Tree Stewardship Education and Urban Forest Management in Sacramento County, California

Jeannette Aames

ABSTRACT

Urban forestry is the promotion of trees in the urban setting for the social, economic, and environmental benefits they impart. The Sacramento Tree Foundation (STF) provides free shade trees to residents of Sacramento County, California in an energy-saving program funded by the local utility district. The general procedure is as follows: residents schedule a site visit for a community forester to visit their property, which is when they select a tree species and planting location, sign a Tree Care Agreement (TCA), receive an educational folder, and about ten days later receive their tree(s). From that point forward, the planting, maintenance and survival of the tree, and any future communication with the program is the responsibility of the resident. Recent studies have found a mortality rate of over fifty percent for shade trees between 1991 and 2001. This raises concerns about resident tree stewardship education and the implementation of tree care practices. Through a questionnaire administered to 500 customers, this study examines the STF Shade Tree program's education and outreach techniques. It found that most of the site visits were short, the topics covered were not extensive, the educational material was helpful but not fully taken advantage of, demographics mainly suggest a middle class background, and residents were generally not seeking further contact and engagement with the program even though they were relatively poorly educated on tree stewardship. Furthermore, residents with longer site visits were more likely to have remembered discussing a greater proportion of tree care topics, $\chi^2(1,N=156)=7.5,p=.006$. Customers also expressed concerns about maintenance, seasonal changes, and tree aesthetics. To improve the program's management regime, this study suggests a longer site visit, an improved folder organization reflecting the most important practices, program-initiated follow-up communication, and a support system containing imagery and stressing rewards to better educate residents and motivate them to be better tree stewards.

KEYWORDS

Outreach, communication, engagement, tree care, implementation, contact, maintenance, community

INTRODUCTION

Urban forestry is the promotion and management of healthy trees in the urban setting to enhance environmental, social, and economic benefits for the surrounding community (Konijnendijk et al. 2006). The benefits of an urban forest range from the conservation of energy, the reduction of air pollution, and the improvement of water quality, to the motivation of neighborhood and community livelihood. Environmental benefits include improved air and water quality, reduced runoff, mitigation of the urban heat island, noise reduction, and a habitat for wildlife (Dwyer et al. 1992, McPherson et al. 1998). Social and economic benefits involve an aesthetically pleasant and psychologically healthful environment, reduced energy costs, increased real estate values, and an overall improved wellbeing and quality of life (Martin et al. 1989, Dwyer et al. 1992). For these reasons, urban forest management programs seek to not only distribute trees to urban communities but also maintain them by promoting community stewardship.

The role the community plays in planting and maintaining urban forests is important, as tree growth and survival depend on human interaction. "If trees are to thrive, and communities are to benefit from them, residents must develop a greater awareness of maintenance issues" (Summit and McPherson 1998).The understanding and implementation of tree stewardship practices such as proper planting technique, staking, watering, and mulching are important for tree survival and growth (Insley 1980, Ferrini et al. 2000, Nowak et al. 2004).This highlights the importance of community education for sustaining the urban forest. Successful urban forestry programs must effectively and efficiently communicate with local people, as educated residents, or "tree stewards," are better equipped with the knowledge to raise a healthy tree into maturity (Dwyer and Schroeder 1994, Clark et al 1997).

The Sacramento Municipal Utility District (SMUD), a nonprofit publicly owned electric utility, and the Sacramento Tree Foundation (STF), a nonprofit urban forestry organization, have formed a partnership to create the Sacramento Shade Tree Program. Since 1990, the Shade Tree Program has planted approximately 10-20,000 trees annually and worked to build and sustain an urban forest throughout Sacramento County, California. A major goal of the program is to plant trees in a manner that produces valuable energy savings in the long run. The program relies on the premise that most of the trees delivered reach maturity and prosper, providing those projected energy benefits in return. Community foresters from STF conduct site visits to residents' homes

and arrange the ideal planting locations for shade trees. The general procedure is as follows: a resident, with the help of a community forester, decides on a tree species and planting location, signs a Tree Care Agreement (TCA) to confirm the transaction, receives a folder of educational material, and about ten days later receives the young shade tree(s) (with the planting stakes and ties). From that point forward, the planting, maintenance and survival of the tree, and any future communication with the program is completely the responsibility of the resident.

The young trees are most vulnerable in the first several years after planting, what has been called "the establishment phase," and it is understandable that some trees will not reach adulthood(Richards 1979). A study conducted on urban Sacramento trees in 2001 concluded that the survival rate of trees given out 10 years earlier was 50%, a rate considerably lower than the program had projected (Lindeleaf 2007). Though this rate was significantly low, there were reasons to believe that such a high mortality rate was due to the relaxed tree distribution practices of the program in its early stages, such as simply dropping off a shade tree, and leaving it up to the resident to place the tree and plant it. The program has been operating under stricter rules since 1996, such as requiring minimum spacing between trees, restricting redundant shading, and situating the trees with respect to the home in a manner that maximizes energy savings (Lindeleaf 2007). Today, residents are provided with a comprehensive educational folder that includes planting, mulching, fertilizing, pruning, and watering techniques, as well as information about energy savings (Table 1). Despite more restrictive program rules and this array of educational material, a second study in 2006 found that the survival rates for a 10-year group and a 5-year group were 43% and 54%, respectively (Lindeleaf 2007). Thus, even with a more meticulous management approach, a greater proportion of trees appears to be dying than surviving.

Educational piece	Content
How to Plant Your Free Tree DVD	Visual instructions on how to properly dig hole and plant tree; also watering and mulching (length: about 8:00 min)
Tree Planting and Stewardship Guide	Step-by-step instructional guide for tree planting; tips for tree care including: watering, fertilizing, mulching, weeding, staking and tying, winter care, and pruning.
Free Wood Chips from SMUD flier	Information on where and how to pick up free wood chips from SMUD building in Sacramento

FAQ brochure	An array of frequently asked questions ranging from tree species, energy savings, details regarding tree delivery, tree planting, watering, fertilizing, staking, damage, and death
"What will 5 million more trees mean to you?" Brochure	Information for on the overall value and benefits of Sacramento's urban forest; inspirational information for the community
Energy Saving Facts / Seasonal Shadow Lengths Fact Sheet	Cost-benefit information on energy savings provided by trees; midsummer shadow length information and tree interception and projected energy savings
"Tall Trees: Twenty Myths Revealed" Brochure	Quells popular misconceptions and concerns about trees e.g. allergies, invasive roots, power line destruction, falling branches, etc.
Tree Species List / Tree Siting Guidelines Fact Sheet	Covers small, medium, and large tree species and their respective fall colors, soil moisture, growth rate, and required minimum distance from certain structural foundations

Table 1. STF educational folder. Materials in the current "Sacramento Shade" Folder and the information they contain.

This study is interested in the Sacramento Shade tree program's educational regime, specifically the exchanges, dialogue, and interactions between the program and the residents in the community receiving shade trees. Tree stewardship education in urban forestry is each tree recipient's understanding of how to plant and raise their tree(s).The educational information concerning the ideal maintenance practices for tree survival is at the resident's disposal, yet over half of the trees that get distributed do not survive after five years (Lindeleaf 2007). This raises the questions: How well do the shade tree program's education and outreach techniques transmit tree planting and stewardship knowledge to residents? Is the site visit a thorough enough interaction to accommodate the tree into each home, or should the program pursue further engagement and follow-up contact? To answer these questions, four components of the program's management curriculum were assessed: (1) the site visit and initial interactions, (2) the educational folder, (3) the tree care agreement, and (4) customer demographics. A questionnaire concerning these aspects of the program was administered to a simple random sample of 500 shade tree customers.

The objectives of this study are to evaluate the shade tree program's current education and outreach techniques and determine ways to improve those aspects of the program.

METHODS

A simple random sample of 500 shade tree customers who received trees in 2009 was

selected from the STF's Shade Tree Program database. Each customer received by mail: a cover letter, questionnaire (see Appendix A), sample tree care agreement for reference (see Appendix B), pre-paid envelope for returning the questionnaire, and an optional raffle sheet to enter in a contest for a free fruit tree (the prize and incentive for participating in this study). The Sacramento Municipal Utility District provided the funding to enable these mailings. Customers were also given the option of filling out the questionnaire online (a link to an online version was included in the cover letter). Two weeks after the first mailing, a second attempt was mailed out to those who had not yet responded, followed by a third and fourth final mailing spaced out by two week intervals (supplemented with respective cover letters of increasing urgency). This followed a modified technique from Dillman's Total Design Method for mail surveys (Dillman1978). After four mailing attempts over the course of three months, questionnaires that had not been received by Apri1 15thwere excluded from the study. A response rate of 35% (176 surveys from 176residents out of 500) is used here[1].

Description of the questionnaire

The site visit and initial interactions with the program

The purpose of this section is to assess the interaction between the community forester and resident during their first (and only) meeting. Here, we explore the nature of the site visit and how the program initially transmits tree care information to its customers. What topics are covered? Are residents satisfied with the site visit? Do they feel well equipped with the appropriate information to raise their shade trees? If they need more information after the site visit, what are the best ways to communicate and when? These are mainly yes/no and multiple-choice questions providing binary and categorical data. For example, question 2 of the survey asks, "How long was your meeting with the community forester?" and provides six check boxes with time frames. In addition, this section contains short answer and open-ended questions to obtain qualitative feedback.

Educational materials: the folder

The purpose of this section is to assess the effectiveness of the shade tree program's educational folder by determining the helpfulness and utility of each piece. Did customers read each item in the educational folder, and if so, how helpful did they find it? Is the educational

[1] An additional 10% of residents replied to the questionnaire, and this data will be entered and used by STF. However, due to thesis deadlines, it could not be analyzed for the present study.

material effectively doing its job in transmitting tree care information to otherwise uninformed tree owners? To answer these questions, this part of the survey lists each item in the educational folder given at the site visit. Photos of each piece are also included. Residents were asked to indicate whether or not they read (or watched) each item, or if they do not remember it at all—multiple choice questions with categorical data. Likertscales are also provided to determine the helpfulness of each item (Clason and Dormody, 1994), ranging from 1 (not helpful) to 5 (very helpful).The distribution of each educational piece's ratings is reported along with the mean and standard deviation.

