tree stewardship and heat mitigation.

### Study Area: San Fernando, CA

Located in the northeast San Fernando Valley, the City of San Fernando is a 2.4-square-mile incorporated jurisdiction adjacent to the City of Los Angeles with a population of approximately 23,000 people. San Fernando is a working-class community that is nearly 90% Latino/a, and has an average annual household income of \$60,655, roughly on par with the rest of Los Angeles County (U.S. Census Bureau, 2022). About half of the City’s census tracts fall between the 75th and 85th percentile for pollution burden and related vulnerability (CA’s Office of Environmental Health Hazard Assessment, 2020). San Fernando has a tree canopy cover of 19%, on par with the LA County average (Los Angeles County Tree Canopy Advanced Viewer, n.d.). Based on a field assessment conducted by the research team, most parkway planting strips (street tree planting sites between the sidewalk and the curb) in the study neighborhood are not served by sprinklers or other automatic irrigation systems.

The project was conducted with support from and regular communication with City of San Fernando staff. For example, survey packets sent to San Fernando residents were sent on letterhead that included logos for both TreePeople and the City of San Fernando.



### Sampling and Recruitment Procedures

Four hundred single-family households in the City of San Fernando were selected with the aid of TreePeople regional staff who serve as liaisons to this community’s residents and to City of San Fernando government representatives. The address list contained three segments:

1. **Homes where a young street tree was planted in the parkway in front of the home** since a collaborative TreePeople and City of San Fernando planting campaign began in January 2019. To date, over 600 trees have been planted, with another 350 planned and funded. The planting schedule was impacted by the COVID-19 pandemic but regular progress was nevertheless made.
2. **Homes that are located on a street segment that has been planted but in front of which a tree was not planted** as part of the current planting campaign. Some of these homes were expected to be planted in later phases of the planting campaign.
3. **Homes that have neither received nor are slated to have a young tree planted in front of them.** Inclusion of these homes enabled evaluation of whether longitudinal changes in attitudes and reported behaviors will change independent of tree planting. Most of these homes have a mature tree or other landscaping in the parkway.

The sample size was informed by the following factors:

1. A post hoc power analysis of the Huntington Park pilot study yielded an effect size of 0.6 for intervention conditions that had as few as 16 subjects, exceeding the minimum desired threshold of 0.5. The analysis was conducted by calculating the difference between average soil moisture of homes that were part of different intervention conditions (active vs. passive outreach condition).

2. The intent of the present study was to build upon the Huntington Park pilot study, increasing the sample size and expanding the scope to include the domains of heat-risk awareness and community resilience.

3. Grant funding availability for survey incentives.

Study participants received a consent form advising them of the voluntary nature of the project and that they did not need to answer any questions they did not wish to answer. Respondents were offered an incentive of a \$20 gift card for the surveys. A low response rate to the second survey, even following numerous reminders, prompted the project team to increase the gift card offer for the second survey to \$50. This increase resulted in a higher response rate.

### Research Design

Surveys were conducted with the option to respond by mail, electronically, or by telephone. The surveys were informed by a literature review and focus groups conducted during the pilot study in Huntington Park. Though originally intended to be conducted via door-to-door canvassing, data collection methods were modified due to risks present during the COVID-19 pandemic. Recruitment was instead conducted by mail to addresses from TreePeople’s database, with the local government of the City of San Fernando serving as a partner and co-messenger with TreePeople on the study.

Though structured in a manner that yielded quantitative data, the surveys incorporated subjective questions meant to elucidate residents’ perceptions, judgments, and preferences. Survey responses were linked longitudinally to observed data. Jones (2018) describes an “objectivity-subjectivity continuum” for measuring resilience and concludes that a research design with a mix of self-reported and observed measures is preferred in order to not impose a one-size-fits-all approach to defining and evaluating resilience. The present research can be considered to fall somewhere in the middle of that continuum.



## BASELINE SURVEY

A 44-question survey (see Appendix A) was the first step in data collection for the behavior change component.

Survey packets were mailed to 400 households in July 2020. Packets contained the following items in Spanish and English (see Appendix A):

- **Letter** introducing the research, inviting the recipient to participate, and explaining three methods to respond: by paper survey returned by mail, electronic survey accessible online, or by telephone by calling TreePeople’s designated study personnel. Recipients were asked to respond within two weeks. With permission from the City of San Fernando, the letter was “co-branded” with the City’s logo and TreePeople’s logo.
- **Consent form** explaining the voluntary and confidential nature of the study, and that respondents may refuse to answer any question.
- **Hard copy of the survey** with a note at the end of the form inviting them to participate in a future survey in a few months.
- **\$2** cash to incentivize response.
- **Incentive selection card** asking the respondent to indicate their choice among four incentive options (Amazon, Chipotle, Starbucks, or Target) and two delivery options (mail or email). Participants were offered a \$20 gift card upon

completion of the first survey. A second (post-intervention) survey was sent to the same respondents nearly one year later. To boost response rates, a gift card valued at \$50 was offered upon completion of that survey.

- **A pre-paid envelope** for returning the paper survey, consent form, and incentive selection card.

The packets were sent in 9”x12” manila envelopes on TreePeople mailing labels. A follow-up reminder mailing containing a one-page letter in Spanish and English was sent to non-responsive households approximately three weeks after the original packet was sent. Of the 400 packets, 11 were undeliverable and returned to sender. The outreach yielded 118 fully or partly completed first surveys, for a response rate of 30%. Of those, 106 also completed the second survey.

