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Logan City CurbsideRecycling Program Phase III Results

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FINAL REPORT

LOGAN CITY CURBSIDE RECYCLING PROGRAM STUDY

PHASE III Results:

UPDATED RECYCLING ATTITUDES AND BEHAVIORS, RESULTS OF 60 GALLON CAN AND RECYCLING EXPERIMENT, AND EVALUATION OF CURRENT CUSTOMERS IN 2005

A Study Conducted for
The City of Logan, Utah

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Section 1: Introduction and Background

1.a) Origins of the Project

This report summarizes the results of a series of survey research projects examining the attitudes and behaviors of Cache County residents regarding recycling programs in 2005. USU researchers were contacted by the Cache County Service District #1, through the Logan Environmental Department, to update information about household recycling attitudes and behaviors, and to present results to various audiences as part of the long-range county solid waste master planning process.

This report is part of a multi-phase study of recycling in Cache Valley that began in 2004. Phase I of this project involved comprehensive random sample surveys of typical Cache County households to ascertain levels of recycling behavior, attitudes towards recycling & landfill issues, and reactions to alternative policy approaches. Sampling strategies allowed the comparison of households in the Logan Metro Area (Logan, North Logan, River Heights & Providence) with households in the rest of the County. There were also special surveys completed with samples of households that had signed up for the county greenwaste curbside pickup program and a private curbside recycling service. These initial surveys were completed during the summer and fall of 2004.

<u>Phase I: Summer and Fall 2004</u>

A final report for Phase I research (Jackson-Smith et al., 2005) was completed in March 2005 and is available from Dr. Douglas Jackson-Smith at USU or the Logan Environmental Department.

Briefly, results of Phase I showed that most area residents recycle some, have positive impressions and know where they can take their recyclable materials (i.e. to drop-off sites). The largest concerns voiced by survey respondents were the inconvenience of having to take recyclable materials to drop-off sites and the space that is taken up keeping the recyclables in their home. With regard to convenience, survey respondents had mixed opinions in terms of the current degree of convenience of recycling. Many individuals said that they would recycle more if it were more convenient, especially if it were a curbside service that did not require sorting.

Overall, the results generally painted a picture of a community that would be receptive to a simple, unsorted, curbside recycling program.

Phase II: Fall/Winter 2005

Phase II was designed to determine how typical households (i.e., those who had not voluntarily signed up for the curbside program) would evaluate a curbside recycling program. One component of the effort was to determine the willingness of typical households to pay for this program. In addition, we were interested in whether recycling behavior and attitudes changed after exposure to structured recycling program.

Methodologically, the second phase consisted of a formal experiment, where 3 months of free curbside recycling were provided to a random sample of roughly half of the original Logan Metro Area Household respondents from Phase I. The curbside service was provided in the fall of 2005. A control group of the remaining households was also included as a benchmark for the study. This phase included two follow-up surveys: with households participating in the experiment in January and February, 2005 and with control households in early summer, 2005.

The results of Phase II suggested that exposure to a curbside recycling program was very well received by the participants. Over 40 percent of the households involved voluntarily signed up for the program (at the $6/month rate) at the end of the study. In addition, availability of curbside recycling cans increased recycling behavior and intensity, improved perceptions of convenience, and was associated with more positive assessments of recycling in general. However, there was not much short-term change in support for policies related to recycling.

Phase II results were summarized in a Masters Thesis in Sociology by Jaime Ericksen at Utah State University (Ericksen 2005), and presented in a professional conference paper in June 2005 (Ericksen and Jackson-Smith 2005). Copies of the relevant documents are available from Dr. Douglas Jackson-Smith at Utah State University.

1.b) Phase III Objectives

This report summarizes Phase III of the overall project, which extends previous surveys that involved various cross-sectional samples of Cache County residents.

The objectives of Phase III were fourfold:

1) to determine whether 'typical 'typical' households can fit their trash into a 60 gallon trash container (if they have curbside recycling),
2) to evaluate both 60-gallon & Curbside Services,
3) to determine the willingness of households in the Logan Metro area to pay for this program, and
4) to update information about recycling attitudes
5) to obtain evaluation feedback from households that were already participating in the voluntary curbside recycling program..

Phase III data collection began in May, 2005 and continued through October 2005.