The tree care agreement (TCA)

The purpose of this section was to evaluate the effectiveness of having residents sign a TCA at the end of the site visit. Is the map on the TCA easy to interpret? To what extent is the TCA a motivating factor for taking better care of the shade tree(s)?A copy of a sample TCA was enclosed for reference (see Appendix B). Residents were asked to indicate the extent to which they followed each of the agreements, and also how reasonable they found each agreement on Likertscales of 1 (not helpful) to 5 (very helpful). These responses are analyzed using similar method for part (2) above, finding the means and distributions of the response frequencies.

Customer demographics

This part of the questionnaire determines the demographics and diversity of the program's customer pool. What is the diversity of customer backgrounds? How can the educational material be adjusted to better communicate proper tree care practices to the entirety of the customer pool? Here we assess demographic information with multiple-choice questions involving education level, average income, race/ethnicity, and language spoken at home. The means and distributions of these responses are used in our analysis. The purpose of this section is to determine the diversity of the shade tree program's customer pool with the ultimate goal of making the educational material more accessible and understandable for every type of tree steward.

The questionnaire closes with an optional section for any additional comments. Each section of the questionnaire ends with space for comments. These are open-ended, providing qualitative and unrestrained feedback. A coding scheme is used to summarize them.

Tree stewardship education and engagement with the program

Residents can be broken into two groups based on their relative knowledge of proper tree

maintenance. This study makes a noteworthy assumption here: the more numerous the number of topics covered during the site visit and pieces of the educational folder read (indicators of preparedness), the more relatively well-educated on tree stewardship a resident is presumed to be. The number of topics covered during the site visit, the number of educational pieces read from the folder, and engagement with the TCA describe a resident's exposure to and familiarity with the program's educational material. Based on these criteria, a resident falls into the category of either(1) well-educated and relatively well prepared to plant and raise a shade tree, or (2) poorly-educated and relatively ill prepared to plant and raise a shade tree (Table 2). Furthermore, the program currently leaves all future communication (after the site visit and tree delivery) up to the discretion of the resident. If a resident has a question or concern regarding their shade tree, he/she would need to initiate the necessary contact with the program (usually by phone). One would assume that a relatively "educated" resident would not need future help from the program and thus not seek further contact. Conversely, relatively "uneducated" residents who are ill prepared with the information necessary to raise a healthy shade tree would be expected to initiate communication with the program with greater likelihood. Are poorly educated residents more likely to contact the program and seek help when compared to relatively well-educated residents? The program's current regime entrusts the residents to initiate contact as they need it, as they please. Two-way, symmetric communication is important for guiding the transmission of knowledge and information (Janse 2007).Should residents be "trusted" to seek helpful information when they need it, or should the program be contacting them? To answer this, the two categories of residents (well and poorly educated on tree stewardship) are used as predictors of further engagement with the program. Our null hypothesis states that there is no difference in the likelihood of seeking future contact between the two groups. Conversely, our hypothesis states that the poorly educated group is more likely to seek further contact with the program, as these residents need more help and information regarding tree stewardship.

Education on Tree Stewardship	Engagement with the Program
Poorly educated and relatively ill-prepared	Did not seek further contact/information
1. Covered less than half of the topics (site visit)	1. Did not contact program after site visit
2. Read less than half the materials (folder)	2. Did not wish to receive additional info
3. Did not read the TCA (or does not remember)	3. Did not suggest more info for the folder
4. Found the TCA map hard to interpret	4. Was not interested in reviewing folder w/ forester
Well educated and relatively well prepared	Sought Further Contact and Info
1. Covered over half of the topics (site visit)	1. Contacted program after site visit
2. Read over half the materials (folder)	2. Wished to receive additional info
3. Read the TCA	3. Suggested more info for the folder
4. Found the TCA map easy to interpret	4. Was interested in reviewing folder w/ forester

Table 2.Tree stewardship education and further engagement with the program. Here are the parameters used to describe a resident's tree stewardship education level. The two groups (poor or well educated) are used as predictors of further engagement with the program (after the site visit). These relationships help determine whether or not inadequately prepared, poorly educated residents are taking the proper initiative to further educate themselves and seek more information.

RESULTS

The site visit and initial interactions with the program

The length of the site visits showed a normal distribution (Figure 1) with over half of them (54.2%) reported lasting 16-30 minutes. 28.6% of residents recalled having a site visit that lasted longer than half an hour.

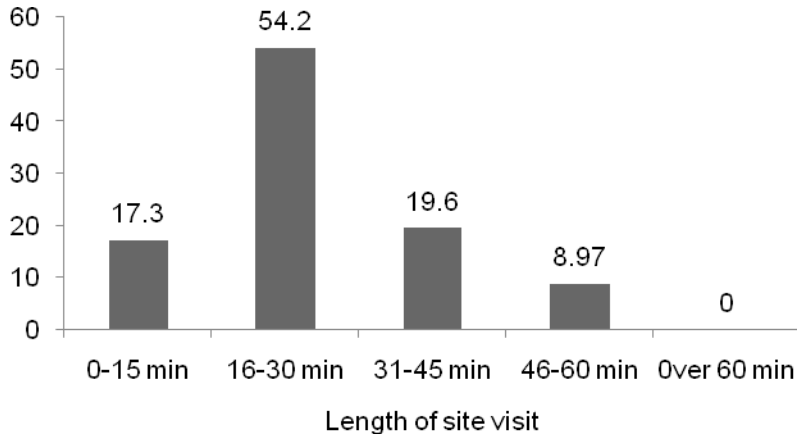


Figure 1. Length of the site visit. Reported as percentages of 156 customers who remembered.

The topics covered were numerous (Table 3).Nearly all the customers remembered discussing where to plant their tree (95.7%). Over half the respondents also recalled discussing tree-planting technique (76.5%), tree staking (66.7%), tree watering (68.5%), and mulching (51.2%).

Topics		Percent
Tree planting/ immediate care		
Where to plant the tree	155	95.7
Tree planting technique	124	76.5
Tree staking	108	66.7
Post-planting maintenance/ prolonged care		
Tree watering	111	68.5
Mulching	83	51.2
Tree pruning	61	37.6
General urban tree information		
Benefits of urban trees	79	48.81
Where to find additional info	67	41.4
Other	24	14.8
Did not remember	7	4.3

Table 3: Topics discussed during the site visit. Topics have been pooled into categories.

59.9% of customers reported having discussed where to plant, tree planting, *and* staking—all components that fall into the category of immediate tree care (Table 3). Furthermore, 29.6% reported having discussed tree watering, mulching *and* pruning—topics regarding prolonged, long-term tree maintenance after planting. However, only 29% of customers reported having discussed *all* of the six aforementioned topics of early *and* long-term tree care (tree planting and where, staking, watering, mulching, and pruning).

There was no significant association between the length of the

site visit and future contact with the program, $\chi^2(1,N=141)=0$, p=1). Residents whose site visits lasted longer than 15 minutes were about 3 times more likely to recall having discussed a greater number of tree care topics with the community forester, $\chi^2(1,N=156)=7.5$, p=.006.

Most shade tree customers (88%)did not express a desire to discuss any additional information. Of the 12% of customers who *did* express a desire to discuss further topics during the site visit, most would have liked to talk about general tree maintenance (37.5%), planting (18.75%), maturity (12.5%), and seasonal changes (12.5%), e.g. "planting near septic lines," "how tall it would grow," and specifics for "hot climate" (Figure 2).

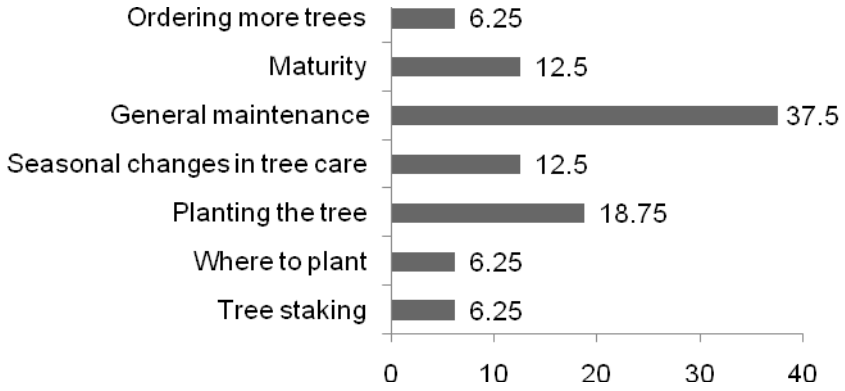


Figure 2 : Suggested topics for further discussion during the site visit (percentages).

Turning to customer-program interactions *after* the site visit, 19.9% of residents sought further contact with the program. When asked about their reasons for such contact in an open-ended question, the codified responses were in the categories of order adjustments and delivery inquiries (40.7%), aesthetically displeasing or unhealthy looking trees (14.8%), getting more trees (7.4%), and other miscellaneous information (Figure 3). These topics were generally concerned with bureaucratic procedures such as "coordinating possible delivery times" and "waiting on the availability of a Willow Oak."

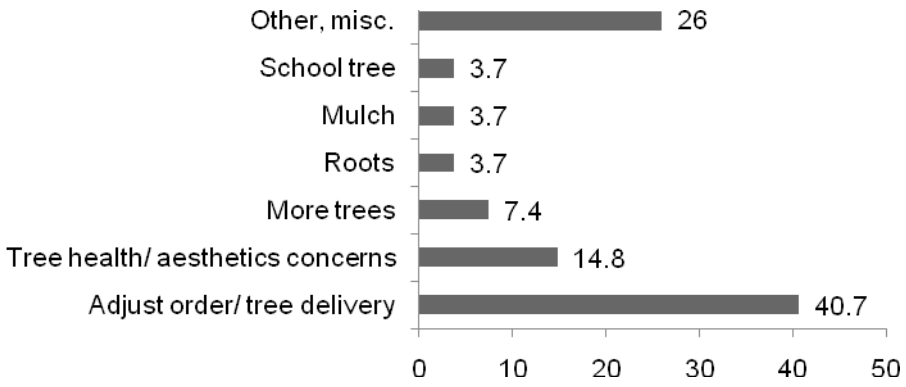


Figure 3: Reasons for further program contact after site visit (percentages)

Residents who indicated that they would have liked to discuss more information during the site visit were not any more likely to have contacted the program afterward, $\chi^2(1,N=145)=2.49$, p=.115.