## BEHAVIOR CHANGE INTERVENTION

Data from the literature review and focus groups conducted during the pilot study in Huntington Park and the baseline survey data were analyzed in order to inform the intervention’s messaging and approach. The survey provided data that were used to support the intervention goal of identifying perceived and/or structural barriers as well as values and benefits that exist around the targeted behavior within the study community. The intent was to design an intervention which further boosts benefits while reducing barriers to adopting the behavior. The intervention was rolled out in fall 2020 and concluded in spring 2021.

The following preliminary findings from the baseline survey informed the intervention design:

1. **Tree care stewardship increases as barriers to tree care decline.** This suggests that the intervention should strive to reduce barriers, whether they are perceived (e.g., not enough time to water) or real and structural (e.g., no hose for watering).
2. **Respondents who report a high concern around the health of loved ones also report higher rates of tree stewardship.** This relationship does not hold between beliefs about heat waves, such as the belief that they have become longer, more intense, or more frequent and tree stewardship behaviors. This suggests that the intervention should emphasize the role that trees have on reducing temperatures.
3. **There is a weak relationship between tree care actions and other heat-related protective measures.** This suggests that framing tree stewardship as a protective measure could be a worthwhile strategy to test, which may be reinforced by the fact that there is a positive correlation between being concerned about health and tree stewardship, and that there is a positive correlation between knowledge about the link between health and trees, and tree care actions.

With the benefit of these findings, we produced several programmatic intervention conditions that were subsequently evaluated against each other for effectiveness. The interventions use CBSM tools such as prompts, vivid communication, and public commitments designed to increase tree stewardship and increase heat-risk awareness among residents. Conditions for segmenting participants into different condition groups included:

1. **Control condition:** This condition replicated the Huntington Park pilot study strategy and used an outreach packet consisting of bilingual materials in English and Spanish (see Appendix B), including:
  - a. **An instructional piece:** A refrigerator magnet with tree stewardship instructions, and messaging to reduce the perception that watering a tree is expensive, and to reinforce that environmental stewardship is consistent with community values.
  - b. **A prompt:** A car air freshener with a reminder to check soil moisture weekly. Many homes in Huntington Park lack private parking and moving a parked car for street cleaning is a common weekly activity in this neighborhood.
  - c. **A public commitment item:** A static-cling sticker, which recipients were asked to display in a sidewalk-facing window indicating a household’s commitment to greening the neighborhood, designed with the intent to appeal to community values and shift norms toward increased environmental stewardship.







2. **Condition 2 - Public Health Framing:** A packet of materials that emphasize the link between trees and health from a public health perspective (see Appendix B).

- a. **An instructional piece:** A postcard designed in a nostalgic mid-century style to appeal to San Fernando neighborhood pride with tree stewardship instructions messaging to reduce the perception that watering a tree is expensive and demonstrate how much water a tree needs on average. The postcard was clipped to a heavy duty decorative refrigerator magnet in the same aesthetic, showing a large shade tree and with the words “San Fernando” above it.
- b. **Prompts:**
  - i. A decorative 3-inch ceramic pot with a succulent plant. The instructional postcard was clipped to the pot with a reminder to check the moisture of the tree in the parkway whenever checking if their new succulent needs to be watered.
  - ii. Two postcards mailed a few months apart and designed in the same neighborhood-specific style reminding residents to water their tree and emphasizing the public health benefits of trees.
- c. **A public commitment item:** A static-cling sticker, which recipients were asked to display in a sidewalk-facing window, using the same shade tree design as the magnet and with the message “San Fernando / We care for trees / Cuidamos nuestros árboles.”

3. **Condition 3 - Environmental Health Framing:** The same packet of materials as Condition 2 but instead emphasizing the link between trees and health from an environmental health perspective (see Appendix B).

### Messaging Condition

We tested three messaging conditions to see which was most effective.

**Condition 1: Control.** We used the same materials produced for the Huntington Park pilot study strategy. An outreach packet of bilingual materials in English and Spanish included an **instructional item** explaining how to check if a tree needs watering, a **prompt** to remind the resident to check soil moisture weekly, and a **public commitment item** to support shifting norms toward increased environmental stewardship (Figure 2a).

**Condition 2: Public Health Messaging.** We designed community-specific materials to emphasize the link between healthy trees and healthy communities. Like Condition 1, a bilingual packet included an instructional item, a prompt, and a public, durable commitment item (Figure 2b).

**Condition 3: Environmental Health Framing.** We also designed community-specific materials to highlight the link between healthy trees and a healthier environment in the neighborhood. (Figure 2b).



**Figure 2a.** Households in Condition 1 (Control) received a package with a letter, an air freshener serving as a prompt to remind residents to check their street tree’s soil weekly, an instructional refrigerator magnet explaining how to check soil moisture and how to properly water a tree, and a static-cling sticker that they were asked to place in a street-facing window to demonstrate their commitment.



**Figure 2b.** Households in Condition 2 (Public Health Messaging) and Condition 3 (Environmental Health Messaging) received a package with a letter, a small plant serving as a prompt to remind residents to check their street tree’s soil when they water their plant weekly with an instructional postcard attached, a refrigerator magnet with health messaging, and a static-cling sticker that they were asked to place in a street-facing window to demonstrate their commitment to a greener San Fernando. Materials in the two conditions were identical except for the messaging.