To accomplish the first four objectives, we approached randomly selected households in the Logan Metro Area that currently used a 90 gallon trash can and were not participating in the voluntary curbside recycling program. These households were invited to replace their 90 gallon trash can with a a smaller 60 gallon can in conjunction with a can for the curbside recycling service. The 60+recycling service would continue for 3 months, after which we would replace their original 90 gallon can. To entice their participation, we offered to waive all or part of their household waste bill during the 3 month experiment. The financial conditions attached to participating in this experimental program were be carefully designed and varied to enable researchers to discover what levels of participation might be expected under a range of policy scenarios. Households were also allowed to cancel their participation in the experiment at any time. Households received this service for 3 months in late spring/summer of 2005 and follow up interviews were then conducted with these households to gather information regarding their experiences.

To accomplish our fifth objective, we drew a new random sample of households that had voluntarily signed up for curbside recycling service with the Logan Environmental Department. A mail survey was used to obtain their evaluation of the curbside service.

1.c) Overview of Report

The remainder of this report describes the methodology used to collect the data, and presents the results of the curbside + 60 experiment as well as the early curbside service evaluation survey.

Section 2
Methodology

2.a) Sampling and Survey Implementation

Phase III: 60 Gallon Can Experiment

Our Phase III study involved three primary samples of households.

The first two samples were used to conduct the 60 gallon can + curbside recycling experiment. As noted above, households were randomly selected to participate in this experiment. Our samples for this experiment were drawn from two lists:

1) We returned to all 110 of the control households from Phase I (fall 2004). These households were originally randomly selected from lists of household waste customers provided by the four cities in the Logan Metro Area.
2) We also selected a new multi-stage cluster sample of 100 households from Logan Metro Area neighborhoods to ensure that our results from the first sample were representative of the current population in the study area, and to boost our overall sample size.

Respondents from households from the first sample were known from the previous phase of the project and were sent an advance letter and then visited by trained and IRB-certified graduate students from Utah State University.

Households from the second sample were selected using procedures developed in Phase I of the overall project. Specifically, households were randomly selected as 'seed houses'. When the field staff arrived at this seed house, they were asked also to approach up to 7 other households in the immediate vicinity (usually following along the same side of the street in both directions) until a total of 5 households were interviewed in each neighborhood. In this way, we effectively contacted 100 new households across 20 neighborhoods in the Logan Metropolitan Area.

During the initial household visits, we asked households to complete a baseline survey that included questions regarding their current recycling behavior and attitudes, and perceptions of 60 gallon trash cans. Specifically, we utilized a standard Drop-Off/Pick-Up (DOPU) method (Steele et al., 2001)[1]. This technique involves making multiple visits to each household until personal contact is made with a selected adult in the household. In this study, we sought to talk to the adult who was most responsible for recycling and waste management decisions in the household. The researcher explains the project, leaves a survey, then arranges a time to return to pick up the completed questionnaire. If a sampled respondent fails to respond after multiple attempts to deliver or pick up the survey, we left a copy of the survey with a prepaid envelope and instructions for the person to mail the survey in once completed.

After we received a completed baseline survey, respondents were approached in person and invited to participate in an experiment that would entail replacing their current 90 gallon trash

[1] Steele, J., Bourke, L., Luloff, A. E., Liao, P., Theodori, G.L. and Krannich, R.S. 2001. The Drop-Off/Pick-Up Method for Household Survey Research. *Journal of the Community Development Society*, 32:238-250.

can service with a smaller 60 gallon can in conjunction with the curbside recycling service. Households would receive this service for 3 months in late spring/summer of 2005. Background about the program was provided.

Because we felt many households would be reluctant to voluntarily give up their 90 gallon trash cans, we made arrangements with the Logan Environmental Department to waive part or all of the households waste collection bills during the study. Specifically, each household was made a series of 'offers' that provided increasing levels of compensation. The offers included:

1) No change in bill (free curbside recycling, no 60 gallon credit),
2) Slight reduction in bill (free recycling + reg. 60 gal. credit), valued at $3.85 and
3) Free waste service for three months ($40 compensation at end; roughly $13 per month).

These options for participating in the experiment were offered only to households that didn't already have curbside recycling service or a 60 gallon can.

After 3 months of 60 gallon + curbside recycling service, all participating households were again visited and a follow up survey was implemented with these households using the DOPU methodology to gather information regarding their experiences.

Phase III: Survey of Recycling Customers

A second aspect of this third phase of research on recycling included a mail survey of current curbside recycling customers. This program was initiated by the Logan City Environmental Department in summer 2004 and was available to households in seven Cache County municipalities at the cost of $6.00 per month. By May 2005, about 1,600 households had voluntarily signed up for this curbside recycling program. This subproject had three objectives:

1) To describe the sociodemographics of households involved in the curbside recycling program, and
2) To acquire feedback regarding the convenience, efficiency, service quality, and other attributes of the curbside service.
3) To see if the new curbside subscriber households were more typical of Cache County households than the original Sunrise Recycling service customer base surved in Phase I in 2004.

