Final EM&V Report for San Diego Cool Communities Shade Tree Program (CPUC 1306-04)

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San Diego Cool Communities Shade Tree Program
Table of Contents

1. Introduction

The San Diego Cool Communities Shade Tree Program is designed to promote tree planting primarily among residential customers in an effort to reduce long-term energy consumption and peak demand. The program is also open to public schools; however, the participation of these groups has been quite limited. Accordingly, the primary focus of this EM&V report is residential customers. The objectives of the EM&V activity, which was conducted for the California Public Utilities Commission (CPUC) at arms-length from the implementer, are to provide:

- baseline analysis;
- on-going feedback, and corrective and constructive guidance regarding the implementation of the program;
- an overall assessment of the performance and success of the program including quantification of energy and peak demand savings; and,
- an assessment of whether there is a continuing need for the program.

In this final report, we include a baseline analysis of other similar programs evaluated in California, a complete description of the program, a summary of program progress over the period June 2004 through June 1, 2006, an evaluation of the potential number of energy saving trees, a process evaluation from the customer's perspective, the results of a telephone survey of 200 participants in the San Diego Cool Communities Shade Tree Program, and an overall evaluation.

2. Key Findings of this Study

The program's primary achievements were:

- planting 16,191 trees, which is 95 percent of the programmatic goal of 17,000 trees;
- providing a service to program participants that resulted in extremely high customer satisfaction; and
- generating significant societal benefits.

However, several problems remain apparent. These include:

- the number of trees that will ultimately provide energy savings, which is dependent on planting location (within San Diego County, vis-à-vis the home,

etc.), tree survival, and other factors, is significantly fewer than the number of trees planted (see Table 1 below);

- there seems to be significant free-ridership, which further limits the potential energy savings, in that individuals who would have planted trees in the absence of the program are planting a fairly large portion of the trees (see Table 1 below);
- the program participants seem to be non-representative of the overall San Diego county population in that they are wealthier, older, less ethnically diverse, and more educated; and
- marketing/outreach has not been able to attract participation of the traditional hard-to-reach population groups.

The impact of the first two problems listed above is demonstrated in Table 1. The first two rows of the table show the overall program goal of planting 17,000 trees and the actual planting level, respectively. An examination of the program database provides information on the location of tree plantings within San Diego County (coastal, inland, mountain), and the proximity and relation to the residential structure (east, west, south and distance). From this information, we can create an estimate of the number of trees that are either unlikely or likely to provide energy savings (see section 5). Ranges for these estimates are provided in the third and fourth rows of the table. We also adjust for tree mortality and free-ridership, which is defined in this study as individuals who were already planning to plant trees. Information on these issues was obtained from a survey of the program's customers (see section 6). Given all these adjustments, we derive an estimate of the trees that are likely to produce energy savings. These values are shown in the bottom of Table 1. Of course, these estimates are preliminary numbers and have a significant amount of embedded uncertainty, which should be addressed in future program evaluations.

Therefore, our bottom-line conclusions regarding the program are: (1) individuals receiving trees rate the program exceedingly high; (2) it generates benefits beyond pure energy savings (e.g., education on proper tree planting and care, more livable communities, carbon dioxide reduction, etc.); and (3) the number of trees that will ultimately provide energy savings is a small percentage of either the programmatic goal of the trees actually planted. This suggests that re-design of some aspects of the program

is necessary in order to increase the relative proportion of energy saving trees. For example, the program needs to implement additional free-rider screening and more explicit requirements for planting trees in locations that provide the intended effect. Of course, these measures will increase the cost of planting each tree and this trade-off must be considered in any re-design. We consider these program design issues in more detail below.

Table 1
Estimate of Potential Energy Saving Trees

Tree Planting Issue	Trees
Planting Goal	17,000
Trees Planted	16,191
Non-Energy Saving Plantings	8,950 – 9,391
Energy Saving Plantings	6,800 – 7,241
Tree Mortality	163 – 174
Free-Rider Plantings	4,891 – 5,208
Potential Energy Saving Plantings	
Number	1,746 – 1,859
% of Goal	10.3 – 10.9
% of Plantings	10.8 – 11.5

3. Baseline Analysis

The objective of the baseline analysis is to determine the existence and relevance of previous evaluations of shade tree programs.[1] Zebedee & Associates conducted a review of the literature, primarily using the California Measurement Advisory Committee website (http://www.calmac.org/), the California Energy Commission website (http://www.energy.ca.gov/), and several forestry related websites (see especially http://wcufre.ucdavis.edu, www.sactree.com, and www.smud.org/residential/saving/trees), to determine whether or not baseline data exist for programs similar to the Cool Communities Shade Tree program to be conducted by SDREO. Our literature search produced the following two conclusions. First, the

[1] This review of evaluations focused on similar California programs as described in the Research Plan. Future evaluations of the program should consider a more comprehensive market assessment analysis as defined in the CPUC Energy Efficiency Policy Manual. That said, the literature review did provide useful information for this evaluation as further described in this section.

benefits and costs of tree planting seem well established. The bottom line is that planting trees yields significant social net benefits. In addition, the energy related benefits of appropriately planted trees (proper location, etc.) are a substantial share of overall net benefits. However, the placement of trees and the magnitude of tree attrition can significantly affect energy related and other benefits. Second, there exists extensive evidence regarding how to effectively create a tree-planting program so that individuals and communities engage in these activities in both the short and long runs. Consider each of these conclusions in detail below.

3.1. Brief Literature Review of the Benefits of Trees

According to "Tree Guidelines for Coastal Southern California Communities" planting a large tree produces net benefits of approximately $2,600 over a forty-year life (see McPherson, et al, 2000). This net benefit figure decreases with the size of the tree, with small trees breaking about even. In another study, Simpson and McPherson (2001) estimated that the net benefits/tree for five-gallon trees averaged $660 for a 30-year life cycle. Finally, McPherson, et al (2002) estimated that the net benefits from Modesto's urban forest were approximately $12.76/ resident or $25.55/tree.[2]

The benefit categories for planted trees include reduced energy use (15 – 30 percent of a home's cooling cost through shading, evapo-transpiration, and wind speed reduction), air quality improvement (absorption and interception of pollutants, oxygen release, transpiration), water quality effects (reducing soil erosion), and social impacts (noise abatement, recreation settings, property value increase, aesthetics). The primary costs of trees are trimming and removal, root damage, leaf litter, and irrigation.

With regard to energy related savings, McPherson and Simpson (2001a) estimate that the Los Angeles Department of Power and Water program creates energy conservation benefits of 81 kWh/year for each tree planted. This value is a net figure in that the authors have adjusted for climate effects, air conditioner saturations, relative energy consumption of room air conditioning and evaporative cooling, and shade from neighboring buildings.

[2] It should be noted that the use of the term "net" by McPherson et al, (2002) is inconsistent with its use in the evaluation of energy efficiency programs. Specifically, the "net" in McPherson et al (2002) accounts for tree cost, tree maintenance costs, tree mortality, etc. whereas the latter measure includes an assessment of the appropriateness of planting and free-ridership.

Of course, net benefits will be tree and location specific but the literature we reviewed was unanimous in concluding that trees provide significant expected net energy conservation and social benefits (see Akbari, et al, 1992; Anderson, 1995; Dwyer, et al, 1992; Heisler, 1986; McPherson, 1992a; McPherson, 1992b; McPherson, et al, 2000; Rosenfeld, et al, 1998; Simpson and McPherson, 1996; McPherson and Simpson, 2001a; McPherson and Simpson, 2001b). In addition, these net benefits will be substantially increased if trees are selected and located properly, with tree selection and/or location dependent upon program goals (e.g., cooling only or a combination of cooling/warming, outdoor shading, or wind breaks, short or long term market effects, etc.) as well as the water and maintenance requirements of surrounding plants. Furthermore, survival rates have a disproportionate impact on projected net benefits (Hildebrandt, et al, 1996).

3.2. Design of Shade Tree Programs

As indicated, there is general unanimity regarding benefits versus costs over the life of a well-situated tree. In addition, there is general agreement regarding how to create an effective tree-planting program. There following are several important design factors that have been associated with long-term program success (see McPherson, et al, 2000)[3]:

- establish of an organizing or core group to plan, build coalitions, and forge important partnerships;
- develop a set of program objectives that are measurable in real time (e.g., number of plantings per time period, percentage of future tree canopy cover, etc.);
- foster direct participation among community members to develop local involvement and concern;
- provide training and assistance, especially where specialized knowledge or resources are required;
- nurture volunteers to maintain long-term involvement;
- obtain high-quality nursery stock in order to enhance retention;
- develop a list of recommended trees that perform best in alternative situations;

[3] Note that McPherson, et al (2000) interpret success to be associated with tree plantings, whereas we are more concerned with the corresponding energy savings of the planted trees. Therefore, a more comprehensive "indicators of success" list would include tree planting requirements and free-rider screeners to guarantee that the trees produce the intended savings.

- commit to long-term stewardship (inspection, maintenance to maximize survival and growth;
- self-evaluate in order to improve program design elements;
- provide public education to inform and to stimulate new linkages in the community and to heighten the potential for long-term market effects.

There have been several previous tree-planting efforts (see McPherson and Simpson, 1995, for an early survey) related to energy conservation. Shade tree programs, for example run by the Sacramento Municipal Utility District (SMUD), the Los Angeles Department of Water and Power (LADWP), American Electric Power (AEP), Tucson Electric Power, all have several program components in common. These include: (1) a partnership between the utility and a "tree foundation;" (2) well developed program materials and marketing, (3) a required workshop or video presentation to learn about tree planting, care, and maintenance, (4) efficient transfer of trees, and (5) a follow-up evaluation of program effectiveness. Thus, there is an extensive history of programs from which to draw design elements.