The intervention was administered during fall 2020 and was followed by an evaluation of the effectiveness of the program via observations of soil moisture and other observable measures. Participating households were asked to take a final survey to gauge changes in knowledge, attitudes, and behaviors. Participants were invited to respond to the second or final survey in May 2021. Initial responses were few and several measures were taken to boost the response rate, like written reminders via mail and email, a larger incentive, and finally, door-to-door canvassing. Final survey data collection closed in November 2021.

In addition to the planned intervention conditions, a quasi-experimental condition referred to as “tree planting condition” was also examined (Figure 3). Specifically, some of the households surveyed received a TreePeople/City of San Fernando tree in the years prior (1-2 years before the start of this study). The survey results and moisture readings from those households were compared to households on the same street and those on a different street—one that had not received any tree plantings. We ensured that the message conditions were relatively equally distributed across each of these three additional tree planting conditions (residents who received a tree, neighbors of those who received a tree, and residents in the City who had no contact with TreePeople).

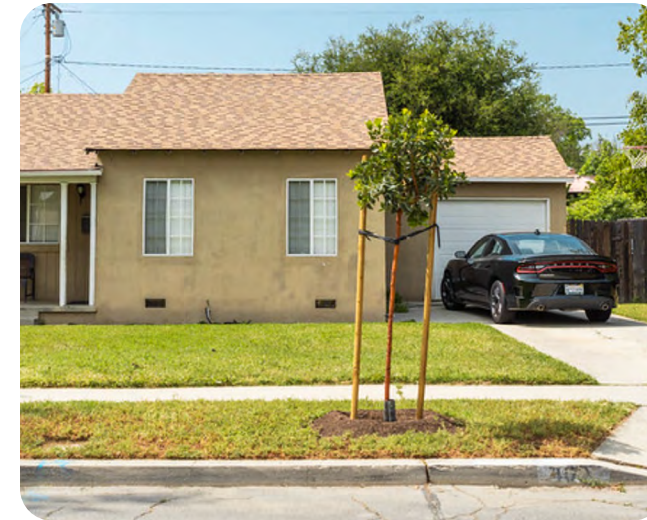
### Tree Planting Condition

In addition to testing three interventions with different types of messaging, we tested how households fared in terms of tree stewardship relative to whether they had recently had a young tree planted in front of their homes. We tested three planting conditions:

**Received a Tree:** Street tree recently planted in home’s planting strip. This group had the highest exposure to TreePeople and the city.

**On Planted Street:** Neighbors’ planting strips recently planted, but the participating household nevertheless had a tree or other vegetation in the parkway requiring irrigation and care. This group had medium exposure to TreePeople and the city.

**New Area:** On a street with no previous or planned planting campaign, but with a tree or other vegetation in the parkway requiring irrigation and care. This group had the lowest exposure to TreePeople and the city.



**Figure 3.** Tree planting conditions, from top to bottom, included: Received a Tree; On Planted Street; and New Area

### OBSERVATIONS

Observed data collection began once the team concluded outreach and participants had received the intervention. Collected data allows for a quantitative evaluation of the intervention’s effectiveness, and a relative comparison of how effective one condition was over another in fostering tree stewardship compared to baseline (pre-intervention) conditions.

Three post-intervention observation rounds were performed:

- Post-Intervention 1: 6-week period from late October to early December 2020
- Post-Intervention 2: 6-week period from mid March to late April 2021
- Post-Intervention 3: occurred at the end of the study period in November 2021 and included just two readings, enabling a comparison between readings taken during the same time of year at the beginning and end of the study.

The observations consisted of visits at various times of day to collect the following:

- **Soil moisture**, using a soil moisture meter (Figure 4)
- **Tree health characteristics**, including rating trunk, branch and leaf health based on industry standards, and noting the presence of mulch and weeds
- **Other observed characteristics**, such as when residents are observed performing tree stewardship actions, and whether intervention materials such as a prompt or instructional sticker, which residents will be asked to display in a visible location as a “public commitment” toward shifting social norms are seen on display

Nineteen soil moisture readings were taken in parkways in front of each of the homes in our study between October 2020 and November 2021. This took into account the quasi-experimental planting conditions and included homes that had received a TreePeople or City of San Fernando tree, neighboring



homes on the same street, and homes in a new area where plantings had not occurred. Moisture readings were taken across four study phases: prior to the start of our study (Baseline), immediately following the first distribution of study materials, including Survey 1 (Post-Intervention 1), immediately following the second distribution of study materials (Post-Intervention 2), and finally once more after all participants completed Survey 2 (Post-Intervention 3).

Approximately every week during each of the four phases, research assistants and TreePeople staff visited each of the homes in our study to measure soil moisture using two DSMM500 Precision Digital Soil Moisture Meters with Probes (see Figure 4).

In order to ensure that the reading was representative of the moisture content within the entire parkway, readings were taken at each residence using two separate probes and in two different locations, and when the readings differed, an average of the two readings was recorded. Data collection days were scheduled at least 48 hours after a rain event to allow moisture levels to drop sufficiently for the moisture probes to take accurate readings.