When asked if there was any additional information they would have liked to receive from the program after the site visit, 91% replied no. When asked about the best times for future contact, most customers suggested one week after (36.1%), one year after (36.1%), and one month after (24.6%) (Figure 4a), with the best methods of contact being paper mail (59.1%), and e-mail (54.5%) (Figure 4b).

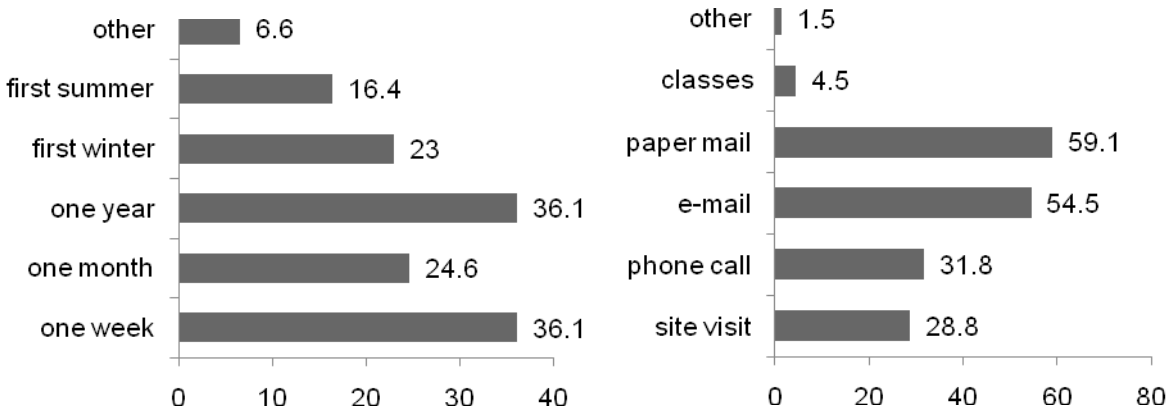


Figure4. How to contact customers with additional information. a. Best times.b. Best ways (both given as percentages of customers who answered these parts)

Educational materials: the folder

In the analysis of the educational folder and its components, some pieces were

found to be more useful than others. 95% of residents remembered receiving an educational folder from the program. Table 4 summarizes the utility and helpfulness of each piece in the folder. The mean helpfulness rating for each piece falls into the range of 3.84/5 (helpful) to 4.48/5 (very helpful), demonstrating that all the educational pieces (that the residents actually read or watched) were found to be helpful. The items with the highest rating averages are the tree planting and stewardship guide (mean=4.48, SD=0.79) and the tree species/siting guidelines sheet (mean=4.48, SD=0.85). 76.8% of residents reported having read both the tree planting and stewardship guide *and* the tree species/siting guidelines sheet—the two items residents found most helpful. Residents who thought the folder needed more information (8.3 %)were not significantly more likely to have contacted the program after the site visit, $\chi^2(1,N=129)=0.292$, p=.059. 7.1% of residents provided recommendations for the folder. Of these suggestions, 36.4% were related to season-specific maintenance, 27.3% to species-specific information, and 27.3% to images demonstrating what the trees and maintenance procedures should look like (Appendix C). 13.7% of residents expressed an interest in going over the educational material with their community forester.

		Helpfulness Rating						
Item	% who read/watched	1	2	3	4	5	*Mean*	SD
Sac Shade How to Plant Your Free Tree DVD*	50.9	1.19	3.57	14.3	22.6	58.3	*4.33*	0.9357
Sac Shade Tree Planting and Stewardship Guide	93.5	0.	1.92	12.8	20.2	65.1	*4.48*	0.7899
Free Wood Chips from SMUD Flier	63.0	1.01	4.04	19.2	21.7	54	*4.24*	0.9672
Sac Shade FrequentlyAsked Questions Brochure	76.5	0	4.1	17.2	31.1	47.5	*4.22*	0.8768
What will 5 millionmore trees mean to you? Pamphlet	49.4	1.25	1.25	16.3	25	56.3	*4.34*	0.8851
Energy Savings/ Seasonal Shadows Fact Sheet	69.7	0	7.21	14.4	65.8	12.6	*3.84*	0.7329
Tall Trees: Twenty Myths Revealed Brochure	48.8	0	3.85	12.8	25.6	57.7	*4.37*	0.8545

Tree Species List/ Tree Siting GuidelinesSheet	78.8	0	4.03	11.3	17.7	66.9	*4.48*	0.8503

Table 4. Summary of the utility and helpfulness of the educational material. Reported as percentages of applicable responses out of the 175 residents who remembered the folder (* 3 residents indicated watching the tree planting video online at the STF website).

The tree care agreement (TCA)

Most of the residents (78.5%) recalled reading the Tree Care Agreement. Of these respondents, 55.5% indicated that they had read it before signing, 14.6% after signing, and 30% did not remember.

In the interpretation of the TCA map, nearly all of the customers (97.1%) indicated that it was at least moderately easy to interpret, giving a rating of at least 3 out of 5 (Figure 5). Furthermore, there seemed to be no relationship between having read the TCA and finding the map relatively easy to interpret, $\chi^2(1,N=165)=0.18$, $p=0.67$.

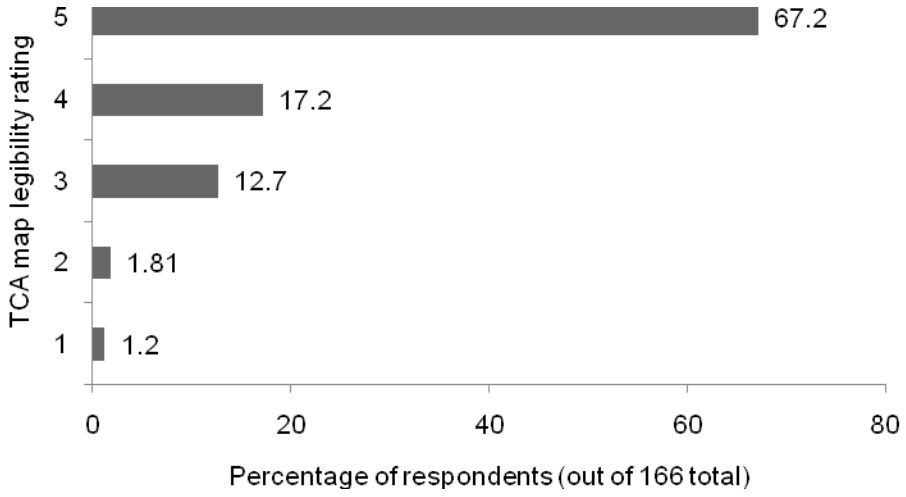


Figure 5. Distribution of TCA map helpfulness rating. Ranging from 1 (hard to interpret) to 5 (easy to interpret). Reported as percentages of 166 total applicable responses.

When asked how motivated they were by the TCA to take care of their shade trees, most residents (33.7%) found it very motivating (Figure 6).16.6% of residents did not find it motivating, rating it 1 (not motivating) or 2 out of 5 (very motivating). Furthermore, 42 residents gave comments about the TCA in the optional, open-ended

section. Half of these comments (50%) were codified as declaration of self-motivation without the TCA, stating things such as, "I am self-motivated" and "We don't need a contract to care for trees." In addition, 40.5% of these residents who declared their own self-motivation rated the TCA as only moderately motivating, at best a 3 out of 5.

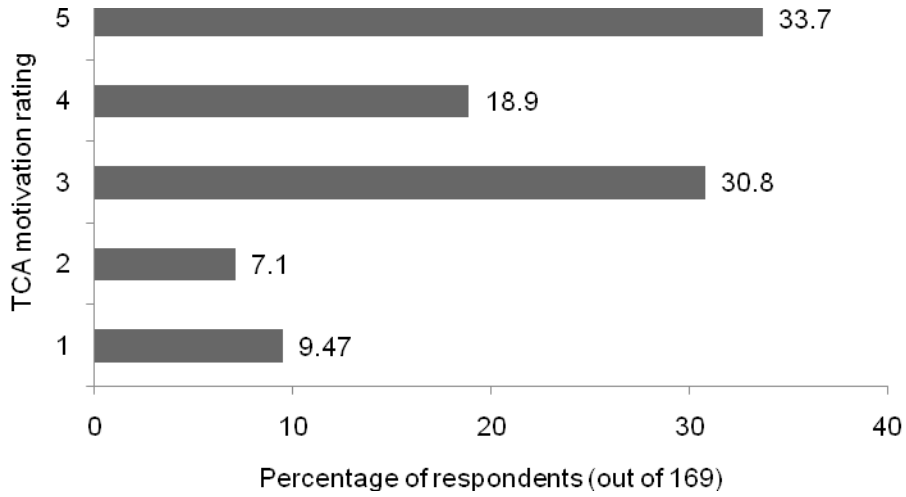


Figure 6. Distribution of TCA motivation ratings. Ranging from 1 (not motivating) to 5 (very motivating). Reported as percentages of 169 total applicable responses.

Customer demographics

Most of the residents (84.6%) who responded to the questionnaire were "owners and residents" of the properties on which the trees were planted.8.6% were residents and renters, 4.6% were owners and landlords, and 2.3% were school administrators, apartment administrators, or other.

Turning to resident race and ethnic group, most of the respondents (70%) were white (Figure 7).

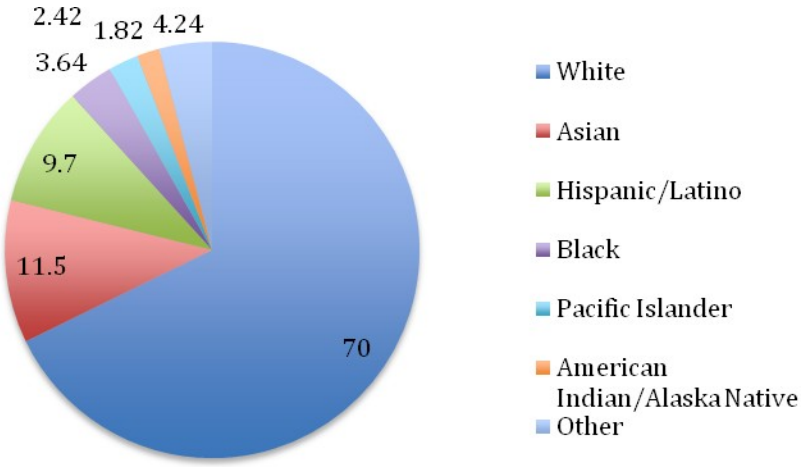


Figure 7. Distribution of customer race/ ethnic group. Reported as percentages out of 165 total applicable responses.