Finally, it is important to understand the reasons why individuals plant trees. For example, site surveys among Sacramento area residents indicate that most residents (68 percent) plant trees on their properties and that issues of comfort (shade) and appearance play more of a role in the decision to plant trees than do concerns about energy savings, environmental benefit, or privacy. In addition, that tree planting tends to be greatest early in a resident's tenure in a home.

3.3. Previous Measurement and Evaluation Studies

Previous evaluations of shade tree program have been very consistent. These programs have a well-established design (not to infer successful from an energy savings perspective) and high customer satisfaction, with potential free-riding and inappropriate planting possibly reducing actual energy related benefits (note that other tree related benefits are not reduced).

The most recent study of a shade tree program was conducted by Zebedee and Associates (Thayer and Zebedee, 2004), in which they evaluated the following aspects of the SDREO Cool Communities Shade Tree Program: (1) program theory and approach; (2) success of program implementation; (3) level of participation, relative to projections; (4)

program success in raising awareness and affecting decisions of participants to implement the energy efficiency and demand reduction measures; and (5) any unanticipated outcomes/results.

In the overall evaluation of the Cool Communities Shade Tree Program, Thayer and Zebedee (2004) found the program theory to be essentially sound, the implementation successful, and the respondents positively inclined toward the program. In addition, the level of participation, as measured by number of trees planted, certainly met expectations. However, there seemed to be issues associated with the representativeness of the program participants, the difficulty in reaching the traditionally hard-to-reach population groups, potential free riding, and the location of tree plantings. The latter two problems could have potential effects on energy conservation savings estimates. And to the degree that the program is not a "tree program" or a customer relationship program, and energy savings potential is the only metric for judging success of the program (i.e., new net plantings that produce shade that can deliver kWh and kW savings), then the program was deficient.

3.4. Lessons Learned from Baseline Analysis

The baseline analysis points to three overriding conclusions. First, shade tree program generate significant social and energy benefits, with the latter category dependent on appropriate planting and maintenance. Second, the design of a shade tree program is well established (again, this does not infer success from an energy savings perspective). Third, there may be implementation problems such as free-ridership, control over the location of tree plantings, and failure to reach diverse populations. We focus our attention on these areas in our evaluation.

4. Program Specifics

The primary objective of the San Diego Cool Communities Shade Tree Program was to plant 17,000 potential energy saving trees during the operational period of the program, which ended June 1, 2006. Program participation is a four-step process. In the initial step, interested individuals fill out and send to the SDREO or *People for Trees* an application (participation agreement) to participate in the program. The application is contained in an information booklet describing the program and can be obtained by

interested individuals from the SDREO. In an attempt to ensure appropriate planting, the participation agreement:

- provides information on proper planting and maintenance;
- demonstrates how planting trees saves energy;
- specifies appropriate planting to create energy savings;
- warns that the SDREO and/or an independent evaluator has the right to conduct on-site compliance visits; and
- requires the participant to sign acknowledging these program details.

The participation agreement does not include any apparent screen for individuals who would have planted trees without the program. Thus, free-ridership is not addressed.

The SDREO also provides assistance for those individuals with questions regarding the program specifics, eligibility, etc. Residential homeowners, renters, small businesses (although there is no specific definition of small business), and public schools (K-12) are eligible to apply for trees. Note that trees are not provided to builders and/or developers because the residents who move in might not maintain them or they may not be the kind of tree they prefer. The primary stipulation of the agreement is that the participant receiving and ultimately maintaining the tree must sign the application. If the participant does not own the property then the owner must also sign the document. There is no income requirement. Each individual applicant may apply for up to five trees. There are in excess of 30 tree types grouped by type (deciduous, evergreen, semi-evergreen), height, and spread.

The second step of the process begins once *People for Trees* receives the application. At that point, *People for Trees* contact the applicant via telephone and either organizes a planting in the applicant's neighborhood or, if there is insufficient neighborhood interest, asks the applicant to attend a planting demonstration. The planting demonstration also includes a discussion of maintenance. Substantial neighborhood interest has another benefit in that trees are delivered to the demonstration site.

The third step is to for the individual participant to dig the hole(s) for the tree(s), after contacting *DigAlert* to ensure that there are no utilities near the dig site. The final step is to attend the planting demonstration and then plant all your trees on the day of the

demonstration. Planting location is also important. It is the intent of the program that each tree ultimately provides shade to the house, although it not necessary they it shades the air conditioner. This implies that trees a significant distance from the house must be significantly larger, which should impact tree choice. However, there is no enforcement of this provision of the agreement other than the aforementioned warning regarding possible post-planting inspection.

5. Program Materials and Procedures

The program utilizes two documents that can be obtained electronically at www.sdenergy.org/trees or in hardcopy format directly from the SDREO.

The first document is a one-page teaser that is quite eye-catching. It contains some limited program information and a detachable card that can be sent to the SDREO to obtain the second document, the program guide and tree planting booklet. In addition, the website includes a telephone number to make easy the requesting of the second document. It should also be noted that the telephone system, which used to lead potential program participants through a menu driven system using an overly long set of detailed instructions and eventually a second telephone number to call and request program materials, has been simplified and made much more user friendly.

The second document, or program participation materials, is mailed directly to the requesting potential participant and is extremely informative. This twenty-page document contains individual sections devoted to:

- the benefits of tree planting;
- the program application process;
- general tree planting information (placement, digging, planting, maintenance, etc.);
- tree selection, with basic statistics on tree height and spread and color photographs;
- the participation agreement; and,
- other information resources.

In summary, the program materials are well thought out, informative, user friendly, and generally available. In addition, all requirements to ensure proper (e.g., energy saving)

planting are explicitly specified. However, there is no screening for potential free riders, those individuals who would have planted trees in the absence of the program.

With regard to program procedures, the participant must initiate the process of SDREO/participant interaction. This requires self-motivated and generally informed citizens and makes the program available to only a subset of the general population. Recently, this flaw in the program procedures has been significantly improved through the expanded use of additional outlets (e.g., mass mailing, newspaper inserts, bill inserts, post office and library flyers, using existing or developing new relationships with governmental and non-governmental agencies, finding databases of and contacting potential users, etc.). It is our understanding that as the program has utilized these additional outlets, interest in the program has measurably increased. Of course, one does not know whether increased interest ultimately increases energy savings since this is a function of both planting trees and appropriate planting/maintenance practices.

6. Program Progress

The San Diego Cool Communities Shade Tree Program continues to perform exceptionally in terms of the number of trees planted (note this measure of success does not address energy savings). Zebedee & Associates has received a database of program participation through June 1, 2006. As of this date, there were 3,271 unique individuals/sites in the database and 16,191 trees planted (95% of the programmatic goal of 17,000 trees). This converts to approximately 4.95 trees per unique individual/site. The program participants are predominantly homeowners (98.80 percent), with English being there first language (99.97 percent).

Table 2 summarizes the tree planting by variety. Over 30 different varieties have been delivered through the program but the most popular varieties are the Crape Myrtle, Jacaranda, and the Purple-Leaf Plum, accounting for nearly 38.9 percent of all trees planted. The tree size is noted in parentheses following the tree name with “s” representing small trees, “m” medium trees, and “l” large trees. Of course, long-term energy savings/tree is a function of both size and planting location vis-à-vis the home. That is, smaller trees have to be planted nearer the home to have the intended savings.

Table 2
Trees by Tree Variety

Tree Type	Trees Planted	Percentage
African Sumac (m)	313	1.9
Bloodgood	298	1.8
Bradford Pear (s)	521	3.2
Camphor (l)	276	1.7
Canary Island Pine (l)	371	2.3
Carolina Laurel Cherry (m)	292	1.8
Chinese Flame (m)	720	4.4
Chinese Pistache (m)	573	3.5
Coastal Live Oak (l)	902	5.6
Crape Myrtle (s)	2,853	17.6
Fern Pine (l)	341	2.1
Flame Bottle Tree (m)	256	1.6
Fruitless Mulberry (m)	376	2.3
Golden Medallion (m)	471	2.9
Goldenrain (m)	349	2.2
Jacaranda (l)	1,740	10.7
Los Angeles Silk (m)	215	1.3
Mimosa Silk Tree (l)	456	2.8
Purple Robe/Locust (m)	168	1.0
Purple-Leaf Plum (s)	1,716	10.6
Southern Magnolia (l)	997	6.2
Stone Pine (l)	372	2.3
Sweetgum (l)	807	5.0
Weeping Peppermint (m)	798	4.9
Unknown	10	0
Total	16,191	

Tables 3 and 4 provide additional aggregate information about the trees being chosen by program participants. Across tree types, deciduous trees are the most popular accounting for approximately 62.5 percent of all trees, followed by evergreen trees (33.2 percent), and semi-evergreen trees (4.2 percent). Note that less than one percent of the trees do not have attached types in the program database. Finally, there seems to be a small preference for larger tree types.

Table 3
Trees Planted by Tree Type

General Type	Trees Planted
Deciduous	10,121
Evergreen	5,374
Semi-Evergreen	686
Unknown	10

Table 4
Trees Planted by Size

Tree Size	Trees Planted
Large	6,873
Medium	4,228
Small	5,080
Unknown	10

Table 5 provides summary information on the location of tree planting as reported by individual homeowners. Most homeowners report planting to the south (35.6 percent) or west (34.5 percent) of their housing structure in order to provide shading, while planting to the east accounts for 27.6 percent of locations. Participants were also asked to identify the expected distance from their home that the trees would be planted. These results are summarized in Table 6. At this juncture there does not seem to be a strong trend regarding planting distance. Additional information is available from the site visits (see section 7 below). Also note that the high number in the "unknown" category reflects the change in the participation agreement post-August 2005. Prior to this date the question concerning distance from house was not included in the participation agreement.