In addition to collecting the moisture readings described above, researchers conducted curbside assessments to visibly assess the health and quality of any plants, including trees, that were planted in the parkway, the presence of mulch and weeds, and recorded the presence of the commitment stickers that were included in the first distribution of study materials.



**Figure 4.** DSMM500 Precision Digital Soil Moisture Meters with Probes used to sample soil moisture content.

## FINAL SURVEY

With observations completed, participating households received a second survey 10 months following the baseline survey, in May 2021. We requested that the second survey be completed by the same person who responded to the first survey. This second, final survey asked the same questions as the baseline survey, enabling a longitudinal analysis of changes in self-reported tree behaviors as well as knowledge and attitudes around trees, heat, and related topics. Respondents were once again offered a \$20 incentive. To ensure a high response rate, reminders were sent in the subsequent weeks and the incentive was ultimately increased to \$50 to encourage a response from households that were non-responsive following multiple reminders.



# Findings

## Survey Analysis and Results

The survey's 44 questions and their variables were re-coded into new categories so that each survey question fit into fewer variable categories. These re-coded variables included:

- Values pertaining to trees
- Beliefs around tree care
- Tree care actions
- Values pertaining to neighborhood
- Knowledge about the link between trees & environmental conditions
- Knowledge about tree care
- Tree care barriers
- Knowledge about the link between trees & health
- Locus of responsibility
- Beliefs about heat
- Concern for health
- Perceptions around heat
- Reported heat-protective measures
- Access to coping strategies during heat waves
- Community support given or received during the pandemic
- Demographics (including home ownership, age, education, income, ethnicity, gender, years lived in neighborhood)

While the analyses for all of the above variables were completed, a discussion of only the statistically significant results based on the 116 responses we received follows.

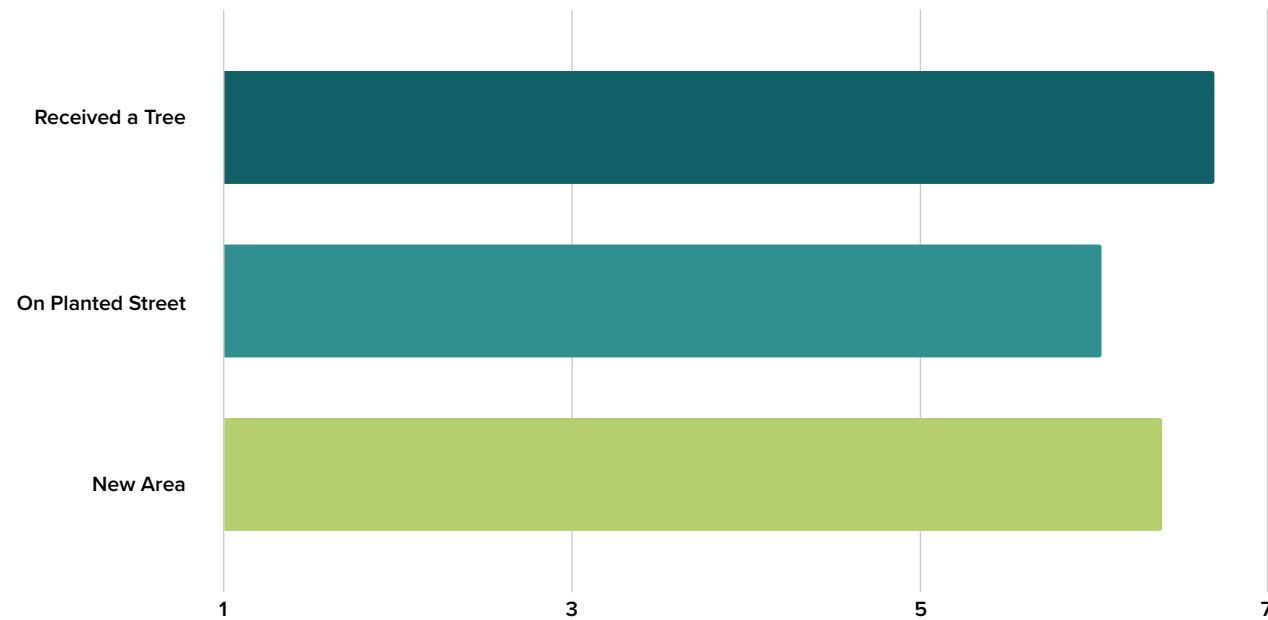


**FACTORS THAT PREDICT TREE CARE ACTIONS**

Contrary to our original predictions, the CBSM messaging intervention had no impact on tree care actions. Instead, we found that tree stewardship

was influenced by the quasi-experimental variable of planting condition discussed above. More specifically, residents who received a TreePeople or City of San Fernando tree reported stronger agreement with the statement “I water my tree” compared with residents in the other planting conditions (see Figure 5).

**Tree Care Actions**



**Figure 5.** Agreement ratings to the question “I water my tree” as a function of tree planting condition. 1=Strongly disagree; 7=Strongly agree.

However, no changes in self-reported tree care actions were found during the study for any of the conditions, possibly because agreement with that statement was already so high at the start of our study. Still, the results suggest that having a community organization on the ground, like TreePeople encourages people to take care of their trees by watering them regularly.