The following number of households in the following cities had signed up for voluntary recycling by May 2005 and were included in our sample frame:

- Smithfield (n=160)
- Hyde Park (n=95)
- North Logan (n=163)
- Logan (n=831)
- River Heights (n=49)
- Providence (n=147)
- Millville (n=28)
- Nibley (n=57)
- Hyrum (n=68)

A mail survey was developed and sent to 250 randomly selected households from the master customer list. The survey was administered out of the USU Sociology department's research lab and entailed two mailings of a cover letter, survey instrument and return envelope. We also mailed reminder cards after each survey mailing. We anticipated high response rates due to the salience of the survey to this population.

2.b) Response Rates

Table 1 summarizes the size of the sampling frame, the contact techniques, the sample size, and the response rates associated with samples used in the main aspects of our study.

Baseline Surveys

With respect to the Experimental 60 Gallon Can experiment, a total of 192 (78%) of households approached completed their baseline survey in the summer of 2005. The results of this baseline survey are considered highly representative of the household waste customers in the four-city Logan Metropolitan Area. In the analysis presented below, these results are used to provide an updated profile of recycling behaviors, attitudes, and policy preferences among these households.

60 Gallon Can Experiment

Of the 192 households who completed a baseline survey, 40 were disqualified for the experiment because they already had a 60 gallon can, had signed up on their own for curbside recycling service, or both. Another 4 households were not able to be contacted to invite them to participate.

The remaining 148 households were invited to participate in the experiment. Of these, 69 (or roughly 47 percent) accepted the offer to participate. As outlined above, a series of financial terms were offered to potential participants. The results suggest that 30 of these households agreed to participate without any financial benefit (e.g., there was no change in their monthly bill). Another 22 agreed to a plan in which they received a $3.85 monthly credit on their bills. A final group of 17 households agreed to participate in exchange for a $40.00 payment at the end of the three month period (essentially compensating them for the full cost of their solid waste bill during that time).

An additional group of 79 households (~ 53% of those eligible) declined to participate in the experiment, despite receiving an offer to compensate them at the $40 level. Most of these households indicated that they were worried that they could fit their trash into a 60 gallon can, or felt that the compensation was not worth the hassle of participating. In the analysis below, we compare the characteristics of these 'refusal' households with those who elected to participate.

Table 1: Response Rates in General Baseline Survey and 60 gallon + Curbside Experiment

Phase of Experiment	Phase I control group sample	New Logan Metro Area Random Sample	COMBINED SAMPLES
Baseline Survey			
Original Sample Frame	111	147	258
Disqualified [1]	6	7	13
Adjusted sample size	105	140	245
Baseline surveys completed	83	109	192
Baseline survey response rate	**79.0%**	**77.9%**	**78.4%**
Participation in 60+curbside experiment			
Disqualified for participation (in advance)	12	28	40
Reasons for disqualification			
has recycling already	*2*	*4*	*6*
has 60 gal can	*9*	*14*	*23*
has both	*0*	*1*	*1*
has 2 90s	*1*	*1*	*2*
has dumpster	*0*	*5*	*5*
moving	*0*	*3*	*3*
Eligible for participation	71	81	152
Not invited (*for various reasons*)	2	2	4
Invited to participate	69	79	148
Accepted offer to Participate	31	38	69
Type of offer accepted			
No change in bill	*19*	*11*	*30*
$3.85 per month reduction	*9*	*13*	*22*
$13.33 per month payment	*3*	*14*	*17*
Refused to participate	38	41	79
Participation Rate	**44.9%**	**48.1%**	**46.6%**
Follow-Up Evaluation Survey (60+curbside experiment)			
Number participated in experiment (original)	31	38	69
Disqualified (had curbside or 60 gallon cans)	3	2	5
Dropped out during experiment	2	0	2
Completed experiment	26	36	62
Completed experiment and filled out follow-up survey	25	32	57
Completed experiment and did not return follow-up survey	1	4	5
Response rate to followup survey			
Percent qualified, completed experiment, did survey	**96.2%**	**88.9%**	**91.9%**

Survey of Curbside Recycling Customers

Of the 250 randomly selected curbside customer households who received a mail survey, 10 were disqualified because they had moved or were not actual private residences. From the remaining 240 households, we received completed surveys from 212 households, for a response rate of 88.3 percent. Table 2 summarizes response rate information for this component of our study. Response rates by city are not shown, but ranged from 78-100 %. Results of this survey of recycling customers will be summarized in the findings section below.