Table 5
Trees Planted by Installation Area

Installation Area	Trees Planted
East	4,482
South	5,764
West	5,588
Unknown	357

Table 6
Trees Planted by Distance from House

Installation Distance	Trees Planted
Within 15 Feet	5,269
Between 15 – 25 Feet	4,233
Between 25 – 50 Feet	5,501
Unknown	1,188

In Table 7, tree plantings are summarized by geographical region or climatic zones. These zones are characterized as coastal, inland, and mountain as determined by the zip code of the program participant. The region with the greatest activity by far is the inland region with approximately 64.4 percent of all program participants followed by mountain and finally coastal. This pattern ultimately bodes well for long-term energy savings, especially those related to air conditioning. However, expected energy savings will likely be smaller than projected since location related plantings do not satisfy the 85 percent Inland Empire and 15 percent High Desert assumption of McPherson and Simpson (2001a).

Table 7
Trees Planted by Climatic Zone

Climate Zone	Trees Planted
Coastal	4,559
Inland	10,430
Mountain	1,150
Unknown	52

Since we do not have knowledge of all the individual participant characteristics, we examined program participant characteristics based upon zip codes to assess the representativeness of the participants. For example, we computed a weighted average (using planted trees as the weights) across zip codes for three specific census variables:

percent with a college degree, percent white, and median household income. The values for these variables were 27.2 percent, 63.1 percent, and $53,376, respectively for the zip codes where there was tree-planting activity. In comparison, the values for San Diego County, weighted by population, are 28.7 percent, 58.5 percent, and $49,150, respectively. Thus, it seems (based on the zip codes level analysis) that participants in the San Diego Cool Communities Shade Tree Program are being drawn from zip codes are fairly representative of the surrounding county, although the program seems to attract slightly fewer non-white residents who have higher than average income and lower educational attainment than the county-wide averages.

Evaluation of Program Year – Number of Trees Planted

The overall objective was 17,000 trees planted over a two-year program window. As of June 1, 2006 there have been 16,191 (95% of goal) trees planted. We consider this performance to marginally meet expectations. As indicated in the baseline analysis, there are several design factors that should be included in a successful tree-planting program. In our evaluation, we find that the SDREO/*People for Trees* program contains almost all of these design elements. For example, the program does:

- provide training and assistance, especially where specialized knowledge or resources are required;
- utilize high-quality nursery stock;
- provide public education to inform and to stimulate new linkages in the community and to heighten the potential for long-term market effects.
- establish an organizing or core group to plan, build coalitions, and forge important partnerships;
- develop a set of program objectives that are measurable in real time (e.g., number of plantings per time period, percentage of future tree canopy cover, etc.);
- foster direct participation among community members to develop local involvement and concern;
- nurture volunteers to maintain long-term involvement;
- develop a list of recommended trees that perform best in alternative situations; and,

- commit to long-term stewardship (inspection, maintenance to maximize survival and growth.

The SDREO has identified a primary program challenge as marketing/outreach, both to the general public and especially to the hard-to-reach sectors. It is a positive development that the SDREO has identified this as a problem area and altered its long-term strategy to achieve the desired results in terms of overall interest and trees planted.

Evaluation of Program Year – Energy Savings from Trees Planted

In this section, we consider the issue of energy savings from the planted trees. The San Diego Cool Communities Shade Tree Program relies on an energy and demand savings algorithm adopted from McPherson and Simpson (2001a). The algorithm considers climate effects, air conditioner saturations, relative energy consumption of room air conditioning and evaporative cooling, shade from neighboring buildings as well as expected mortality of the planted trees. In adopting the algorithm to San Diego, the SDREO has assumed two climate zones with relative weightings of 85% Inland Empire and 15% High Desert. To the extent that the trees are properly planted and maintained, based on this algorithm the program is expected to generate average annual savings of 155.9 kWh/tree and 133.9/tree kWh for single family and multi-family residences, respectively. In addition, it is expected that the SDREO program will reduce the coincident peak by 2,871 KW.

Given the relative immaturity of the trees, the program is not expected to create any energy savings in the near term. However, Zebedee & Associates has broad concerns about the current energy and demand savings algorithm and recommends they be updated to reflect realized program outcomes. We have revised the number of trees planted during the program cycle to reflect these concerns. The purpose of this revised estimate is to provide an estimate of the number of trees that may *eventually* provide energy savings. The problem with this latter approach is that our analysis was not designed to explicitly provide such an estimate. Since we knew in advance that energy savings would not exist for several years we designed our evaluation to focus on customer satisfaction. Therefore, our analysis is based on participant reported data and we have no independent assessment of the quality of the data. Our estimates could have significant error and we cannot, at this time, accurately assess either the direction or

magnitude of any error. That stated, consider an estimate of potential energy saving trees.

In this approach, we eliminate trees that will be unlikely to produce energy savings. First consider the distance trees are planted away from the house. The current program literature states small trees should be planted within 15 feet for energy savings, medium trees should be planted between 25 and 40 feet, and large trees 40 feet and up[4]. As a part current program database, SDREO collects self-reported information about the planting location including the distance from the house. The data is recorded in three increments within 15 feet, between 15 and 25 feet and between 25 and 50 feet. These increments do not correspond to the program literature and should be changed to be consistent with the marketing materials as the program moves forward. This inconsistency clouds our ability to correct the number of trees that will eventually result in savings so we have provide two estimates – one with all medium trees outside 25 feet eliminated as unlikely to produce energy savings and one where we allow all medium trees to be counted as potential energy saving trees. Both estimates assume small trees outside 15 feet will not produce discernable energy savings in the future.

Second consider the placement of the trees around the house. The current algorithm assumes a mix of trees planted to the west and east. McPherson and Simpson (2001b) report a reduction of energy and demand savings when the trees are planted to the east. Specifically they estimate energy savings resulting from trees planted to the east are 60 to 75 percent of the saving resulting from plantings to the west. More importantly they report no energy saving for trees planted to the south, indicating trees in these locations are energy neutral. Using the self reported data for the placement of the trees around the house; we have eliminated trees to the south as potential energy saving trees consistent with McPherson and Simpson (2001b). Furthermore, the current algorithm should be updated to reflect the realized mix of placements to the east and west, as there are substantially different savings in these placements.

The third issue of concern is trees planted in the coastal area since these trees do not correspond to the current algorithm assumptions. McPherson and Simpson (2001a)

[4] The program market material has been recently updated requiring program participants to plant trees closer to the house. For example, the previous version of the program literature required small trees planted within 25 feet, medium trees within 25 and 40 feet and large trees 40 feet and up.

estimate the southern coastal area generates air conditioning saving between 40 and 60 kWh which is considerably less than the inland empire and high desert estimates currently used in the algorithm. The energy and demand savings algorithms should be updated to reflect program data indicating coastal area participation. In our alternative analysis we have assume trees planted in the coastal areas will likely not produce the expected shade benefits. While this is clearly an underestimation of the true energy savings it is done to provide a baseline analysis of the number of trees expected to eventually provide energy and demand savings.

In total after adjusting for trees planted too far from the house, to the south of the house and in coastal areas, Zebedee & Associates estimates between 6,800 trees at 2,020 unique sites (3.37 trees/site) and 7,241 trees at 2,068 unique sites (3.50 trees/site) are available for potential energy savings. Thus, in this approach, only between 42 and 45 percent of the 16,191 trees planted are designated potential energy saving trees. In terms of energy, it seems that the Cool Communities Shade Tree program can deliver less than half of the expected savings. This value will be further adjusted to the extent that trees were planted by free-riders and there is tree mortality, issues we consider in more detail below[5]. Further, it is evident that some program design changes will have to implemented in order for the program to create additional energy saving trees. For example, expanded pre- and post-inspections could reduce the number of trees planted inappropriately (i.e., those that fail to achieve expected energy savings). Of course, these program changes have associated costs and would likely reduce the number of trees planted.

7. Survey Instrument

Zebedee & Associates, with the assistance of our subcontractor Social Science Research Laboratory (SSRL) at San Diego State University, conducted a telephone survey of program participants to help assess post-participation customer satisfaction as well as retention of trees. The survey instrument (see appendix) focuses on the specific program goals, as well as the following general issues:

- participant issues and needs;
- the success of program implementation;

[5] Our current estimate of SDREO program tree mortality, which is based on the self-reported data, is consistent with the McPherson and Simpson (2001b) algorithm (25 percent mortality rate among trees by year 15).

- the level of participation, relative to projections;
- program success in raising awareness and affecting decisions of participants to implement the energy efficiency and demand reduction measures;
- the relative values of the various elements/components of the program;
- any perceived energy/comfort savings; and,
- any unanticipated outcomes/results.

The survey was conducted in two phases (January 2005 and September 2006). The initial phase was designed to provide early feedback to interested parties on the program. The second phase was conducted in order to survey program participants entering the program later in the program cycle and to measure any difference in the results from the initial survey.

7.1 Sampling Plan

The survey sample was developed from the list of participants in the Cool Communities Shade Tree Program. The initial step in our sampling procedure was to obtain the participant list from the SDREO. In conducting the survey, Zebedee & Associates began with a list of individual names, addresses, and contact and tree choice information. Our next step was to remove duplication and problem telephone numbers (incomplete contact information), thereby leaving 617 and 932 unique individuals in phases I and II, respectively. We used these values to represent the relevant populations.