**“The results suggest that having a community organization on the ground encourages people to take care of their trees by watering them regularly.”**

Residents’ knowledge of the association between trees and health also predicted self-reported tree care actions. Simply stated, the more a resident understands the benefits that trees have on health, the higher their level of tree stewardship. Residents with knowledge about the relationship between trees and health also reported having fewer barriers that might prevent them from stewarding their trees. This could be because people who understand the health benefits of trees intentionally remove those barriers, or perhaps because they are less likely to perceive the requirements of tree care as a burden or barrier to maintaining the health of their trees than those with little to no knowledge about the relationship between trees and health. Importantly, we found that residents with fewer perceived barriers to tree

stewardship were more likely to care for their trees. This finding suggests that increasing awareness about the benefits that trees have on health could be an effective strategy for increasing tree stewardship and encouraging residents to eliminate barriers, although this correlation needs further exploration.

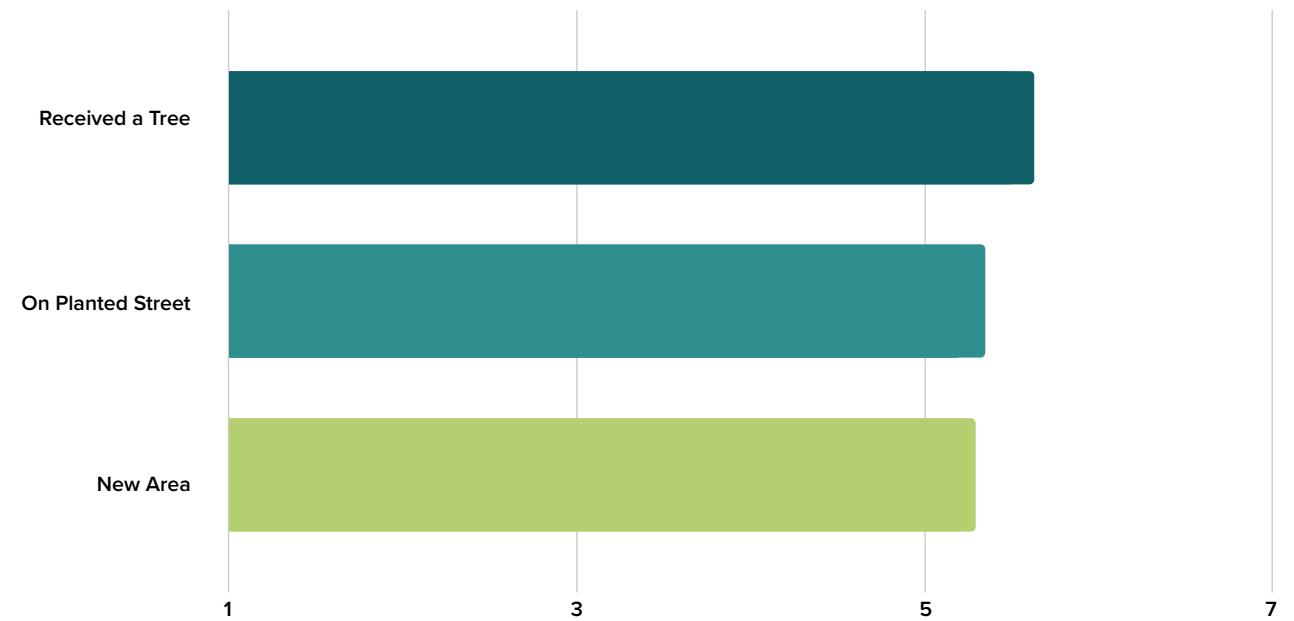
**“The more a resident understands the benefits that trees have on health, the higher their level of tree stewardship.”**

Not surprisingly, residents who value trees a great deal were also more likely to water their trees, and were less likely to have barriers to tree stewardship than those who do not place a high value on trees.

**“We found that residents with fewer perceived barriers to tree stewardship were more likely to care for their trees. Increasing awareness about the benefits that trees have on health could be an effective strategy for increasing tree stewardship and encouraging residents to eliminate barriers.”**

Overall, concern about the impacts of heat on health, including the health of animals, was generally high, and slightly higher for residents who received a TreePeople or City of San Fernando Tree than other residents (see Figure 6).

**Concern About Impacts of Heat on Health**



**Figure 6.** Average agreement with the statements “I am concerned that heat waves are bad... for my health,” “... the health of people I care about,” and “... the health of animals” as a function of the tree planting condition. 1=Strongly disagree; 7=Strongly agree.



Although the effects were small, residents who expressed concern about heat-related health risks, and those who took protective measures, such as staying out of the sun and drinking plenty of liquids on really hot days, were somewhat more likely to engage in tree care actions. These findings suggest that raising awareness about the impacts that heat can have on health could increase tree stewardship activities, although not nearly as much as either having a community organization on the ground or increasing awareness about the association between trees and health.

Approximately 86% of the residents who completed our survey reported owning their homes, compared with just 57% of San Fernando residents at large (U.S. Census Bureau, 2022). The average household income of survey respondents was in the range of \$50,000-\$75,000, with 42% earning more than \$75,000. This compares with a median household income in San Fernando of \$60,655 in 2020 dollars (U.S. Census Bureau, 2022). The majority of residents (73%) who completed the survey had completed at least some college, or had earned a degree from either a trade school or university, including 17% who had completed postgraduate degrees. This compares with just 65% of San Fernando residents over 25 years old who have a high school diploma or equivalent (U.S. Census Bureau, 2022).