Annual household income levels of respondents were relatively equally distributed, except for the $90,0001+ level, which 24.8% of respondents reported making (Figure 8).

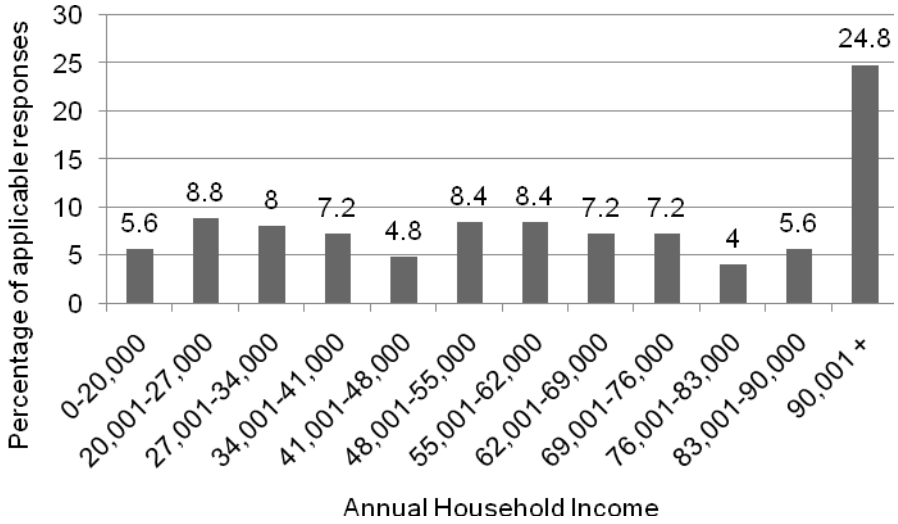


Figure 8. Distribution of customer annual income level. Reported as percentages out of 125 total applicable responses.

Most of the customers also come from educated backgrounds (Figure 9). 27.3% reported Bachelor's degrees, 24.8% reported some college, and 17.4% reported Master's degrees as their highest level of education achieved.

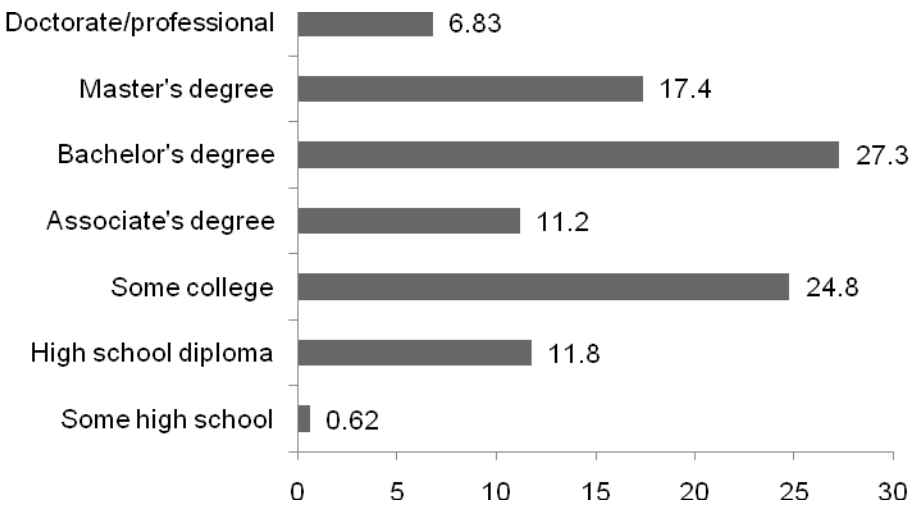


Figure 9. Distribution of customer education level. Reported as percentages out of 161 total applicable responses.

Turning to preferred languages, 95% of residents reported English as their main language spoken at home. The remaining 5% indicated Spanish, Chinese (Mandarin and Cantonese), Panjabi, Korean, Vietnamese, Tagalog, Persian, Russian, or other as their language of choice.

Tree stewardship education and engagement with the program

The relationship between relative resident tree stewardship knowledge and future program engagement was not significant, indicating that residents poorly educated on tree care practices were not significantly more likely to seek further contact with the program than well-educated ones. Thus, the null hypothesis is true, indicating that regardless of their education and knowledge about tree care, residents are generally not initiating communication with the program.

		Did not Seek Further Contact and Info				Sought Further Contact and Info			
		Did not contact program after site visit	Did not wish to receive additional info	Did not suggest more info for the folder	Did not express interest in reviewing folder w/ forester	Contacted program after site visit	Wished to receive additional info	Suggested more info for the folder	Expressed interest in reviewing folder w/ forester
Poorly educated, ill prepared	Covered less than half of the topics (site visit)	46	60	53	48	18	8	6	12
	Read less than half the materials (folder)	37	47	53	51	12	5	2	8
	Did not read the TCA (or does not remember)	26	31	29	31	3	3	2	2
	Found the TCA map hard to interpret	19	20	22	21	1	2	3	4
Well educated, well prepared	Covered over half of the topics the topics (site visit)	68	81	75	75	14	6	6	10
	Read over half the materials (folder)	74	88	90	88	18	8	11	14
	Yes, read the TCA	86	106	113	108	28	11	11	19
	Found the TCA map easy to interpret	89	113	118	114	28	11	10	18

Table 5. Summary of tree stewardship education and further engagement. The customers from the two groups (poorly and well educated on tree stewardship practices) and their likelihood of future contact with the program. Relationships were not significant, $p>0.005$ for all.

DISCUSSION

The objectives of this study were to evaluate the Shade Tree Program's education and outreach techniques and determine ways to improve those aspects of the program.

The site visit and initial interactions with the program

The site visit is likely the most intimate interaction shade tree residents ever have with the program. Amidst their jobs, families, and busy lifestyles, those 15-45 minutes with the community forester are the most profound engagement they will experience with the program. This site visit is where the most dialogue and discussion oftree planting and stewardship occurs. Because the shade tree program is a high-volume tree-distributing

program, the site visit is quick and efficient, with the purpose of situating the new shade tree into the customer's home and ensuring it will be cared for to adulthood (Frickmann, pers. comm.). The majority (54.2%) of the site visits were relatively quick, lasting about 16 to 30 minutes.

The topics discussed were numerous, but more oriented toward the planting and location of the tree—the things a resident must do for the tree immediately upon reception. This makes sense, as the location of the tree is important for the future energy savings and cost-benefit analyses that keep the program running (Heisler 1986, McPherson and Simpson 1995).As we move away from the short-term into topics more related to long-term, habitual maintenance of the tree(s), fewer and fewer residents reported discussing them. Relatively long-term practices like watering, mulching, and pruning were not as popularly discussed as those related to immediate tree care such as siting, planting, and staking. Indeed, it is important to discuss factors associated with the initial act of planting a tree, as poor planting, improper staking and tying techniques, soil compaction, and tree guard girdling all play a significant role in mortality of newly planted trees (Gilbertson and Bradshaw 1985, Beatty and Heckman 1981). Furthermore, proper tree siting is also important for the planting process of the shade trees, namely for the projected energy benefits inherent to the program (McPherson et al. 1994). The site visit makes a point of stressing the tree planting process and the very first things residents must do for their shade trees when they arrive at their property.

However, long-term tree *maintenance* is equally vital to the health and growth of shade trees (Summit and McPherson 1998). Even if properly planted, young trees are still vulnerable, especially during extreme seasons (Richards 1979). Maintenance behaviors strongly associated with tree growth are: watering, fertilization, reduced competition, and pest management. Pruning is also important for tree growth, but the appropriate habits are time-sensitive; it should be kept to a minimum in the very beginning to preserve the crown volume and photosynthetic area of young trees, although it is still important for early tree care when practiced in moderation (Nowak et al. 1990, Summit and McPherson 1998). Furthermore, water and nutrient stress and mechanical injury also play a significant role in the mortality of newly planted trees (Gilbertson and Bradshaw 1985, Beatty and Heckman 1981). On my ride-along with a community forester in late winter

of 2010, we visited a property that had two previously planted shade trees from a couple of years earlier. One of the trees was significantly smaller than the other, and we noticed it had been damaged by a lawnmower, compromising its absorption of nutrients in addition to the stress from competition with surrounding grass (Frickmann, pers. comm.). Post-planting maintenance is just as important as the planting itself, yet most of the residents in our study do not recall discussing as many of these topics, and this particular anecdote is an example of the poor maintenance that results from such miseducation.

Only about 1/4 of customers reported having discussed all of the following topics during the site visit: tree planting techniques, where to plant, staking, watering, pruning, and mulching—a thorough combination of planting and maintenance topics related to short and long term tree stewardship important for tree health. This means that nearly 3/4 of customers are not being thoroughly educated during the site visit, compromising the implementation of tree care practices necessary for young trees. A study on customer maintenance of shade trees conducted in 2008 found the following:28% of shade trees were not planted in the correct sited location, 37% of nursery stakes were left tied on the trees, only 28% had been properly staked, 30% of soil was improperly watered, and only 11% were properly mulched (Roman, unpublished data). Even with a site visit that emphasizes tree stewardship practices important for immediate care and planting, a significant proportion of residents is not implementing them. "Maintaining a healthy urban forest requires a variety of behaviors and an investment of time and money; because a considerable portion of the urban forest is on private land (in Sacramento, 72% of all trees are on residential property), the action of individual homeowners has a significant impact" (Beaty and Heckman, 1981).

Most of the suggestions for further topics to discuss during the site visit relate to tree maintenance issues; there were about twice as many concerns regarding general maintenance than there were concerns about planting (Figure 2), further highlighting the disproportionate discussion of topics during the site visit and the need for greater emphasis on proper tree maintenance. Residents also suggested topics related to seasonal maintenance of their shade trees. If the urban forest is to prosper, information on tree maintenance must be made available to tree owners (Summit and McPherson 1998). This places a greater emphasis on the educational folder and the individual will of the resident

to assume roles as tree stewards.