In order to determine the appropriate sample size, we began with the following formula: $n = \frac{\{Z_{\alpha/2}\}^2 pq}{E^2}$, where n is the sample size, Z is the normal distribution Z-score, 1-α is the degree of confidence, p is the population proportion, q = 1-p, and E is the margin of error. Since the population was not infinite we corrected the formula above by the finite correction factor. This produced the following equation: $n = \frac{Npq\{Z_{\alpha/2}\}^2}{pq\{Z_{\alpha/2}\}^2 + (N-1)E^2}$, where N is the population size (617 for Phase I, 932 for Phase II) and all other variables are defined above (see Triola, 2001). In addition, we used a 90 - 10 sample model, consistent with CALMAC procedures, implying Z = 1.60 and E = 0.10. Finally, we did not use knowledge gained from our previous work to provide an *a priori* estimate of p.

Rather, we used p = 0.5. Thus, our target sample sizes were 58 and 60 individuals for Phase I and Phase II, respectively. In fact, we surveyed 100 individuals in each phase.

7.2 Survey Implementation

Each individual on the final participant list was telephoned to ascertain his/her willingness to participate in the survey. This initial inquiry resulted in one of the following outcomes:

(1) unknown eligibility (e.g., busy signal, answering machine, left message, unqualified refusal, etc.);
(2) ineligible (e.g., incorrect contact information);
(3) unwillingness to participate; and,
(4) completed survey.

In Table 8, we present the complete attrition analysis, including both sampling and survey implementation. As illustrated in the table, 100 surveys were completed in each phase. These values convert to response rates of 16.2 percent and 10.7 percent of the original list samples (617 and 932 individuals). Alternatively, one can calculate the following rates as (all values taken from Table 7):

- Phase I Eligibility Rate = E* = Eligible/(Eligible + Ineligible) = 103/(103 + 9) = 91.96%.
- Phase II Eligibility Rate = E* = Eligible/(Eligible + Ineligible) = 104/(104 + 29) = 78.2%.
- Phase I Response Rate = R* = Completes/(Eligible + Unknown Eligibility) = 100/(103 + 42) = 68.97%.
- Phase II Response Rate = R* = Completes/(Eligible + Unknown Eligibility) = 100/(104 + 145) = 40.2%.
- Phase I Cooperation Rate = C* = Completes/Eligible = 100/103 = 97.10%.
- Phase II Cooperation Rate = C* = Completes/Eligible = 100/104 = 97.10%.

As is evident, the survey implementation can be characterized as quite successful in both response rate and cooperation of the respondents.

Table 8
Attrition Analysis

Sampling/Survey Step	Phase I Number of (Potential) Respondents	Phase II Number of (Potential) Respondents
Initial Survey List	617	932
Remove Excess Names	463	654
Remove Unknown Eligibility	42	145
Remove Ineligible Records	9	29
Remove Terminated Surveys	3	4
Completed Surveys	100	100

Another measure of the survey coverage is the percentage of trees that are accounted for by the survey respondents. In this case, Phase I and Phase II survey respondents, taken together, accounted for 5.4% (882 out of a population of 16,191) of trees planted.

7.3 Respondent Characteristics

There were 200 completed surveys in the two survey phases, with 92 male respondents and 108 female respondents. The socio-demographic characteristics of the survey respondents are presented in Table 9. As is illustrated the survey respondent values, relative to San Diego County residents, suggest that the survey respondent group is significantly older, less ethnically diverse, more educated, and has lower labor force participation and somewhat higher income.

Table 9
Summary Characteristics of Residential Visitors

Characteristic	Units of Measure	Phase I Survey Value (n=100)	Phase II Survey Value (n=100)	San Diego County
Age	Percent Greater than 45	61.0	70.0	30.8
Household Size	Mean	3.02	2.95	2.7
Income	Percent Greater than $75,000	49.5	50.6	27.2
Membership in Environmental Organization	Percent Yes	7.0	12.0	NA
Employment Status	Percent Working Full or Part-Time	68.0	74.0	74.0
Ethnicity	Percent White, Not Hispanic	86.6	54.9	54.9
Education	Percent Bachelor's Degree or Greater	47.0	62.0	29.5

7.4 General Observations

The average respondent to the survey received 4.41 trees, slightly less than the overall average of 4.95 trees. In fact, 72 percent received the maximum allowable number of five trees. Approximately 48 percent first heard about the tree program via "word-of-mouth," whereas very few learned of the program through the usual media outlets (flyers, newspapers, and the SDREO website accounted for approximately 31.5% combined, with newspapers being the most important information source (29.3%)). The most common reason for program participation (42.7%) was to improve landscaping/property value. Reducing energy bills was a secondary concern. Approximately 96.5 percent of the respondents indicated that they or another household member was responsible for care of the newly planted tree(s).

7.5 Customer Satisfaction

In order to test the level of customer satisfaction we examined five different aspects of the program:

(1) planting location;

(2) the *DigAlert* program;

(3) the planting event/workshop;

(4) primary organization of neighborhood planting; and,

(5) overall.

Planting Location

With regard to planting location, respondents indicated that approximately 78.5 percent of the locations were chosen solely by the tree recipient. Thus, individuals from *People for Trees* or the SDREO had input in the remaining cases. At this time, 88 percent of the respondents remain "very satisfied" with the location choice. Of course, customer satisfaction with planting location may not be consistent with planting to produce the maximum obtainable energy savings. Further, if energy savings are not being achieved because of planting location then the program requires design revisions (e.g., pre-inspection of planting sites).

DigAlert Program

The *DigAlert* program also received high customer satisfaction, with 86.9 percent of respondents indicating they were "very satisfied" with it. However, about eight percent of the Phase I respondents indicated general dissatisfaction (4.0 percent "somewhat dissatisfied" and 4.0 percent "very dissatisfied") with *DigAlert*. There was no evidence of these problems in the Phase II survey.

Planting Event/Workshop

In Table 10 we present the various measures of customer satisfaction pertaining to the lead presenter at the planting event/workshop. As is evident, the respondents were overwhelmingly "very satisfied" with the planting event presentation. It fact, it is difficult to imagine doing a better job in terms of meeting the needs of the participating individuals. The key drivers of satisfaction (demonstrated knowledge, communicated clearly, etc.) are listed in the table.

Table 10
Customer Satisfaction -- Planting Event

Satisfaction Measure	Phase I "Very Satisfied" (%)	Phase II "Very Satisfied" (%)
Presenter "On Time"	98.9	98.0
Demonstrated Knowledge	100.0	100.0
Communicated Clearly	100.0	100.0
Organized Presentation Effectively	97.9	98.0
Provided Sufficient Information	97.9	97.9
Answered Questions	97.9	97.9
Instilled Confidence	100.0	97.0
Cared about Participation	97.9	96.0
Made Workshop Positive Experience	98.9	98.0
Overall Satisfaction	92.6	90.8

Primary Organization of Neighborhood Planting

Only six (2) out of 27 (23) responding individuals in the Phase I (Phase II) survey, or 22.25% (8.7%) of respondents, indicated that they were primary organizers of a planting event. Most responded that it was relatively easy to gather together the neighborhood group – 66.7% (100.0%) stated that it was "very easy" or "somewhat easy" and five (one) of the six (two) stated that they would act as a primary organizer again.

Overall

When queried about their overall program satisfaction, 98 percent (96%) of the Phase I (PhaseII) survey respondents selected "very satisfied" when queried regarding the Cool Communities Shade Tree program. In addition, 100.0 percent (100.0%) of respondents indicated that they would willingly participate in this program again. These are extremely high satisfaction values and suggest that, for the participants, the program has little room for improvement.

7.6 Program Effects

The Cool Communities Shade Tree program is primarily designed to provide house structures with shade and corresponding energy savings. It has also been suggested that

there are indirect program benefits related to home and/or neighborhood appearance, knowledge of environmental and energy issues, and sense of community (e.g., see John Balzar, *Los Angeles Times*, March 8, 2004). In Table 11 we provide a summary of survey responses for these program effects. Consistent with expectations the newly planted trees have provided almost no shade or energy savings. However, as the trees mature we would expect the appropriately planted trees to capture significant benefits from both shade and energy savings (see discussion above for an estimate of the proportion of trees that are potentially energy savers). In terms of indirect benefits it seems that the program has enhanced neighborhoods and provided information to participants.

Table 11
Program Effects

Program Effect	Phase I "Yes" (%)	Phase II "Yes" (%)
Trees Shade Home	3.0	9.0
Trees Shade Air Conditioner	3.0	2.7
Trees Reduce Energy Bill	0.0	33.3
Program Increased Knowledge of Energy/Environmental Issues	91.0	92.0
Program Enhanced Neighborhood	90.8	97.0
Program Increased Sense of Community	77.8	64.7

7.7 Tree Survival or Retention

Tree survival is an important impact parameter and is being assessed both through the telephone survey instrument but also on-site verification (see Section 7 below). The telephone survey results indicate that approximately 21 of the 882 trees planted (2.4%) have not survived, indicating a persistence factor of 97.6 percent for net-to-gross adjustments. Of course, tree survival will change over time, especially during the first few years after planting. Consequently, we recommend that during the next program cycle the number of site visits be significantly increased and the include sampling trees planted since the beginning of the program. This will allow the creation of a time trend for tree survival.

7.8 Tree Maintenance

The cost of tree maintenance is primarily borne by the program participant, approximately 98 (95) percent of the Phase I (Phase II) respondents are the primary people responsible for watering, mulching, fertilizing, pruning, and weeding. Of these tasks many of the respondents have not completed any mulching, pruning or fertilizing. Watering is considered "very easy" by approximately 79.6 (73.7) percent of respondents. Only weeding is somewhat problematic in that about three percent indicated it to be "very difficult." These results indicate that the cost of tree maintenance, at this time, is quite small.