Although the sample was somewhat skewed in terms of renters and residents with lower income or lower educational attainment, we found no correlations between home ownership, income, or education and either self-reported tree care actions or the actual soil moisture measurements. This suggests that renters and homeowners are equally likely to care for trees, and that residents with higher income and education are no more likely to water their tree than those with lower income and education. In addition, home ownership, income, and education were not correlated with tree care barriers. That is, renters, lower-income residents, and those with relatively less education did not report having more barriers to tree stewardship than homeowners or those who earn a high income and/or are highly educated. Taken together, these findings are very encouraging given the high levels of rentership and variable income and education levels in the region. Further, they suggest

that tree stewardship is not predicated on owning a home, or being wealthy and highly educated. Instead, they suggest that widely enhancing tree stewardship among Los Angeles County residents can be achieved regardless of these demographic variables that are typically related to social status.

**We found no correlations between home ownership, income, or education and either self-reported tree care actions or the actual soil moisture measurements. This suggests that renters and homeowners are equally likely to care for trees, and that residents with higher income and education are no more likely to water their tree than those with lower income or education.**

### HOW KNOWLEDGE ABOUT THE BENEFITS OF TREES IMPACTS HEALTH

In addition to benefiting the health of trees through increased watering and tree stewardship activities, having some knowledge about the benefits that trees have on human health was highly correlated with self-protective heat-health actions. That is, residents who were highly knowledgeable about the connection between trees and health were also more likely to take protective actions against heat. For example, they were more likely to stay out of the sun during the hottest part of the day, drink plenty of liquids, avoid alcohol, and check in with family and friends on really hot days. Residents with a higher knowledge of trees and health were also more likely to attribute heat-related symptoms to heat rather than to other possible causes — indicating a higher awareness of the risk of heat. These residents also expressed more concern that heat waves are a problem for their health and the health of their loved ones, including animals, than those who were less knowledgeable. Furthermore, these residents also reported taking more heat-protective actions. Interestingly, residents who expressed concern about heat waves also reported valuing trees more than those who were less concerned, suggesting that concern for heat may encourage residents to think more deeply about the important role trees play, whether simply for beauty or for their cooling effects.

**“Residents who were highly knowledgeable about the connection between trees and health were more likely to take protective actions against heat. For example, they were more likely to stay out of the sun during the hottest part of the day, drink plenty of liquids, avoid alcohol, and check in with family and friends on really hot days.”**

In sum, the findings from our surveys suggest that having a community organization on the ground, like TreePeople increases tree stewardship behaviors. Further, increasing awareness about the benefits of trees not only increases the likelihood that residents will care for the trees planted in their parkways and yards, but that they will also care for themselves by taking protective actions that may reduce their vulnerability to heat waves.





## Observational Analysis and Results

### SOIL MOISTURE

The percentage of soil moisture did not differ as a function of our messaging conditions. However, soil moisture did differ by tree planting condition (see Figure 7). As discussed previously, for the survey results, we found that self-reported watering was highest for residents who received a TreePeople or City of San Fernando tree, and did not change during the course of our study for any of the households. Soil moisture readings showed a somewhat different

pattern. That is, similar to the self-reports, moisture readings were highest for residents who received a tree, including at baseline, but they were also quite high for neighbors who lived on the same street as those who had received a tree. In fact, at baseline, moisture readings for residents in both conditions were almost twice as high as those who lived on a street that had not been planted and, therefore, likely had no interaction with TreePeople prior the start of this study. Lower soil moisture content for these residents continued throughout most of the study period.