After the site visit, nearly 1/5 of residents sought further contact with the program. This communication was mainly concerned with tree order adjustments and delivery inquiries, getting more trees, miscellaneous information, and aesthetically displeasing or unhealthy looking trees (Figure 3).This sort of resident-initiated communication is not related to maintenance issues and further tree stewardship education, but rather the appearance of their trees. This suggests that while residents are concerned with tree health, they are generally not striving to "educate" themselves on the proper practices necessary to achieve that health. Certainly, personal issues of comfort and appearance are predominant incentives for residents to plant trees on their properties, with aesthetics and shade in particular playing a central role in the decision to order trees (Summit and McPherson 1998).

Educational materials: the folder

The folder thoroughly covers the information needed to raise a healthy shade tree. The single most important piece is the tree planting and stewardship guide, which covers the ideal planting procedure and gives advice on watering, mulching, and pruning for different seasons. The mean helpfulness rating of this item was 4.48 out of 5 (SD=0.7899), and 93.5% of residents recalled reading it. Community forester Pamela Frickmann has made a habit of emphasizing this item (along with the DVD) during the site visit (Frickmann, pers. comm.). With its diagram and step-by-step guide for tree planting, and comprehensive yet concise description of watering, fertilizing, mulching, weeding, staking and tying, pruning, and winter care, it is easily the item in the folder with the most thorough, informative instructions on how to plant and care for shade trees (Table 1). Though such an item provides helpful information on raising a healthy shade tree, its suggestions should be practiced regularly and consistently in order to be effective in the long run (Jennings 2003).

The next most popular item was the tree species list/tree siting guidelines sheet, which 78.8% of customers indicated reading. This makes sense, because there isn't a whole lot of reading or work to do when observing this item (or any earnest tree stewardship education to be extracted from it). It is essentially a tree menu listing botanical names, common names, sizes, flowers, growth rate, positioning guidelines, and

descriptions of autumn colors for dozens of tree species. This makes sense, as residents seem to be interested in the shade, comfort, and appearances of trees, as well as ordering more of them (Summit and McPherson 1998).

The third most popular item was the FAQ sheet, which 76.5% of customers reported reading. This pamphlet goes over a motley array of topics ranging from "How will I know the best places to plant trees for energy savings?" to "Why are there no fruit and evergreen trees?" The next most popular items were the energy savings sheet and the free wood chips flier, which 69.7% and 63% of residents read, respectively. Again, these small, colorful sheets are an easy read, providing interesting yet minimal information on general energy savings and where to get free wood chips (Table 1). After the site visit once the community forester leaves, a resident perhaps sits down and reads the folder for some time, skimming some of the more pleasant, easy information it contains, and likely does not reread the items extensively thereafter (Frickmann, pers. comm.). Interestingly enough, only half of the residents watched the DVD (50.4%).

A few residents (7.1%) provided some suggestions for the folder, namely season-specific and species-specific maintenance information and pictures of what the trees and maintenance procedures should look like. This is consistent with the suggested topics for further discussion during the site visit, which also related to general tree maintenance, tree growth and maturity, and seasonal changes (Figure 2); and the main reason (excluding bureaucratic delivery inquiries and miscellaneous information) for further contact with the program: tree aesthetics and concerns with unhealthy looking trees (Figure 3). This shows that residents want to learn more about the maintenance changes they should be making for the different seasons, as well as more images to support and describe those practices and their shade trees.

Although the educational folder is the most comprehensive resource of shade tree information available to the customer, consistent reference to it is important for reinforcing the actual implementation of those practices (Jennings 2003). A study on the implementation of recommended forest stewardship program practices in West Virginia found that "landowners who at least occasionally reference their plans are more likely to implement the prescribed practices than other landowners who pay little attention to their plan after its initial obtainment" (Jennings 2003). Consistent reference to recommended

stewardship practices means they are more likely to be mobilized, ultimately augmenting tree health. Though the information in the folder should in theory thoroughly educate residents on tree stewardship, a significant portion of shade trees were found to have been inadequately cared for (Roman, unpublished data). This suggests that even while residents do in fact read the educational material at some point, many of the most important tree care practices are not being implemented. To ensure the committed, consistent implementation of stewardship practices like mulching and watering, it is important that customers be reminded of them via more developed outreach techniques (McPherson et al. 1999, Hildebrandt et al. 1996).

The tree care agreement (TCA)

The tree care agreement is intended to provide customers with a sense of responsibility toward their shade trees. Most customers remembered the agreement and found it motivating, making it an important component of the program's outreach techniques. A similar tree-distributing non-profit urban forestry program in California, Million Trees LA, runs an analogous program called "Trees for a Green LA," which also binds residential customers with a sort of contract. However, this program does not leave customers with the benefit of the doubt, as they have to sign an online contract with an electronic signature, on top of being quizzed on the most important tree care practices *before* they become eligible for a free tree (Sarno, pers. comm.). Both the Trees for a Green LA and the Sacramento Shade Tree programs have implemented a type of contract to imbue customers with a sense of responsibility toward their tree.

There were mixed feelings toward the question in the survey that asked residents how motivated they were by the TCA to take better care of their shade tree(s). Most indicated that they were indeed motivated by the TCA. However, 50% of the optional comments in this section show that residents have an internal sense of pride, with self-proclaimed motivation to care for their tree(s) independent of the TCA. There is an intrinsic enthusiasm for tree stewardship; the motivation to raise a tree curiously stems from personal commitment. Whether or not a resident is familiar with extensive tree care practices, the single act of ordering a shade tree in the first place demonstrates an active interest in growing a tree. This intrinsic motivation is key; a study on recycling habits in New York City found that “intrinsic motivation mechanisms rather than overt extrinsic

solutions result in a greater likelihood of continuation of behaviors for the long-term" (Clarkea and Mantaay).This does not invalidate the importance of the agreement, but rather highlights the intrinsic interest in tree care on the part of the residents, something the program should acknowledge and possibly take advantage of.

Customer demographics

Most of our respondents (90%) were owners of the property for which they ordered shade tree(s), and 85% were residents, too. Only 8.6% of respondents reported being renters on the property. Furthermore, 70% of respondents reported being white, 41.6% reported an annual household income level of $69,001 or higher (24.8% of which were in the $90,000 or higher bracket), 62.7% reported holding a degree, and 95% reported English as their language of choice. Our respondents tended to be from educated, middle class, property-owning backgrounds. It makes sense that most participants of the Shade Tree Program own and live on the properties, as these people are generally more invested in the landscape and value of their homes (Lara, pers. comm.).Though the strengths of surveys lie in the representativeness of the information collected, this study likely attracted certain types of people, with the total number of participants being low (Loikkanen et al. 1997,Tyrväinenetal. 2003).In addition, the customers already most engaged with the program were more likely to respond to the questionnaire. This raises some uncertainties about this study's representation of the actual program customer pool.

Tree stewardship education and engagement with the program

Residents well and poorly educated on tree care practices were equally likely to have sought further engagement and contact with the program. The program's current regime entrusts the residents to initiate contact as they need it, as they please, yet inadequately educated, poorly prepared residents are failing to take the necessary initiatives to seek help with their tree(s). An inherent assumption here is that the educational material provided by the program determines the level of tree stewardship education. A poorly-educated, ill prepared resident is one who discussed few tree care topics and read less than half of the educational material provided by the program. Perhaps these residents are already knowledgeable and well versed in tree stewardship practices, and do not need the resources provided by the program. Even still, the program

exists for the community and is the most comprehensive master source for everything related to shade trees; communication between it and residents is key (Sipilä and Tyrväinen2005). It is clear that residents cannot be "trusted" to seek helpful information for themselves, and this is where the program should assume that responsibility.

Recommendations for management

Extend length of site visit

Extending the length of the site visit would allow for a more thorough discussion of tree stewardship, bolstering resident education and tree health.

While a high-volume tree-distributing program like the Sacramento Shade Tree prioritizes the efficiency and quantity of visits, it would be worthwhile to shift that focus to the quality of the visit. Indeed, the residents whose site visits lasted longer than 15 minutes were more likely to have discussed a greater proportion of tree stewardship topics. Furthermore, Sacramento county already has a high average number of trees per property relative to the number of potential trees per property, implying that the focus of the program should not be on the growth sector but rather on ensuring successful tree growth; that is, gage the time and effort to ensure the quality and survival of the shade trees rather than their sheer quantity (Summit and McPherson 1998).

A longer site visit would bolster resident exposure to and discussion of tree stewardship information, promoting healthier trees. The time investment here is usually worthwhile, as the trees would be better established, giving them a high probability of continued survival (Hildebrandt et al. 1996).Interestingly, nearly all of the residents who wrote something in the optional comment section of the questionnaire had only positive, remarkable things to say about the friendly community foresters and the pleasure of the site visit, describing them as "friendly," "knowledgeable," and "very helpful," many of them even referring to their respective community foresters by name. A slightly longer site visit would only do good, as the residents on a property have the opportunity to personally engage, asking and answering questions through human dialogue. "Group discussions are one of the most remarkable innovations in learning theory of the 20th century," as they promote reciprocal communication, profound discussion, and greater understanding (Van Herzele et al. 2005).

Organized folder design with easy reference

A new folder design is already under way, with clear, color-coded distinctions between important information such as planting, watering, and mulching (Caditz, pers. comm., Frickmann, pers. comm.). This new design takes the major themes scattered throughout the pamphlets in the current folder and organizes them in a more comprehensive, distinctive manner. I recommend adding a section on winter and summer care, too, as the long dry season requires, surprisingly, less frequent watering with longer, slow trickling for deeper soil penetration (Frickman, pers. comm.).This simplified and direct layout of the educational material would make it clear for residents exactly what practices need to be implemented to raise a healthy shade tree, rather than scattering those practices among various pamphlets.