7.9 Participation Motivation

As stated above the most common reason for program participation (43.8% of the Phase I respondents, 42.2% of Phase II respondents) was to improve landscaping/property value, whereas reducing energy bills was a secondary concern (16.3%, in Phase I, 22.2% in Phase II). Of course, this does not affect the overall program benefits – energy savings are energy savings regardless of the motivation for planting the tree(s). Approximately 66.7 percent of the Phase I respondents were "already planning to plant trees" before hearing about the program. This value increased significantly to 78.8 percent in Phase II. These individuals are generally classified as free riders in the energy efficiency literature and they do impact the resulting energy savings from the program.[6] Future program evaluation will want to refine this estimate to reflect other aspect of free ridership. For example, how did the program influence the placement of the tree from an energy efficiency standpoint, how long had the participant been planning to plant new trees, etc. The current estimate of free ridership is likely biased upward and therefore requires further study. One potential indicator of this bias is the number of respondents who added shade trees for the first time. Of those participants who said they were already planning to plant trees 79 percent of Phase I (78% in Phase II) respondents reported that the trees planted were new additions rather than replacements.

[6] The magnitude of free riding is somewhat offset by the educational component of the program. Specifically, individuals who plant trees without participating in the program are more likely to select an inappropriate tree type and/or to have significantly more tree mortality.

7.10 Verification Process

One aspect of the participation agreement is that individuals are explicitly notified that there is an evaluation phase of the program designed to verify that trees are planted appropriately and being well maintained. In order to test whether or not this information was being effectively transmitted we asked respondents if they were aware of this contact provision. A large majority (83% in Phase I and 78.8% in Phase II) of respondents were aware of the possibility of a verification site visit. This implies that this information is being transmitted quite effectively as the program matures.

7.11 Overall Evaluation from Survey Data

In summary, it seems that the survey respondents are quite satisfied with the Cool Communities Shade Tree program. However, several potential problem areas were identified in the survey. These include:

(1) the representativeness of the participant group, relative to San Diego County residents;
(2) the lack of in-roads into the hard-to-reach customer segments;
(3) the number of potential free riders, even accounting for the educational elements of the program;
(4) the relative ineffectiveness of the traditional media outlets compared to word-of-mouth; and,
(5) the finding that a significant proportion of the respondents were not aware of the verification aspect of the program.

Finally, we return to the energy savings from the Cool Communities Shade Tree program. In section 5, we presented an estimate of the number of potential energy saving trees. This estimate (approximately 7,000 trees or 43.2% of total trees planted) must be further adjusted to reflect tree mortality and free-ridership to obtain an estimate of the program's energy impact. Multiplying the initial estimate by 0.976 to account for tree mortality and 0.273 to reflect non-free-riders produces an estimate of 1,835 potential energy saving trees. Therefore, approximately 11.3 percent of the total of 16,191 trees planted in the program can be considered to potentially provide energy savings.

This estimate should be considered a worst-case scenario since no credit was given for any tree planted on the south side of a home, planted in the coastal region, or planted

relatively far from the home. In addition, the survey data on tree survival and free-ridership are participant reported and were not independently verified. Finally, this estimate does not account for any of the other benefits of the program.

8. On-Site Verification Visits

In order to further investigate tree retention, Zebedee & Associates completed site visits to a sample of individual locations that had received trees.

Sampling Plan

The on-site sample was developed from the list of participants in the Cool Communities Shade Tree Program, which during the June – December 2004 period included 617 unique individuals. In order to determine the appropriate sample size, we began with the following formula: $n = \frac{\{Z_{\alpha/2}\}^2 pq}{E^2}$, where n is the sample size, Z is the normal distribution Z-score, 1-α is the degree of confidence, p is the population proportion, q = 1-p, and E is the margin of error. Since the population was not infinite we corrected the formula above by the finite correction factor. This produced the following equation: $n = \frac{Npq\{Z_{\alpha/2}\}^2}{pq\{Z_{\alpha/2}\}^2 + (N-1)E^2}$, where N is the population size (617) and all other variables are defined above (see Triola, 2001). In addition, we used a 90 - 10 sample model, consistent with CALMAC procedures, implying Z = 1.60 and E = 0.10. Finally, since we were most interested in the proportion of trees still alive, we used knowledge gained from both the telephone survey and our previous work to provide an *a priori* estimate of p equal to 0.9 (see Thayer and Zebedee, 2004). Thus, our target sample size was 22 sites for this round of site visits.

We further restricted our target sample to six specific zip codes: 91941 and 91942 in La Mesa; 91945 in Lemon Grove; 91977 in Spring Valley; and 92019 and 92020 in El Cajon. These zip codes were concentrated in the inland climate zone. Future site visits will focus on coastal and mountain locations. The limitation to this subset of zip codes left 35 potential locations.

On-site Visit Implementation

Each individual on the final participant list was telephoned to ascertain his/her willingness to allow a site visit. The 35 phone calls yielded the following outcomes: (1) five no answers; (2) six answering machines; and (3) 24 completed calls. Of the completed calls, 22 agreed to a site visit, although four individuals indicated that they would not be available during the stated visitation period, which was within 1 – 2 hours of the phone call. These individuals provided precise directions to the tree locations (e.g., front yard right hand side of lot) and the visit was conducted without the owner being present. After obtaining site visit approval from the homeowner, we then mapped the locations using the *Thomas Guide Digital Edition* mapping software program and visited the sites. The remaining two completed calls unearthed an unexpected problem. These individuals had not received their trees even though they had been listed as having planted their trees at least eight months previous to our scheduled site visit.

On-Site Visit Results

The twenty-two sites we visited had planted 83 trees (3.78/home) and 75 trees were still alive (90.4%). This level of tree attrition (9.6%) is significantly higher than we found in the two phases of the household telephone survey (approximately 2.3%) and may indicate survey bias related to either lack of respondent knowledge or respondent deceit. This should be an area of future inquiry. Of the surviving trees, 47 or 56.6% were planted so that they would eventually provide shade to the structure.[7] Of the 22 homes, 19 (86.4%) had a central air conditioning unit outside their home. However, most individuals also indicated that they hardly ever used their air conditioning systems. This could have significant implications for "real" savings from the tree program. The newly planted trees would eventually shade the air conditioning unit in one (5.3%) of this latter group (homes with air conditioning).

Overall Evaluation from On-site Visits

In summary, our on-site visits discovered that individuals planted and cared for the trees as directed and that the level of tree attrition is small and in line with our previous

[7] Note that if we used these values for tree retention (0.904) and potential energy savings (0.566), our estimate of potential energy saving trees would be 3,969 trees of 24.5% of the total of 16,191 trees planted. This is significantly different than the estimate of 12.8% provided in the previous section and reinforces both the concept of possible measurement error the need for more in-depth analysis of the energy impacts of the program.

analysis (see Thayer and Zebedee, 2004). In addition, the people we met with were very appreciative of the program, very friendly, wanted to discuss the program, and very cooperative. Many expressed interest in obtaining additional trees. However, tree survival was significantly smaller than that suggested by the telephone survey.

Our on-site visits also uncovered three potential problems. First, many of the trees were planted on the property's borders. Thus, potential shade benefits were minimal for these trees. This problem increased with lot size. This has continued to be a problem in spite of more explicit directions in the program materials. Second, most of the homes with air conditioning units had placed these units on the north side of the home since that is the cooler, shadier side. However, these same individuals were directed to not plant their trees on the north side. Therefore, it is not surprising that few trees shade air conditioning units. Finally, some of the individuals we contacted (two out of 24) had not received their trees even though they had been listed as having planted their trees several eight months previous to our site visit. This may be a fluke or may be indicative of a significantly larger problem.

9. Overall Evaluation of the Cool Communities Shade Tree Program

In our original scope of work we stated that we would develop a scoring system to be used to evaluate the long-term efficacy of the program. Our scoring system uses a 1-10 scale to evaluate the following components of the program: (1) the program theory and approach; (2) the success of program implementation; (3) the level of participation, relative to projections; (4) program success in raising awareness and affecting decisions of participants to implement the energy efficiency and demand reduction measures; and (5) any unanticipated outcomes/results. The overall scale value is then used to make conclusions regarding the program future.

The program theory and approach refers to both how the program is to operate in the field (implementation theory) and why the program is expected to lead to specific outcomes (program theory). The Cool Communities Shade Tree Program was designed to flow from initial contact to delivery of trees, to tree planting demonstration and tree planting, to tree retention, and ultimate energy savings. Thus, there are several linkages that affect the overall performance of the program. For example, ultimate program success requires that program effort directly lead to participant action and corresponding energy savings. On the contrary, a flawed program theory would have linkages that are

poorly designed so that the program does not meet its stated objectives (e.g., difficulty finding potential participants, poorly planted trees, free-ridership, tree mortality).

Success of implementation refers to the quality of the program materials, the ability of the program to reach the intended audience, and the resulting energy savings action taken by participants. Success implies that program effort leads to participation and ultimate energy savings action on the part of participants.

Level of participation, relative to projections is simply an analysis of program activity compared to program goals. If the program satisfies its goals then it is considered successful, although the evaluation also allowed the program to receive extra credit for surpassing its stated goals.

Program success in raising awareness and affecting energy use decisions is dependent on the program participant's response to program initiatives. For example, for an information only program we would expect that a large majority of program participants felt that the program changed their knowledge of energy issues. A program designed to create energy savings would be evaluated according to the magnitude of actual savings.

Finally, Zebedee and Associates account for any unexpected developments by evaluating the occurrence of any unusual program results. For example, excessive free ridership, or tree planting in areas that do not create energy savings would be cause for downgrading the program effectiveness.

Our overall evaluation of the Cool Communities Shade Tree Program is presented in Table 12 below. As is illustrated, we found the program theory to contain several flaws. For example, there may be issues associated with potential free riding, the location of tree plantings, the representativeness of the program participants, and the difficulty in reaching the traditionally hard-to-reach population groups. In addition, the level of participation, as measured by number of trees planted did not achieve 100% of the program goal.