Table 2: Response Rates for Survey of Curbside Recycling Customers, Summer 2005

Type	Number
Total Eligible to be Sampled	1,598
Size of Random Sample Selected	250
Disqualified	10
Adjusted Sample Size	240
Responded to Survey	212
Response Rate	88.3%

2.c) Characteristics of Respondents & Response Bias Analysis

To ensure that our samples reflect the broader community of households, we examined in detail the demographic and household characteristics of respondents from each of our FU and NRS subsamples. We also examined the characteristics of households involved at various stages of the 60-gallon + curbside can experimental project. Differences in households across various participation categories (disqualified, participated, refused to participate) help identify any systematic response bias that might have occurred in our study. (See Table 3).

Demographic Characteristics

Roughly 60 percent of our respondents were female (which reflects the greater role of women in managing waste or recycling in their homes), and the mean age was 46 years old. Roughly 20 percent of our participants had a graduate degree, another 30 percent had a four-year college degree, and the rest had some college or a high school diploma. About 17 percent of responding households had incomes above $75,000 per year, 45 percent had incomes between $35,000-$75,000, and just over 10 reported household incomes below $15,000. The mean household size was 3.2 persons, and 53 percent of our respondents reported having children living at home. The typical household lived in Cache County for over 20 years, and 79 percent owned their own home. These demographic characteristics are reasonably representative of census estimates of Logan Metro Area homes. Because of the nature of the sampling frame (residential trash service customers), there are fewer rental households than is typical in Logan City, and thus more people in our samples with higher levels of education and income.

Table 3. Demographic Characteristics of Samples Included in Phase III Efforts

Characteristic	Original Sampled Households			Experimental Participation Status			Participant Plan Selected (Among 70 Participating Households)		
	FU respondents (N=83)	NRS respondents (N=109)	Combined Samples (N=192)	Initially Not Eligible for Experiment (N=40)	Participated in Experiment (N=70)	Refused to Participate in Experiment (N=78)	Plan A - no change (n=30)	Plan B - $3.85 credit (n=22)	Plan C $13.33 credit (n=18)
Percent female	65.1	56.1	60 *n.s.*	65.0	62.1	55.8 *n.s.*	56.7	72.7	66.7 *n.s.*
Mean Age (years)	45.9	46.4	46.2 *n.s.*	40.6	44.7	49.4 *	43.8	42.6	50.3 *n.s.*
Percent in Age Group									
Under 35	25.3	38.0	32.6	45.0	33.3	24.0	33.3	38.1	27.8
35-49	39.2	20.4	28.3	27.5	31.6	28.0	36.7	28.6	33.3
50-64	19.0	21.3	20.3	20.0	19.3	24.0	20.0	19.0	5.6
65+	16.5	20.4	18.7	7.5	15.8	24.0	10.0	14.3	33.3
Total	*100.0*	*100.0*	*100.0* *	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*
Percent by Educational Level									
HS diploma or less	14.6	17.4	16.2	10.0	15.3	20.8	6.7	21.7	16.7
Some college, no degree	31.7	23.9	27.2	17.5	30.5	27.3	33.3	21.7	44.4
Trade school (2-yr degree)	7.3	10.1	8.9	12.5	5.1	9.1	6.7	8.7	5.6
Bachelor's degree	28.0	32.1	30.4	45.0	28.8	27.3	30.0	30.4	22.2
Graduate school or professional degree	18.3	16.5	17.3	15.0	20.3	15.6	23.3	17.4	11.1
Total	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*
Percent by Income Level									
under 15K	5.5	14.1	10.5	12.8	8.9	9.2	0.0	30.4	6.3
15K-24,999	15.1	8.1	11.0	12.8	8.9	12.3	14.3	4.3	0.0
25K - 34,999	13.7	19.2	16.9	15.4	14.3	16.9	14.3	13.0	25.0
35K - 49K	21.9	21.2	21.5	23.1	25.0	18.5	17.9	26.1	25.0
50K-74,999	20.5	25.3	23.3	20.5	28.6	23.1	32.1	21.7	25.0
75K and up	23.3	12.1	16.9	15.4	14.3	20.0	21.4	4.3	18.8
Total	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*
Percent by Household Size									
1	14.8	12.8	13.7	20.0	8.8	11.5	10.3	13.6	16.7
2	27.2	34.9	31.6	32.5	31.6	30.8	17.2	40.9	38.9
3	16.0	17.4	16.8	22.5	17.5	14.1	17.2	9.1	22.2
4	18.5	12.8	15.3	7.5	14.0	20.5	20.7	18.2	5.6
5 or more	23.5	22.0	22.6	17.5	28.1	23.1	34.5	18.2	16.7
Total	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*	*100.0*	*100.0*	*100.0 n.s.*
Mean Household Size	3.2	3.2	3.2 *n.s.*	2.9	3.3	3.4 *n.s.*	3.6	3.0	2.7 *n.s.*
Percent of Households with Children at Home	58.5	48.6	52.9 *n.s.*	37.5	67.2	55.1 **	72.4	56.5	50.0 *n.s.*
Means years living in Cache County	22.5	25.2	24.0 *n.s.*	19.6	20.2	30.0 **	21.9	20.2	13.0 *
Percent who own their own home	80.5	77.1	78.5 *n.s.*	60.0	83.1	85.7 *n.s.*	83.3	69.6	88.9 *n.s.*