Program-initiated follow-up contact

Though the site visit—the most intimate engagement between the program and the residents—should emphasize all topics relevant to tree care, realistically most of the time gets devoted to choosing the tree species, deciding on its location, and discussing the planting process; an extensive conversation here about pruning, though important for tree heath, is not only chronologically out of place but also impractical (Frickman, pers. comm., Nowak et al. 1990, Summit and McPherson 1998). Residents ought to be reminded of the maintenance they should be practicing on their trees at the relevant stage in the tree's lifetime. Ideal pruning practices, for example, change with respect to the tree's age and size, so residents should be reminded to adjust their practices when the time is right. This also applies to seasonal changes in tree needs, further highlighting the need for follow-up contact. Just as tree stewardship ought to be an ongoing, consistent habit, changing dynamically and seasonally as the tree grows, so should the management approach implement ongoing communication and active engagement with customers. Residents must be dedicated to the ongoing care of their shade trees. The program should "send out information on tree care to prompt program participants to water, mulch, prune, and inspect their trees" (McPherson 1999).

The lack of customer-initiated engagement also highlights the need for program-initiated follow-up contact. Relatively poorly prepared residents are not actively contacting the program and seeking help with their tree(s). Equally interesting, residents

who said they wanted to discuss more information during the site visit were not significantly more likely to have contacted the program afterward. Even when they feel inadequately prepared with tree stewardship knowledge necessary to raise a tree, they are not doing anything about it. The implications of this behavior for urban forest management programs are that their outreach plans should not leave it up to the individual residents to seek the information and help they need. Program-initiated follow-up contact would engage these inadequately prepared residents, reinforcing for them the recommended stewardship practices and increasing the likelihood of implementation (Jennings 2003).

Follow-up contact ought to still be cost-effective for the program (Roman, pers. comm.). To make these efforts cost-effective, the follow-up communication should be designed as a complement to the information already in the educational folder, saving resources. Small, single-sheet mailings one week after delivery (to ensure trees are properly planted and staked), the first summer after, the first winter after, and finally the first year after delivery would be relatively low-cost and feasible for the program to implement, and would also adhere to customer suggestions for the best times for follow-up contact (Figure 4a). Furthermore, such communication is only necessary during the "establishment phase" of young trees and does not need to continue extensively throughout a tree's lifetime (Richards 1979)."Active stewardship that increases the health and survival of recently planted trees is one strategy for increasing cost effectiveness" (Hildebrandt et al. 1996, McPherson et al. 2001). These extra efforts on the part of the program would likely pay off in the long run, as this sort of work increases survival rates and thus energy savings from trees.

Phone calls and e-mails are also effective, low-cost forms of follow-up communication suggested by residents (Figure 4b). A major benefit of telephone and e-mail communication is the feasibility of reciprocal dialogue. True and effective communication is not static but rather a social process involving at least two people, and to be reciprocal it must involve actions and reactions (Janse 2007). The exchange of information and ideas in both directions—the dialogue between the forester and the resident—creates a space for learning. "When a shared meaning basis is present, then an area of agreement or common ground comes into existence where both understanding and

communication can take place" (Burkart 1995). Furthermore, one phone call from a community forester to the resident whose property he or she visited would put the them on a first-name basis with one another and open up the possibility for further future contact. If the resident were to have any future questions, he/she would likely feel more comfortable and willing to call back (Roman, pers. comm.).This kind of engagement breeds an important relationship between the program and residents, one that can only improve the transmission of tree stewardship and boost tree survival (McPherson 1999).

Imagery that stresses the rewards to motivate residents

Customers responded well to the images in the educational folder, and they also requested more to describe what the trees and certain aspects of maintenance should look like. A central issue in communication is "the principle of encoding and decoding," the adequate transmission of information from the program to the residents (Lenke et al. 1995). People respond well to images, and they are an important component of learning. Efforts to optimize recycling habits in the diverse communities of New York City have implemented images in the educational material mailed to residents in order to promote legibility and universality of the information (Clarkea and Mantaay).The universal language of images makes communication and education straightforward and direct.

Furthermore, images emphasizing what a healthy shade tree should look like provide an added incentive. Residents could compare such images to their actual trees, giving them the opportunity to realize their tree's potential, and an incentive to provide better care. The objective here is the importance of reminding residents the rewards of tree stewardship—healthy, beautiful shade trees—and to commend them for their stewardship (Hildebrandt et al. 1996). "If participants were very certain that the recommended practices prescribed in their plan would fulfill their objectives they [are] much more likely to implement plan practices"(Jennings 2003).

The presentation of educational information alone is insufficient to motivate resident behavior (Geller et al. 1983). A supportive motivational system that includes feedback, commendation, and monetary incentives is substantially more effective than information alone in motivating individual environmental behavior and action (Geller et al. 1983). A follow-up mailing sent out to customers a year after planting that not only applauded the successful anniversary of the tree's life, but also the energy savings

obtained in that time would give residents a necessary "pat on the back," instilling a sense of pride and encouraging continued tree stewardship. This sort of support system ties tree stewardship practices to the ultimate goal they purport to achieve: full grown, healthy shade trees. This educational approach would undoubtedly incentivize residents, reminding them that their commitment and work has an edge of conceivable purpose.

CONCLUSIONS

This study found that there is much potential for improved program-customer engagement and ways to optimize the transmission of tree stewardship information. The combination of images, a supportive motivational system, program-initiated follow-up contact complementing a comprehensive set of educational materials, a longer site visit, and greater intimacy between residents and their community foresters is a management approach that supports the resilience of the urban forest. These education and outreach techniques encourage residents to become "part-time tree stewards," engaging them to better promote the healthy growth of shade trees and the benefits they impart.

One of the limitations of this study is that it did not shed light on the actual *implementation* of the educational material, nor did it ask about the frequency of reference to it. Another weakness was the inherent confounding factor of survey bias. To start, the survey was in English, so this automatically excluded customers fluent in languages other than English. Furthermore, people most likely to respond to surveys tend to come from educated, middle class backgrounds. This raises some uncertainty about the representative of our respondents with respect to the broader customer pool.

A recommendation for future studies is to determine residents' frequency of reference to the educational material. Future studies in this field should also focus on a long-term comparison of how different urban forest management regimes communicate with their community and cater to the needs of a diverse and busy customer pool (and the needs of their urban trees). Studies should also explore the relationship between certain outreach techniques and the resulting customer implementation of tree stewardship practices and the conditions of trees, creating a stronger tie between outreach techniques, management, and tree survival. Studies of this nature relating certain education and outreach techniques to tree health and survival would shed light on the ideal management

approaches. Next year at STF, with the new folder design and the addition of some type of follow-up contact—a phone call and mailing (e-mail, paper, or both)—a future study ought determine the effectiveness of these methods, and determine how well tree stewardship knowledge is transmitted. Finally, a community meeting to engage residents in participatory research would shed light on social behaviors and attitudes with respect to different education and outreach techniques (Sipilä and Tyrväinen, 2005).

The ultimate goal of this study is to help improve urban forest management and program participant education. These methods for community tree stewardship can be extrapolated to other environmental behavior and optimizing community education and awareness in the urban setting.

ACKNOWLEDGEMENTS

I would like to use this space here to express my gratitude to the inspiring instructors and GSIsof ES196 Patina Mendez, Kurt Spreyer, Lucy Diekman, and Gabrielle Wong-Parodi. Without their guidance and generous support, this study would not have been possible. I especially want to thank Patina Mendez and Lucy Diekman for their unremitting feedback and patience with this study, and for warmly guiding me through the process of writing a scientific paper. I am also indebted to Suzanne Robinson and LiaEconomos for their generosity and help with the tedious process of preparing the questionnaire mailings. Furthermore, I want to thank Jacobe Caditz, Desiree Backman, Luanne Leneke, Pamela Frickmann, and Sarah Saetern with the Sacramento Shade Tree Program for their kind and optimistic support, and for running the program with a genuine devotion to the shade trees and community. Lastly, I cannot express enough gratitude to my mentor Lara Roman for her dedication and marvelous enthusiasm for the field. Her intellectual guidance and unfaltering encouragement were this study's inspiration and backbone. Thank you.

REFERENCES

Beatty, R.A. and C.T. Heckman. 1981. *Survey of urbantree programs in the United States.* Urban Ecology 5:81-102.

Burkart, R. 1995.Kommunikationswissenschaft: Grundlagen und Problemfelder. Böhlau

Verlag, Vienna.

Cardelino, C. A. and Chameides, W. L. 1990. Natural hydrocarbons, urbanization and urban ozone. Journal of Geophysical Research 95, 13, 971-13, 979.

Clarkea, M. J.and Maantay, J. A. Optimizing recycling in all of New York City's neighborhoods: Using GIS to develop the REAP index for improved recycling education, awareness, and participation

Clark, J.R., Matheny, N.P.; Cross, G.; Wake, V. 1997. A model of urban forest sustainability. Journal of Arboriculture. 23(1): 17-30.

ClasonD. J., Dormody,T. L. 1994. Analyzing data measured by individual Likert-type items. J Agricultural Educ 35: 31–35.

Dillman D.A. 1978. Mail and telephone surveys: the total design method. New York: John Wiley & Sons.

Dwyer, J. F., McPherson, E. G., Schroeder, H. W., &Rowntree, R. A. 1992. Assessing the benefits and costs of the urban forest. Journal of Arboriculture, 18 (5), 227-234.

Dwyer, J. F., & Schroeder, H. W. 1994. The human dimensions of urban forestry. United States Department of Agriculture Forest Service

Ferrini, F., F.P. Nicese, S. Mancuso, A. Giuntoli. 2000. Effect of nursery production method and planting techniques on tree establishment in urban sites: preliminary results. J. of Arbor. 26: 281-284.

Geller, E., Ericksson, J., and Buttram, B.1983. Attempts to promote residential water conservation with educational, behavioral and engineering strategies. Population and Environment Behavioral and Social Issues 6, 96-112.

Gilbertson, P. and A.D. Bradshaw. 1985. *Tree survival incities: the extent and nature of the problem.*Arboric. J.9:131-142.

E. Heisler, G. 1986. Energy Savings with trees. J. Arboric. 15:113-125

Hildebrandt, E.W.,Kallett, R., Sarkovich, M.,Sequest, R. 1996.Maximizing the energy benefits of urban forestation. In: Proceedings ofthe ACEEE 1996 summer study on energy efficiency in buildings, volume 9;Washington DC: American Council for an Energy Efficient Economy: 121-131.

Insley, H. 1980. Wasting trees? The effect of handling and post planting maintenance on the survival and growth of amenity trees. Arbor. J. 4: 65-73.