The most important consideration concerns free-ridership, which is difficult to assess for the Cool Communities Shade Tree program. However, several portions of our research point to significant free riding behavior. For example, approximately 66.7 percent of the Phase I (78.8% of Phase II) respondents were "already planning to plant trees" before hearing about the program. This points to both a significant amount of free-riding and

increased free-riding as the program becomes better known. In addition, a significant number of individuals, especially those with large lots, planted their free trees (approximately 44% of trees at the homes visited in the site visits) on the property's borders, thereby limiting the potential shade benefits. On the other hand, there are potentially large education benefits of the program (e.g., appropriate tree selection, enhanced maintenance, reduced tree mortality, etc.) that could potentially offset some of the effects of any free-ridership.

Finally, consider the issue of whether there is a continuing need for the Cool Communities Shade Tree Program. On the one hand the program was well designed from the customer's perspective, seemed to fulfill a market niche, almost met planting goals, and altered the awareness and subsequent decisions of the participants. On the other hand, there is evidence consistent with free-ridership and inappropriate planting procedures. Therefore, our overall assessment is marginally positive and we recommend that the program be continued in the short term. During the next program year we recommend that the program be re-designed to prevent, to the greatest degree possible, inappropriate planting and free-ridership. Of course, this re-design, which might include pre and post inspections, will increase the cost of planting each tree. In effect, there is likely a trade-off between the number of trees planted and control of the appropriate planting and free-ridership. The value of shade trees and the San Diego Cool Communities Shade Tree Program is far beyond energy savings. For example the program also results in education on proper tree planting and care, more livable communities, carbon dioxide reduction as well as reduced storm runoff. However as a resource program the San Diego Cool Communities Shade Tree Program seems at risk unless the expected energy savings are obtained on a consistent basis.

Table 12
Overall Evaluation of the
Cool Communities Shade Tree Program

	Cool Communities Shade Tree Program Value	Comments
Program Theory and Approach	6	Tree planting important for energy savings. In addition, many potential side benefits. However, several design flaws since free-riding and inappropriate tree planting not prevented.
Success of Implementation	9	Program materials very informative and appropriate to pre-participation through care and maintenance. Usage of print and broadcast media helped to expand program.
Level of Participation	8	Almost satisfied all programmatic goals; in fact, delivering and planting 16,000 plus trees constitutes a major accomplishment.
Change in Awareness, Decisions	7	Most respondents to survey commented that the program upgraded their understanding of energy efficiency.
Unanticipated Outcomes	5	Potentially excessive free-ridership as most participants stated they would have planted trees in the absence of the program. Also, many plantings on borders of property, which could minimize energy savings.
Total	35	

10. References

Akbari, H., S. Davis, S. Dorsano, J, Huang, and S. Winnett, eds. 1992. "Cooling Our Communities: A Guidebook on Tree Planting and Light-Colored Surfacing." Washington, DC: U.S. Environmental Protection Agency.

Anderson, A. 1995. "Utilities Grow Energy Savings." *Home Energy* 12 (2): 14-15.

Balzar, John. 2004. "No Safe Arbor in the City." *Los Angeles Times*, March 8.

Dwyer, J.F., E.G. McPherson, H.W. Schroeder, and R.A. Rowntree, R.A. 1992. "Assessing the Benefits and Costs of the Urban Forest." *Journal of Arboriculture* 18(5): 227-234.

Heisler, G.M. 1986. "Energy Savings with Trees." *Journal of Arboriculture* 12 (5): 113-125.

Hildebrandt, E.W., R. Kallett, M. Sarkovich, and R. Sequest. 1996. "Maximizing the Energy Benefits of Urban Forestation." In the Proceedings of the ACEEE 1996 Summer Study on Energy Efficiency in Buildings, Volume 9. Washington DC: American Council for an Energy Efficient Economy; 121- 131.

McPherson, E.G. 1992a. "Accounting for Benefits and Costs of Urban Green-Space." *Landscape and Urban Planning* 22: 41-51.

McPherson, E.G. 1992b. "Evaluating the Cost Effectiveness of Shade Trees for Demand-Side Management." *The Electricity Journal* 6 (9): 57-65.

McPherson, E.G. and J.R. Simpson. 1995. "Shade Trees as a Demand-Side Resourece. *Home Energy Magazine*, Online March/April.

McPherson, E.G., J.R. Simpson, P.J. Peper, and Q. Xiao. 1999. "Benefit-Cost Analysis of Modesto's Municipal Urban Forest." *Journal of Arboriculture* 25(5): 235-248.

McPherson, E.G., J.R. Simpson, P.J. Peper, K.I. Scott, and Q. Xiao. 2000. "Tree Guidelines for Coastal Southern California Communities." USDA Forest Service, Sacramento, CA.

McPherson, E.G. and J.R. Simpson. 2001a. "Benefit-Cost Analysis of LADWP's Trees for a Green LA Shade Program." USDA Forest Service, Davis, CA.

McPherson, E.G. and J.R. Simpson. 2001b. "Effects of California's Urban Forest on Energy Use and Potential Savings from Large-Scale Tree Planting." USDA Forest Service, Davis, CA.

Rosenfeld, A.H., H. Akbari, J.J. Romm, and M. Pomerantz. 1998. "Cool Communities: Strategies for Heat Island Mitigation and Smog Reduction." *Energy and Buildings*. 28: 51-62.

Simpson, J.R. and E.G. McPherson. 1996. "Potential of Tree Shade for Reducing Residential Energy Use in California." *Journal of Arboriculture* 22 (1): 10-18.

Thayer, M. and A. Zebedee, 2004. Final Report for Cool Communities Shade Tree Program, prepared for California Public Utilities Commission, Zebedee and Associates, San Diego, CA.

Appendix – Final Survey Instruments

SDREO's Cool Communities Survey
(August 2006)

INTRO. Hello, my name is _____. May I speak with... **{INSERT NAME FROM LIST}**? **[WHEN SPEAKING WITH LISTED PERSON:]** I'm calling from the Social Science Research Lab at San Diego State University. We're conducting a study to follow up with people who received trees in the Cool Communities Shade Tree Program sponsored by the San Diego Regional Energy Office. Are you the person in your household who was most involved in this process? (attended the workshop, met with the forester from program, planted and/or maintain the trees) **[IF NO, ASK FOR THAT PERSON; IF YES:]** Do you have approximately 5 to 10 minutes right now to answer some questions? . **[IF NO, CHECK NAME FIELD AND SCHEDULE A CALL BACK; CODE ANY NON-ENGLISH SPEAKING CONFIRMED RESPONDENTS ACCORDINGLY]**

VER. **[VERSION OF INTERVIEW:]** 1 - VERSION A 2 - VERSION B*

* = RESPONSE OPTIONS REVERSED ON VERSION B FOR ALL QUESTIONS INDICATED

SCR1. Have you ever been surveyed regarding your satisfaction with the Cool Communities Shade Tree Program?

1 - YES **----------> CLARIFY FIRST, THANK AND TALLY NQR-VIS**
2 - NO
9 - DK/REF

SCR2. Have you participated more than one time in the Cool Communities Shade Tree Program?

1 - YES
2 - NO
9 - DK/REF

SEX. 1 - MALE 2 - FEMALE

- - - - - - - - - - - - - - - - - - QUALIFIED RESPONDENT: QUOTAS CHECKED; DATA SAVED - - - - - - - - - - - - - - -

Q1. To ensure that my work is done honestly and correctly, this call may be monitored by my supervisor. **[ONLY IF ASKED ABOUT MONITORING:]** My supervisor randomly listens to interviews to make sure we're reading the questions exactly as written and not influencing answers in any way. To start off, where did you first hear about the Cool Communities Shade Tree Program? **[DO NOT READ, RECORD ONLY ONE]**

1 - FLYERS POSTED IN NEIGHBORHOOD (POST OFFICES, LIBRARIES)
2 - NEWSPAPERS
3 - SDREO'S WEBSITE
4 - SDREO'S FACILITY (FLYERS)
5 - NEIGHBORHOOD/CITY ORGANIZATION (NEWSLETTERS)
6 - WORD OF MOUTH
7 - OTHER, SPECIFY: _____
9 - DK/REF

Q2. What was the main reason you chose to participate in the Cool Communities Shade Tree program? **[DO NOT READ; CLARIFY AND RECORD ONLY ONE]**

1 - REDUCE ENERGY BILL
2 - IMPROVE LANDSCAPE/PROPERTY VALUE
3 - ASKED BY NEIGHBORS/HELP NEIGHBORHOOD
4 - HELP THE ENVIRONMENT
5 - REDUCE STORMWATER RUNOFF
6 - OTHER, SPECIFY: _____
9 - DK/REF

Q3. How many trees did you receive through this program? **[IF RESPONDENT HAS PARTICIPATED IN THE PROGRAM MORE THAN ONCE, THIS QUESTION AND ALL ENSUING QUESTIONS SPECIFICALLY REFER ONLY TO TREES RECEIVED IN LAST BATCH]**

_____ TOTAL NUMBER OF TREES (1-5)
0 - NONE **----------> THANK AND CODE AS NQR-TREE**
97 - MORE THAN 5 TREES **------> THANK AND CODE AS NQR-5+ TREE**
99 - DK/REF **----------> LOCATE HOUSEHOLDER W/ INFORMATION, ----------RE-INTRODUCE AND BEGIN AGAIN (OR CODE AS NQR-TREE)**

[Q4 TO]

Q4_1. We're interested in the type(s) of tree(s) you received **[INSERT NEXT PHRASE ONLY IF MORE THAN ONE TREE:]** {Let's start with your first tree.} What type of tree is it? **[READ LIST IF NEEDED; IF MORE THAN ONE TREE, CONTINUE FOR EACH TREE RECEIVED]**

1 - AFRICAN SUMAC
2 - BRADFORD PEAR
3 - CAMPHOR
4 - CANARY ISLAND PINE
5 - CAROLINA LAUREL CHERRY
6 - CHINESE FLAME
7 - CHINESE PISTACHE
8 - COAST LIVE OAK
9 - CRAPE MYRTLE
10 - FERN PINE
11 - FLAME BOTTLE TREE
12 - GOLDEN MEDALLION
13 - GOLDEN RAIN
14 - ITALIAN STONE PINE
15 - JACARANDA
16 - LONDON PLANE
17 - LOS ANGELES SILK
18 - MIMOSA SILK TREE
19 - PURPLE-LEAF PLUM
20 - PURPLE ROBE / LOCUST
21 - SOUTHERN MAGNOLIA
22 - SWEETGUM / LIQUID AMBER
23 - WEEPING PEPPERMINT
24 - OTHER TYPE OF TREE
99 - DK/REF TYPE OF TREE(S)

Q4_2. **[IF RECEIVED <u>MORE THAN ONE</u> TREE:]** What type of tree was the <u>second</u> tree you received?