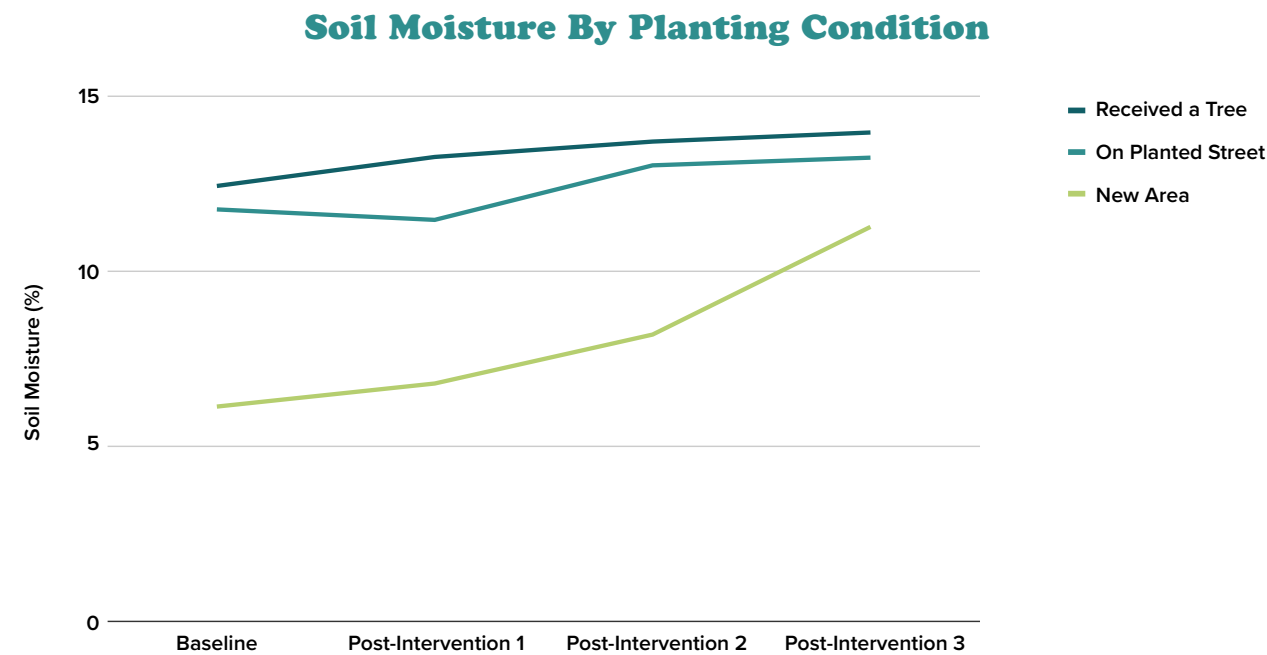


Figure 7. Percentage of soil moisture as a function of phase and tree planting condition.

**“Moisture readings were highest for residents who received a tree, but they were also quite high for neighbors who lived on the same street as those who had received a tree. At baseline, moisture readings for residents in both conditions were almost twice as high as those who lived on a street that had not been planted and, therefore, likely had no interaction with TreePeople or the city related to tree planting prior the start of the study.”**

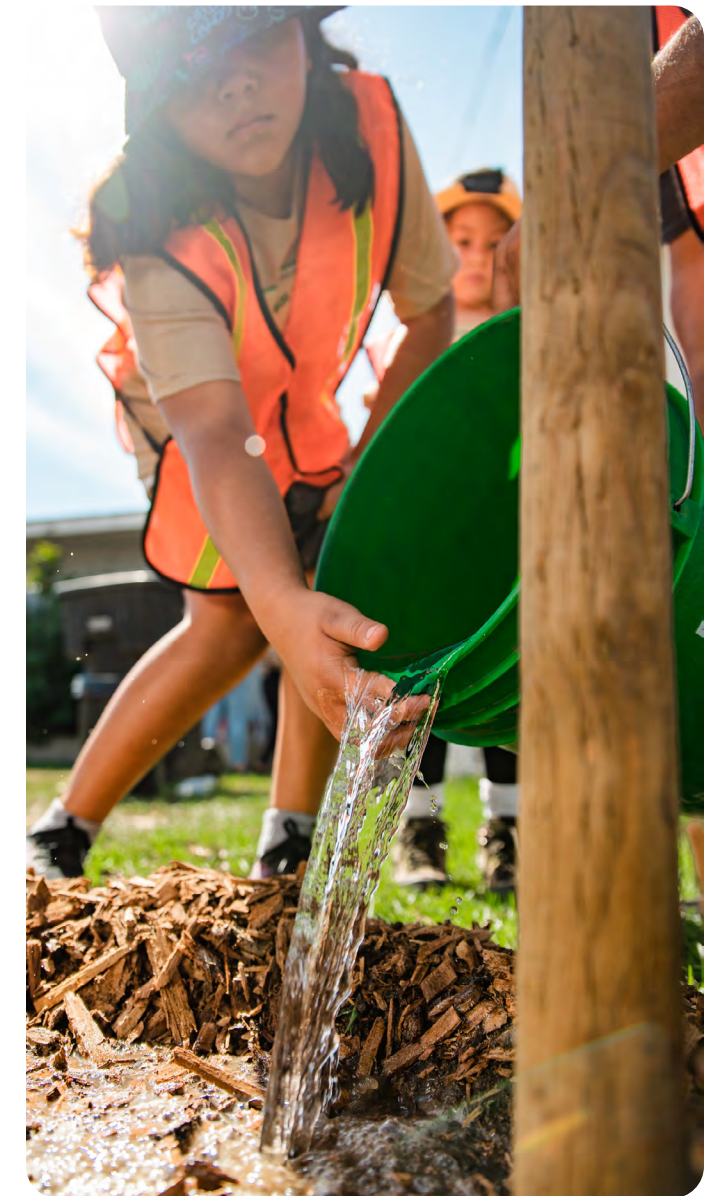
Unlike the self-reports, moisture readings for all three planting conditions increased during the study — though, perhaps surprisingly, the largest increase was found for those who live on a street that had not been planted. In fact, by the end of the study, moisture levels for residents who lived on a street that had not been planted were only slightly lower than those who either received a tree or were neighbors of residents who received a tree. Because we collected soil moisture readings across a full year, and never within 48 hours following a rain event, the increase over time is unlikely to be attributable to changes in weather.

The increase in soil moisture over the course of the study could, however, be due to the fact that in order to collect moisture readings, TreePeople staff and volunteers had to visit those homes and, as a result, residents saw moisture readings being taken. Although we cannot confirm that residents were home at the time moisture readings were taken, this outcome is consistent with what we observed during the pilot study in Huntington Park (de Guzman, et al. 2018). In addition, or perhaps alternatively, the surveys themselves could have served as a reminder to water trees more regularly. That is, the act of completing a survey that asked about tree stewardship behaviors may have had an intervention-like effect and served as an engagement strategy to encourage watering. Either way, these results further bolster the idea that the presence of a community organization, like TreePeople in a neighborhood and some form of community engagement, even minimal indirect contact, may encourage people to take care of their trees by watering them regularly.