Janse, G. 2007. Communication in forest policy decision-making inEurope: a study on communication processes between policy, science and the public.Academic Dissertation.DissertationesForestales: 48-72

Jennings, B.M. 2003. Implementation of recommended forest stewardship program

practices in West Virginia: Ten-year assessment. M.S. thesis, West Virginia Univ., Morgantown, WV. 68 p

Konijnendijk, C. C., Ricard, R. M., Kenney, A., and Randrup, T. B. 2006. Defining urban forestry - A comparative perspective of North America and Europe. Urban Forestry & Urban Greening, 4(3-4), 93-103.

Lenke, N., Lutz, H.D. &Sprenger, M. 1995.GrundlagensprachlicherKommunikation: Mensch, Welt, Handeln, Sprache, Computer. – Wilhelm Fink Verlag, Munich: 18-25.

Lindeleaf, W. 2007.Shade tree program 2006 tree survival study. SMUD Research and Evaluation. pp. 3-17. Executive Summary. Sacramento, CA.

Loikkanen, T., Simojoki, T., Wallenius, P., 1997.Osallistavansuunnittelunopas luonnonvara-ammattilaisille (A Guide to Participatory Planning for Professionals of Natural Resources). Metsa¨hallitus, Kuopio (in Finnish).

Martin, C.W., R.C. Maggio and D.N. Appel. 1989. The contributory value of trees to residential property values in the Austin, Texas metropolitan area. J. of Arbor. 15: 72-76.

McPherson, E.G. 1994.Benefits and costs of tree planting and care in Chicago. In McPherson, E.G., D.J. Nowak, and R.A. Rowntree (Eds.). Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. USDA for. Serv. Northeast. For. Exp. Sta. Gen. Tech. Rpt. NE-GTR-186.

McPherson, E. G., Scott, K. I., & Simpson, J. R. 1998. Estimating cost effectiveness of residential yard trees for improving air quality in Sacramento, California, using existing models. Atmospheric Environment, 32(1), 75-84.

McPherson, E.G., and J.R. Simpson. 1995. Shade trees as a demand-side resource. Home Energy. March/April 1995:11-17.

McPherson, E. G. and Simpson, J. R. 1999. Carbon dioxide reduction through urban forestry: Guidelines for professional and volunteer tree planters. Gen. Tech. Rep. PSW- GTR-171. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 237 p.

McPherson, E. G, J.R. Simpson, P.J. Peper, Q. Xiao, D.R. Pittenger and D.R. Hodel. 2001. Tree guidelines for inland empire communities, Local Government Commission, Sacramento, CA.

Nowak, D. J., McBride, J. R., Beatty, R. A. 1990. Newly planted street tree growth and mortality. Journal of Arboriculture. 16(5): 124-130.

Nowak, D. J., Kuroda, M., and Crane, D. E. 2004. Tree mortality rates and tree population projections in Baltimore, Maryland, USA. Urban Forestry & Urban Greening, 2, 139-147.

Richards, N.A. 1979. Modeling survival and consequent replacement needs of a street tree population. J. of Arbor. 5: 251-255.

Sipilä, M., and Tyrväinen, L. 2005. Evaluation of collaborative urban forest planning in Helsinki, Finland. Urban Forestry & Urban Greening, 4[s](1), 1–12.

Summit, J., and McPherson, E. G. 1998. Residential tree planting and care:A study of attitudes and behavior in Sacramento, California. Journal of Arboriculture,22(2), 89-97.

Tyrväinen, L., Silvennoinen, H., Kolehmainen, O. 2003. Ecological and aesthetic values in urban forest managment. Urban Forestry & Urban Greening 1, 135–149.

Van Herzele, A., Collins, K., Tyrva¨inen, L., 2005. Involving people in urban forestry. A discussion of participatory practices throughout Europe. In: Konijnendijk, C.C., Nilsson, K., Randrup, T.B., Schipperijn, J. (Eds.), Urban Forests and Trees. A Reference Book. Springer, Heidelberg, pp. 207–228.

Weedall, M. 1995. What we know about shade trees and energy use in Sacramento. In *Benefits of the Urban Forest.*pp. 5-6. Sacramento, CA: Sacramento Municipal Utility District.

Wells, N. M. 2000. At home with nature: effects of 'greenness' on children's cognitive functioning. Environment and Behavior. Vol. 32, No.6, 775-795.

APPENDICES

Appendix A: sample of the questionnaire

Sacramento Shade Tree Customer Questionnaire 2010 **[Cust ID#]**

Today's date: _____ / _____ / _____

Month / Day / Year

PART 1: Interactions with the shade tree program

1. Were you the person who interacted with the community forester? The community forester is the Sacramento Tree Foundation staff member who visited your property. (check one)

   □Yes→ Continue to question 2

   □ No → Go to question 8 in Part 2 of this survey

2. How long was your meeting with the community forester? (check one)

   □ 0-15 minutes □ 16-30 minutes □ 31-45 minutes

   □ 46-60 minutes □ over 60 minutes

   □ I do not remember

3. What did the community forester talk about during your site visit? (check all that apply)

   □ Tree planting technique □ Tree watering
   □ Where to plant the tree □ Tree pruning
   □ Benefits of urban trees □ Tree staking
   □ Mulching □ Where to find additional information
   □ Other: (please explain) _____

   □ I do not remember

4. Was there more information you would have liked the community forester to talk about *during* your site visit? (check one)

□Yes→ Continue to question 4a

□ No → Go to question 5

4a. What specific topics would you have liked to talk about *during* the site visit?

5. Did you contact the shade tree program *after* the site visit? (check one)

□ Yes → Continue to questions 5a and 5b

□ No → Go to question 6

□ I do not remember → Go to question 6

5a. Who did you communicate with? (check all that apply)

□ Stewardship coordinator (Luanne Leineke)

□ Community forester (the staff person who visited your property)

□ Other Sacramento Tree Foundation staff: (please explain) _____

□ Sacramento Municipal Utility District (SMUD) staff

□Other: (please explain)_____

□ I do not remember

5b. Why did you contact the program, and what specific topics did you discuss?

6. Is there additional information you *would have liked to receive* from the Shade Tree Program *after* your site visit? (check one)

□ Yes → Continue to questions 6a, 6b, and 6c

□ No → Go to question 7

6a. What additional information would you have liked to receive *after* the site visit?

6b. In the future with the Shade Tree Program, when would it be best for us to send customers additional information? (check all that apply)

□ 1 week after receiving tree

□ 1 month after receiving tree

□ 1 year after receiving tree

□ First winter after receiving tree

□ First summer after receiving tree

□Other: (please explain)_____

6c. What is the best way to receive additional information? Please rank in order of preference with 1 being the most preferred.

___ In-person site visit

___ Phone call

___ Email

___ Paper mail

___ Tree care classes

___ Other: (please explain) _____

7. Please write any additional comments about your interactions with the Shade Tree Program:

PART 2: Educational materials

8. Do you remember receiving a "Sacramento Shade" folder from the community forester? This folder has educational materials about your tree and was given to you during the site visit. (check one)

   □Yes→ Continue to question 9

   □ No → Go to question 13 in Part 3 of survey

9. Below is a list of the materials in the "Sacramento Shade" folder. Please note whether you remember each item from the folder, and whether or not you read (or watched) it. For the items that you read (or watched), please tell us how helpful they were.

9a. "Sacramento Shade How to Plant Your Free Tree" DVD

□ Yes, I did watch the DVD

□ No, I did not watch the DVD

□I do not remember this item from the folder

If YES, you did watch the DVD, how helpful do you consider it?

Not helpful				Very helpful
□1	□2	□3	□4	□5

9b. "Sacramento Shade Tree Planting and Stewardship Guide" (which includes instructions on planting and caring for your tree)

□ Yes, I did read this item

□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5

9c. "Free Wood Chips From SMUD" Flier

□ Yes, I did read this item

□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5


Sacramento Shade
Frequently Asked Questions

Why is SMUD giving away free shade trees?

Once properly placed shade trees mature, you can save as much as 40 percent on your summer cooling electric bill and help conserve energy during SMUD's peak usage period. Shade trees also improve our air quality, provide beauty and privacy, improve property values, and absorb storm runoff.

How will I know the best places to plant trees for energy savings?

A Sacramento Tree Foundation (STF) Community Forester will set up a site visit at your home to help you select appropriate trees based on the amount of room in your yard, soil conditions, and SMUD's requirements for energy saving tree sitings.

When is the best time of year to plant trees?

The shade tree program, *Sacramento Shade*, distributes trees to be planted twelve months of the year. Availability of tree species is **best in late spring, summer, and early fall**. During the hot summer months extra care should be taken when loosening the root ball and providing deep watering on a regular basis.

How is the tree list chosen? I don't see some of my favorite trees!

The Sacramento Tree Foundation's Technical Advisory Committee created SMUD's shade tree list. The trees are chosen for their longevity, adaptability to local soils, strong structure, and a minimum of insect disease, excessive litter, surface root and mistletoe problems.

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.®

®A registered service mark of Sacramento Municipal Utility District

9d. "Sacramento Shade Frequently Asked Questions" Brochure

□ Yes, I did read this item

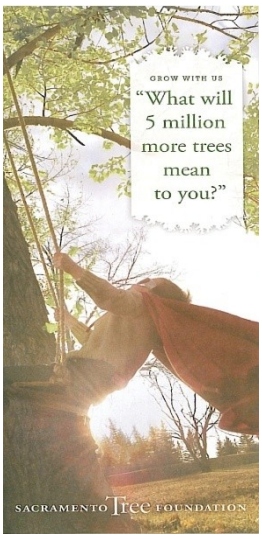
□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5



9e. "What will 5 million more trees mean to you?" Brochure

□ Yes, I did read this item

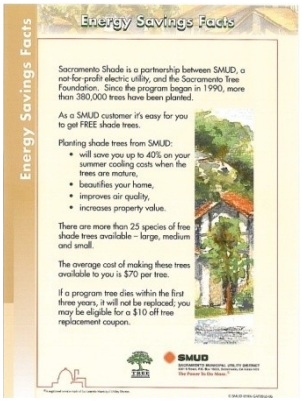
□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5



9f. "Energy Saving Facts / Seasonal Shadow Lengths" Fact Sheet

□ Yes, I did read this item

□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5

9g. "Tall Trees: Twenty Myths Revealed" Brochure

□ Yes, I did read this item

□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5

9h. "Tree Species List / Tree Siting Guidelines" Fact Sheet

□ Yes, I did read this item

□ No, I did not read this item

□I do not remember this item from the folder

If YES, you did read this item, how helpful do you consider it?