1 - AFRICAN SUMAC
2 - BRADFORD PEAR
3 - CAMPHOR
4 - CANARY ISLAND PINE
5 - CAROLINA LAUREL CHERRY
6 - CHINESE FLAME
7 - CHINESE PISTACHE
8 - COAST LIVE OAK
9 - CRAPE MYRTLE
10 - FERN PINE
11 - FLAME BOTTLE TREE
12 - GOLDEN MEDALLION
13 - GOLDEN RAIN
14 - ITALIAN STONE PINE
15 - JACARANDA
16 - LONDON PLANE
17 - LOS ANGELES SILK
18 - MIMOSA SILK TREE
19 - PURPLE-LEAF PLUM
20 - PURPLE ROBE / LOCUST
21 - SOUTHERN MAGNOLIA
22 - SWEETGUM / LIQUID AMBER
23 - WEEPING PEPPERMINT
24 - OTHER TYPE OF TREE
97 - NO MORE TREES **----------> GO TO Q6**
99 - DK/REF TYPE OF TREE(S)

Q4_3. **[IF RECEIVED <u>MORE THAN TWO</u> TREES:]** What type of tree was the <u>third</u> tree you received?

1 - AFRICAN SUMAC
2 - BRADFORD PEAR
3 - CAMPHOR
4 - CANARY ISLAND PINE
5 - CAROLINA LAUREL CHERRY
6 - CHINESE FLAME
7 - CHINESE PISTACHE
8 - COAST LIVE OAK
9 - CRAPE MYRTLE
10 - FERN PINE
11 - FLAME BOTTLE TREE
12 - GOLDEN MEDALLION
13 - GOLDEN RAIN
14 - ITALIAN STONE PINE
15 - JACARANDA
16 - LONDON PLANE
17 - LOS ANGELES SILK
18 - MIMOSA SILK TREE
19 - PURPLE-LEAF PLUM
20 - PURPLE ROBE / LOCUST
21 - SOUTHERN MAGNOLIA
22 - SWEETGUM / LIQUID AMBER
23 - WEEPING PEPPERMINT
24 - OTHER TYPE OF TREE
97 - NO MORE TREES **----------> GO TO Q5**
99 - DK/REF TYPE OF TREE(S)

Q4_4. **[IF RECEIVED <u>MORE THAN THREE</u> TREES:]** What type of tree was the <u>fourth</u> tree you received?

1 - AFRICAN SUMAC
2 - BRADFORD PEAR
3 - CAMPHOR
4 - CANARY ISLAND PINE
5 - CAROLINA LAUREL CHERRY
6 - CHINESE FLAME
7 - CHINESE PISTACHE
8 - COAST LIVE OAK
9 - CRAPE MYRTLE
10 - FERN PINE
11 - FLAME BOTTLE TREE
12 - GOLDEN MEDALLION
13 - GOLDEN RAIN
14 - ITALIAN STONE PINE
15 - JACARANDA
16 - LONDON PLANE
17 - LOS ANGELES SILK
18 - MIMOSA SILK TREE
19 - PURPLE-LEAF PLUM
20 - PURPLE ROBE / LOCUST
21 - SOUTHERN MAGNOLIA
22 - SWEETGUM / LIQUID AMBER
23 - WEEPING PEPPERMINT
24 - OTHER TYPE OF TREE
97 - NO MORE TREES **----------> GO TO Q5**
99 - DK/REF TYPE OF TREE(S)

Q4_5. **[IF RECEIVED MORE THAN FOUR TREES:]** What type of tree was the fifth tree you received?

1 - AFRICAN SUMAC
2 - BRADFORD PEAR
3 - CAMPHOR
4 - CANARY ISLAND PINE
5 - CAROLINA LAUREL CHERRY
6 - CHINESE FLAME
7 - CHINESE PISTACHE
8 - COAST LIVE OAK
9 - CRAPE MYRTLE
10 - FERN PINE
11 - FLAME BOTTLE TREE
12 - GOLDEN MEDALLION
13 - GOLDEN RAIN
14 - ITALIAN STONE PINE
15 - JACARANDA
16 - LONDON PLANE
17 - LOS ANGELES SILK
18 - MIMOSA SILK TREE
19 - PURPLE-LEAF PLUM
20 - PURPLE ROBE / LOCUST
21 - SOUTHERN MAGNOLIA
22 - SWEETGUM / LIQUID AMBER
23 - WEEPING PEPPERMINT
24 - OTHER TYPE OF TREE
97 - NO MORE TREES **----------> GO TO Q5**
99 - DK/REF TYPE OF TREE(S)

Q5. **[ONLY ASK IF RECEIVED MORE THAN ONE TYPE OF TREE:]**

a) Overall, which one type of tree worked out best for you in terms of ease of planting, maintenance, and the anticipated benefit of the tree?

_____ ENTER TREE CODE FROM LIST
99 - DK/REF

b) And looking back, which one type of tree would you have preferred not to have selected, if any?

_____ ENTER TREE CODE FROM LIST
99 - DK/REF

Q6. {How many of these trees are / Is your tree} still living?

_____ NUMBER STILL LIVING (LESS THAN OR EQUAL TO Q3)
99 - DK/REF

Q7. In terms of overall health, how would you rate the condition of the tree(s) you received? Would you say...

1 - excellent,
2 - good,
3 - fair, or
4 - poor?
9 - DK/REF

Q8. Who decided on the planting location(s)? Was it...* **(reverse options 1-2 only)**

1 - you or someone in your household,
2 - individuals associated with the Cool Communities program (SDREO, or People for Trees), or
3 - was it a joint decision between you and individuals associated with the Cool Communities program?
9 - DK/REF

Q9. How satisfied are you with the location(s) chosen? Would you say...*

1 - very satisfied,
2 - somewhat satisfied,
3 - somewhat dissatisfied, or
4 - very dissatisfied?
9 - DK/REF

Q10. We're interested in where the {trees are / tree is} relative to your home. Was the ***{INSERT NAME FOR TREE 1}*** planted east, west, or south of your home? **[REPEAT FOR ALL TREES]**

	East	West	South	DK/REF
1) Tree 1	1	2	3	9
2) Tree 2	1	2	3	9
3) Tree 3	1	2	3	9
4) Tree 4	1	2	3	9
5) Tree 5	1	2	3	9

Q11. We're also interested in how close the {trees are / tree is} to your home. Is the trunk of the ***{INSERT NAME FOR TREE 1}*** less than 15 feet, 15 to 24 feet or 25 to 50 feet from your home? **[REPEAT FOR ALL TREES]**

	Less than 15 Feet	15 - 24 Feet	25 - 50 Feet	DK/REF
1) Tree 1	1	2	3	9
2) Tree 2	1	2	3	9
3) Tree 3	1	2	3	9
4) Tree 4	1	2	3	9
5) Tree 5	1	2	3	9

Q12. How satisfied are you with your experience with DigAlert, the organization which came out to mark your underground power lines? Would you say...*

1 - very satisfied,
2 - somewhat satisfied,
3 - somewhat dissatisfied, or
4 - very dissatisfied?
9 - DK/REF

Q13. Thinking now about the planting event or workshop you attended before receiving your tree(s), please let me know how you would evaluate the following aspects of the workshop. Did the workshop presenter...**

	YES	NO	DK/REF
1) show up at the appointed time?	1	2	9
2) demonstrate knowledge of the subject?	1	2	9
3) communicate information clearly?	1	2	9
4) organize the presentation effectively?	1	2	9

	YES	NO	DK/REF
5) give you sufficient information to successfully care for your trees?	1	2	9
6) answer any questions you had to your satisfaction?	1	2	9
7) make you feel confident about planting and taking care of your new tree(s)?	1	2	9
8) make you feel that he/she cared about your participation in the program?	1	2	9
9) make the workshop a positive experience?	1	2	9

** = ITEMS ON LIST RANDOMLY ROTATED FOR ALL QUESTIONS INDICATED

Q14. Overall, how satisfied were you with the planting event or workshop? Would you say...*

1 - very satisfied,
2 - somewhat satisfied,
3 - somewhat dissatisfied, or
4 - very dissatisfied?
9 - DK/REF

Q15. Who has been responsible for doing most of the care for the newly planted tree(s)? Was it...

1 - you or another household member, or
2 - a gardener or professional service? ---------- > **GO TO Q16**
9 - DK/REF ---------- > **GO TO Q16**

Q15a. **[IF RESPONDENT/HOUSEHOLD RESPONSIBLE FOR TREE CARE:]** In terms of maintaining the tree(s) after being planted, please tell me how easy or difficult each of the following was, and just let me know if no one in your household did a particular activity. Was...** **{INSERT ITEM}** very easy, somewhat easy, somewhat difficult, very difficult, or has that not been done?