The increase in moisture readings for residents in the new area condition suggests that completing the surveys or seeing TreePeople staff and researchers take regular soil moisture readings may have been a sufficient form of public engagement to encourage more frequent watering. In fact, the final moisture readings in the new area condition were almost as high as those in the other conditions, again, suggesting even minimal exposure to a community organization could promote tree stewardship.

### CURBSIDE ASSESSMENT RESULTS

Although moisture readings increased throughout the study, this did not result in improvements in tree health, possibly because average tree health was good at the start of the study. Moreover, watering is one form of tree stewardship that changed as a result of our study, but other forms of tree stewardship did not change. That is, we found no change over time in the presence of mulch or weeds, and we were only able to confirm that about 10% of residents put the commitment stickers provided in their windows, as requested.



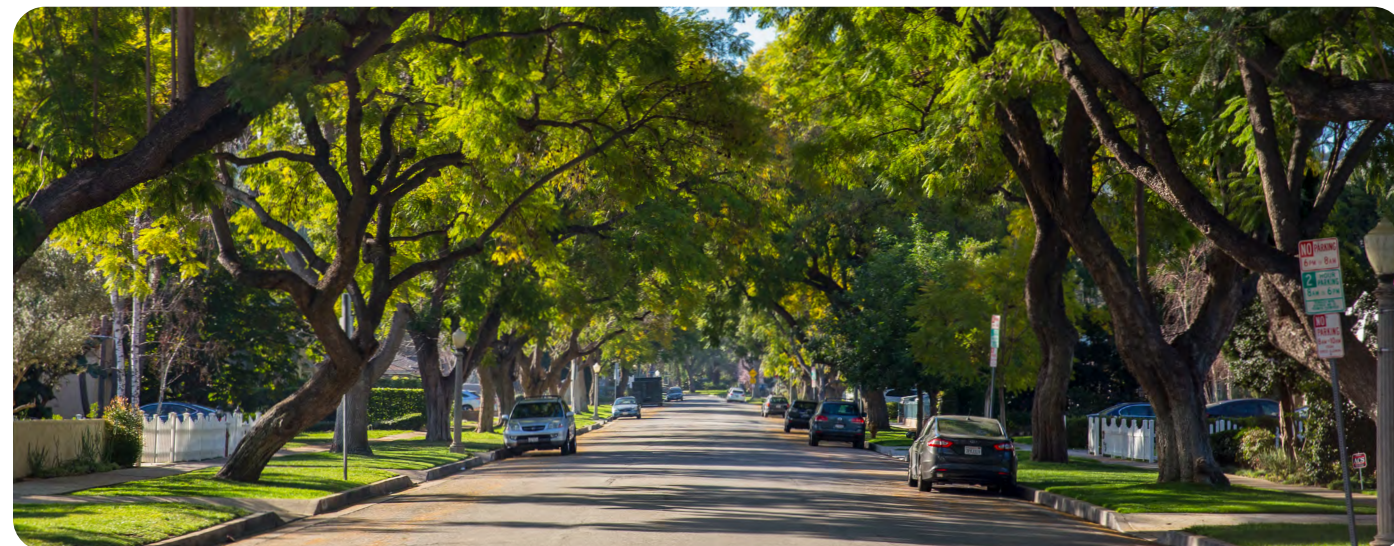


# Conclusions and Implications

We share the study methods and findings with the intent to help inform future directions for nonprofit and municipal tree planting programs. We saw increases in tree stewardship across the board despite the limitations imposed by the COVID-19 pandemic, suggesting that even with limited in-person engagement from a community organization, like TreePeople, resident behaviors in support of tree stewardship can be fostered. We saw that even the survey itself served as an intervention supporting behavior changes. In addition to engaging directly and in the neighborhood, tree-planting organizations can consider a variety of ways of reinforcing social norms toward tree care — for example, inviting residents to answer a few questions via a poll or survey, or sending seasonal reminders in the mail or via text or email.

We also saw that increasing knowledge of the link between trees and public health or environmental health increased residents' level of self-protective knowledge and action during heat waves. As cities around the world invest in urban forestry for climate adaptation and urban heat mitigation, marrying tree planting and care programming with raising awareness about the risks of heat and how they can be reduced is critical.

This study offers several additional lessons. The first is that not being able to engage communities face-to-face just makes things more difficult. We saw lower response rates, and even among participants that did respond, we saw a lower level of commitment and action than in the Huntington Park pilot study. Secondly, the type of messaging — generic versus community-tailored messaging emphasizing public health or environmental health benefits of trees — has an impact on specific outcomes, but no single type of messaging shifts all outcomes in the desired direction. Rather than partitioning these, a combination of messages may be effective in future programs. This study also raises questions about whether the assumptions that many municipal and nonprofit tree planting programs make that residents will take on the responsibility of watering street trees is reasonable, particularly in communities with limited resources. With a concerted effort, we were able to move San Fernando residents to regularly adopt tree stewardship as measured by watering behavior, but our efforts required sustained personnel and financial resources. There are many reasons why this might be the case, but in effect, we need to ask whether this assumption is sustainable or whether other alternatives are needed as well — for example, funding and support to hire crews to care for the urban forest.



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# Appendices

- A. [Survey Packet](#)
- B. [Intervention Materials](#)





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