Not helpful Very helpful

□1 □2 □3 □4 □5

10. Is there additional information you would like to see added to the folder?

□Yes→Continue to question 10a

□ No →Go to question 11

10a. What do you think should have been included in the folder?

11. Would you have liked to talk about the materials in the folder with the community forester during the site visit?

□Yes→ Continue to question 11a

□ No → Go to question 12

11a. Why would you like to talk about the materials in person?

12. Please write any additional comments about the educational materials:

PART 3: Tree Care Agreement

These questions concern the Tree Care Agreement that you received during the site visit with the community forester. A sample Tree Care Agreement is enclosed. Please refer to it while answering these questions.

13. Your Tree Care Agreement includes a list of five agreements. Did you read these agreements before now? (check one)

□Yes→ Continue to question 13a

□ No → Go to question 14

□ I do not remember → Go to question 14

13a. Did you read the agreements before or after signing the Tree Care Agreement?

□Before signing □ After signing □ I do not remember

14. The Tree Care Agreement includes a map showing the suggested planting locations for your tree(s). How easy or hard is this map to understand?

Hard to understand				Easy to understand
□1	□2	□3	□4	□5

14a. Please give specific suggestions (if any) to improve the map:

15. To what extent did signing the Tree Care Agreement motivate you to take better care of your tree?

Not motivating				Very motivating
□1	□2	□3	□4	□5

16. Please write any additional comments about the Tree Care Agreement:

PART 4: Customer Information

17. Which of the following best describes your situation when you received your shade tree(s)? (check one)

□ Owner and resident, living on this property

□ Resident and renter, living on this property

□ Owner and landlord, living elsewhere

□ Home owner association administrator / representative

□ School administrator

□ Apartment administrator

□ Park administrator

□Other: (please explain)_____

18. Which of the following best describes your race or ethnic group? (check all that apply)

□ Hispanic or Latino

□ White

□ Black or African-American

□ American Indian or Alaska Native

□ Asian

□ Native Hawaiian or Pacific Islander

□Other: (please explain)_____

□ I prefer not to answer

19. What is the annual income for your household? (check one)

□ $20,000 or less
□ $20,001 to $27,000
□ $27,001 to $34,000
□ $34,001 to $41,000
□ $41,001 to $48,000
□ $48,001 to $55,000
□ $55,001 to $62,000
□ $62,001 to $69,000
□ $69,001, to $76,000
□ $76,001 to $83,000
□ $83,001 to $90,000
□ $90,001 or higher

□ I prefer not to answer
□ I do not know

20. What is your highest level of education achieved? (check one)

□Some high school
□ High school diploma or equivalent
□Some college
□ Associate's Degree
□ Bachelor's Degree
□ Master's Degree
□ Doctorate or Professional Degree
□Other: (please explain)_____
□ I prefer not to answer

21. What language do you mostly speak at home? (check all that apply)

□ English □ Spanish

□ Vietnamese □ Miao, Hmong

□ Korean □Tagalog

□ Chinese: circle Mandarin or Cantonese □ Japanese

□ Hindi □ Armenian

□ Panjabi □ Miao-Yao, Mien

□ Persian □ German

□ French □ Russian

□ Ukrainian □Other: (please explain)_____

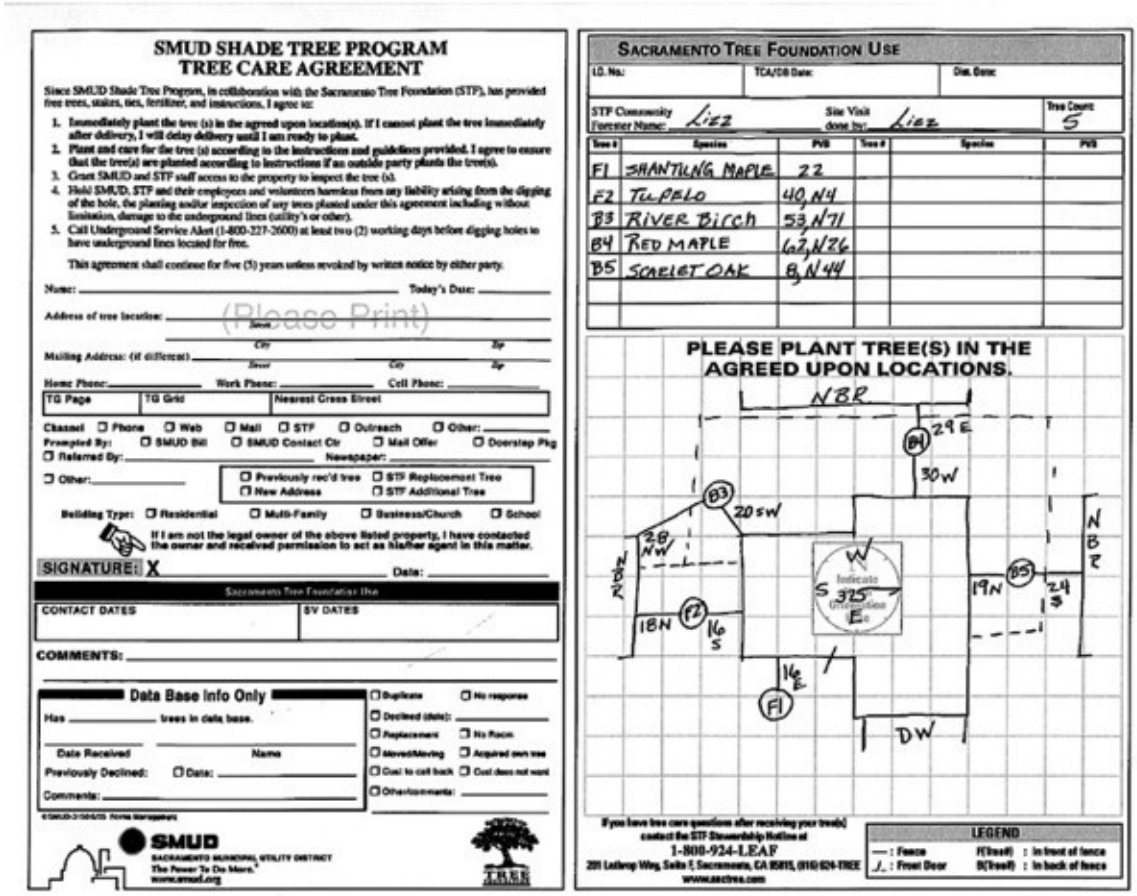
□ I prefer not to answer

PART 4: Additional Comments

Thank you for completing this questionnaire!

Additional comments about the Shade Tree Program are welcome!

Appendix B: sample TCA



SMUD SHADE TREE PROGRAM
TREE CARE AGREEMENT

Since SMUD Shade Tree Program, in collaboration with the Sacramento Tree Foundation (STF), has provided free trees, stakes, ties, fertilizer, and instructions, I agree to:

1. Immediately plant the tree (s) in the agreed upon location(s). If I cannot plant the tree immediately after delivery, I will delay delivery until I am ready to plant.
2. Plant and care for the tree (s) according to the instructions and guidelines provided. I agree to ensure that the tree(s) are planted according to instructions if an outside party plants the tree(s).
3. Grant SMUD and STF staff access to the property to inspect the tree (s).
4. Hold SMUD, STF and their employees and volunteers harmless from any liability arising from the digging of the hole, the planting and/or inspection of any trees planted under this agreement including without limitation, damage to the underground lines (utility's or other).
5. Call Underground Service Alert (1-800-227-2600) at least two (2) working days before digging holes to have underground lines located for free.

This agreement shall continue for five (5) years unless revoked by written notice by either party.

Name: _____ Today's Date: _____

Address of tree location: _____ (Please Print)
Street
City Zip

Mailing Address: (if different) _____
Street City Zip

Home Phone: _____ Work Phone: _____ Cell Phone: _____

TG Page	TG Grid	Nearest Cross Street

Channel ☐ Phone ☐ Web ☐ Mail ☐ STF ☐ Outreach ☐ Other: _____
Prompted By: ☐ SMUD Bill ☐ SMUD Contact Ctr ☐ Mail Offer ☐ Doorstep Pkg
☐ Referred By: _____ Newspaper: _____
☐ Other: _____
☐ Previously rec'd tree ☐ STF Replacement Tree
☐ New Address ☐ STF Additional Tree
Building Type: ☐ Residential ☐ Multi-Family ☐ Business/Church ☐ School

If I am not the legal owner of the above listed property, I have contacted the owner and received permission to act as his/her agent in this matter.

SIGNATURE: X _____ Date: _____

Sacramento Tree Foundation Use

CONTACT DATES	SV DATES

COMMENTS: _____

Data Base Info Only
Has _____ trees in data base.
Date Received Name
Previously Declined: ☐ Date: _____
Comments: _____

☐ Duplicate ☐ No response
☐ Declined (date): _____
☐ Replacement ☐ No Room
☐ Moved/Moving ☐ Acquired own tree
☐ Cost to call back ☐ Cost does not want
☐ Other/comments: _____

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.®
www.smud.org

TREE

SACRAMENTO TREE FOUNDATION USE

I.D. No.:	TCA/DB Date:	Dist. Done:

STF Community Forester Name: Lizz Site Visit done by: Lizz Tree Count: 5

Tree #	Species	PVB	Tree #	Species	PVB
F1	SHANTUNG MAPLE	22			
F2	TUPELO	40, N4			
B3	RIVER BIRCH	53, N71			
B4	RED MAPLE	62, N26			
B5	SCARLET OAK	8, N44			

PLEASE PLANT TREE(S) IN THE AGREED UPON LOCATIONS.

If you have tree care questions after receiving your tree(s) contact the STF Stewardship Hotline at
1-800-924-LEAF
201 Lathrop Way, Suite F, Sacramento, CA 95815, (916) 924-TREE
www.sactree.com

LEGEND
—: Fence F(Front): In front of fence
▯: Front Door B(Back): In back of fence