	Very easy	Somewhat easy	Somewhat difficult	Very difficult	Not done	DK/ REF
1) watering your tree(s)	1	2	3	4	5	9
2) mulching your tree(s)	1	2	3	4	5	9
3) fertilizing your tree(s)	1	2	3	4	5	9
4) pruning your tree(s)	1	2	3	4	5	9
5) weeding around your tree(s)	1	2	3	4	5	9

Q16. {Have any of the / Has the} newly planted tree(s) grown to the point where {they are / it is} shading any portion of your home?

1 - YES
2 - NO ---------- **> GO TO Q17**
9 - DK/REF ---------- **> GO TO Q17**

Q16a. **[IF YES:]** Have you noticed any reduction in your household's use of air conditioning or fans to cool your home that you believe is related to having planted {these trees / this tree}?

1 - YES
2 - NO
9 - DK/REF

Q16b. Have you noticed any reduction in your energy bill that you believe is related to having planted {these trees / this tree}?

1 - YES
2 - NO
9 - DK/REF

Q17. Do you have an air conditioning unit that is located outside your home?

1 - YES
2 - NO ---------- **> GO TO Q18**
9 - DK/REF ---------- **> GO TO Q18**

Q17a. **[IF YES:]** { Have any of the / Has the} newly planted tree(s) grown to the point where {they are / it is} shading your outside air conditioning?

1 - YES
2 - NO
9 - DK/REF

Q18. Do you think that your participation in this program has increased your knowledge of ecological, energy, and/or environmental issues...*

1 - a great deal,
2 - somewhat, or
3 - not at all?
9 - DK/REF

Q19. Overall, do you feel that your participation in this program has enhanced the appearance of your neighborhood?

1 - YES
2 - NO
9 - DK/REF

Q20. Thinking back to before you heard about this program...*

1 - were you already planning to plant trees on your property before hearing about this program, or
2 - did you decide to plant trees on your property as a result of hearing about this program? ----------> **GO TO Q21**
9 - DK/REF ----------> **GO TO Q21**

Q20a. **[IF ALREADY PLANNING TO PLANT TREES:]** Did your participation in the program change where you were originally planning to put the tree(s)?
[IF YES:] How?

_____

96 - NO, DID NOT CHANGE
97 - N/A, NO SPECIFIC LOCATION PLAN
99 - DK/REF

Q21. {Were the trees you planted replacements for existing trees or were they new additions to your landscaping? / Was the tree you planted a replacement for an existing tree or was it a new addition to your landscaping?}

1 - REPLACEMENT(S)
2 - NEW ADDITION(S)
3 - BOTH VOLUNTEERED
9 - DK/REF

Q22. Did you attend a planting session in your own neighborhood, or in some other neighborhood?

1 - OWN NEIGHBORHOOD
2 - OTHER NEIGHBORHOOD ---------- **> GO TO Q22f**
9 - DK/REF ---------- **> GO TO Q23**

Q22a. **[IF OWN NEIGHBORHOOD:]** Were you one of the primary organizers of your neighborhood group, or were you invited by another neighbor who organized the group?

1 - ORGANIZER
2 - INVITED ---------- **> GO TO Q22d**
9 - DK/REF ---------- **> GO TO Q22d**

Q22b. **[IF ORGANIZER:]** How easy or difficult was it to get together a group of neighbors to participate in this program? Was it...*

1 - very easy,
2 - somewhat easy,
3 - somewhat difficult, or
4 - very difficult?
9 - DK/REF

Q22c. If you had it to do over again, would you act as one of the primary organizers for such a program?

1 - YES
2 - NO
9 - DK/REF

Q22d. Would you say that participating in this program increased the sense of community among the participating neighbors...*

1 - a great deal,
2 - somewhat,
3 - not very much, or
4 - not at all?
9 - DK/REF

Q22e. Besides the neighbors who participated, have you or other members of your household told any <u>other</u> people about the Cool Communities Shade Tree Program? **[IF YES:]** Approximately how many people have you told?

_____ PEOPLE
0 - NONE
97 - 97 OR MORE
99 - DK/REF

NOW GO TO Q23

Q22f. **[ONLY ASK IF <u>OTHER</u> NEIGHBORHOOD:]** Why was it necessary for you to attend a workshop in <u>another</u> neighborhood? **[PROBE AND RECORD <u>ONE</u> MAIN REASON]**

1 - NOT ENOUGH PARTICIPATION IN OWN NEIGHBORHOOD
2 - SCHEDULE PROHIBITED ATTENDING IN OWN NEIGHBORHOOD
3 - LOCATION MORE CONVENIENT IN OTHER NEIGHBORHOOD
4 - OTHER, SPECIFY: _____
9 - DK/REF

Q22g. How easy or difficult was it for you to participate in this program by attending the planting session in <u>another</u> neighborhood, rather than in your own neighborhood? Was it...*

1 - very easy,
2 - somewhat easy,
3 - somewhat difficult, or
4 - very difficult?
9 - DK/REF

Q23. Overall, how satisfied or dissatisfied are you with the Cool Communities Program? Are you...*

1 - very satisfied,
2 - somewhat satisfied,
3 - somewhat dissatisfied, or
4 - very dissatisfied?
9 - DK/REF

Q24. Overall, how satisfied or dissatisfied are you with the customer service aspect of this program? Would you say...*

1 - very satisfied,
2 - somewhat satisfied,
3 - somewhat dissatisfied, or
4 - very dissatisfied?
9 - DK/REF/NO EXPERIENCE WITH CUSTOMER SERVICE

Q25. Were all of your questions answered to your satisfaction and in a timely manner?

1 - YES
2 - NO
9 - DK/REF/NO QUESTIONS

Q26. If you had it to do over again, would you choose to participate in this program?

1 - YES
2 - NO
9 - DK/REF

Q27. Are you aware that a representative of the San Diego Regional Energy Office could make an on-site visit to your home to check the status of the tree(s) you planted? **[IF ASKED, THIS WAS STIPULATED IN THE PARTICIPATION AGREEMENT]**

1 - YES
2 - NO
9 - DK/REF

Q28. What <u>one</u> suggestion would you offer to improve this program?
[PROBE AND RECORD <u>ONE</u> MAIN RESPONSE]

_____

99 - DK/REF

RES. In closing, the following questions are for comparison purposes only. How long have you lived in your current residence? **[RECORD CUMULATIVE YEARS IF GAP IN RESIDENCE]**

_____ YEARS
0 - LESS THAN 6 MONTHS
99 - DK/REF

ENV. Are you a member of any environmental organizations?
[IF YES:] Which one(s)? **[DO NOT READ; RECORD ALL MENTIONED]**

1) AUDUBON SOCIETY
2) GREENPEACE
3) NATURE CONSERVANCY
4) SIERRA CLUB
5) WORLD WILDLIFE FEDERATION
6) OTHER, SPECIFY:
_____
7) DK/REF/NONE

EDU. What is the highest grade or year of school that you have completed and received credit for...

1 - high school or less;
2 - at least one year of college, trade or vocational school;
3 - graduated college with a bachelor's degree; or
4 - at least one year of graduate work beyond a bachelor's?
9 - DK/REF

ADT. How many adults age 18 or older, including yourself, live in your household?

_____ ADULTS
99 - DK/REF

KID. How many children under the age 18 live in your household?

_____ CHILDREN
0 - NO CHILDREN IN HOUSEHOLD
99 - DK/REF

EMP. What is your employment status? Are you...
[CLARIFY AND RECORD ANY COMBINATIONS THAT INCLUDE WORKING AS '1' or '2', SUCH AS "*STUDENT AND WORKING PT*"]

1 - working full-time, (at least 35 hours per week)
2 - working part-time, or
3 - not working?
9 - DK/REF

AGE. Please tell me when I mention the category that contains your age...

1 - 18 to 24,
2 - 25 to 34,
3 - 35 to 44,
4 - 45 to 54,
5 - 55 to 64, or
6 - 65 or over?
9 - DK/REF

ETH. Which of the following best describes your ethnic or racial background...

1 - white, not of Hispanic origin,
2 - black, not of Hispanic origin,
3 - Hispanic or Latino,
4 - Asian or Pacific Islander,
5 - Native American, or
6 - another ethnic group? SPECIFY: _____
9 - DK/REF

INC. Now, we don't want to know your exact income, but just roughly, could you tell me if your annual household income before taxes is...

1 - under $25,000,
2 - $25,000 up to but not including $50,000,
3 - $50,000 up to (but not including) $75,000,
4 - $75,000 up to (but not including) $100,000, or
5 - $100,000 or more?
9 - DK/REF

[THANK RESPONDENT AND RECORD ALL INFORMATION BELOW]

PHN. Those are all the questions I have. **[ONLY IF NOT ON CATI:]** I'd like to confirm that I reached you at...

[VERIFY AND INSERT TELEPHONE NUMBER:] _____

NAM. and that I'm speaking with...

[VERIFY AND INSERT RESPONDENT'S NAME:] _____

Your name and phone number will be separated from your responses to these questions and destroyed after the data has been processed.
[THANK RESPONDENT; RECORD REMAINING INFORMATION BELOW]

TIN. **[INTERVIEWER NUMBER:] _____**

LEN. **[LENGTH OF INTERVIEW IN MINUTES:] _____**

DAT. **[DATE OF INTERVIEW:] _____**

REC. **[CATI RECORD NUMBER:] _____**

PID. **[PROJECT ID#:] _____ [MDI: IMPORTED FROM SAMPLE RECORD]**