Differences across our FU and NRS samples were generally not significant. FU and NRS sample respondents only differed in a statistically significant sense on the age variable – with fewer respondents in the 35-49 year old range in the NRS sample.

Differences across experimental participation status were also not very remarkable. We were concerned that people who were ineligible for the experiment (because they already had curbside recycling or 60 gallon cans) might be unusual. More importantly, we were concerned that the eligible households who volunteered to participate in the experiment might have certain characteristics that make them different from those who refused to participate. Overall, there were no statistically significant differences among these three groups by gender, age groups, education, income, homeownership status, or household size. The only notable differences were that respondents in the households that refused tended to be older, less likely to have children at home, and had lived in Cache County for more years on average. Some of these differences are discussed in more depth below.

Section 3
FINDINGS

3.a) The Frequency of Recycling and Recycling Behavior

The results of the summer 2005 household baseline surveys indicate that the majority of households in the four Logan Metro Area cities continue to engage in some type of recycling activity. The frequencies of various types of recycling behaviors are reported in Table 4 below. Results are disaggregated to allow comparison of responses from the "New Random Sample" (NRS) of households first contacted in 2005 with the "Follow-Up Sample" (FU) of households that had also participated in our survey in 2004. This comparison helps identify any systematic patterns or changes that might have occurred in the community over the previous year.

For both samples, over two-thirds of respondents reported recycling at least some of their household waste. Most, however, did not recycle very intensively. Indeed, only 10 and 7 percent of households from the NRS and FUS sample reported recycling "almost all" of the potentially recyclable waste products that they generate. Another 22 to 26.5 percent of the households who do recycle indicated that they recycle only "a little."

The majority of households in both the NRS and FUS knew the location of the drop-off sites, which are located around the county as places where people can recycle their sorted recyclable waste products. These sites require people to organize their recyclables and transport them to the drop-off site for disposal. Of those aware of the drop-off site location, 88% of the NRS and 78% of the UFS respondents had taken materials there. And of those who have used the sites, majorities expressed high levels of satisfaction with various aspects of the drop-off bins, including overall (98.7%), distance from their residence (91.2%), cleanliness of the site (88.7%), the type of materials accepted (87.2%), and the frequency of pickup (86.3%).

Participants (in the NRS) were asked about various types of materials and the frequency with which they typically recycled them. While slightly more than fifty percent of respondents reported always recycling newspapers (51.6%) and cardboard boxes (53.4%) and almost half reported always recycling aluminum cans (49.3%), such a high rate of consistently recycling is not the case with the other nine types of materials about which participants were queried. In fact, only slightly over 30 percent reported always recycling pop bottles (33.9%), magazines (31.8%) and milk jugs (30.9%). Less than one-fifth of households reported always recycling regular paper, other plastic containers, metal cans, and glass bottles and jars. Indeed, consistently over forty percent of households reported that they 'always throw away' regular paper, pop bottles, milk jugs, and other plastic containers, and over half always throw away metal cans (52.3%) and glass bottles and jars (58%).

Table 4. Recycling Behavior; Summer 2005

Indicator	% NRS sample (Summer 2005)			% FU sample (Fall 2004)	
Frequency of Recycling					
Did not recycle	28.4%			37.3%	
Recycled (amount unclear)	5.5%			0.0%	
Recycled a little	22.0%			26.5%	
Recycled less than half	17.4%			16.9%	
Recycled more than half	16.5%			12.0%	
Recycled almost all	10.1%			7.2%	
	100.0%			100.0%	
How much of the following did you recycle?[1]	Always throw away	Sometimes throw away, sometimes recycle	Always recycle		
Newspapers	12.5	35.9	51.6	*n.a.*	
Cardboard boxes	13.7	32.9	53.4	*n.a.*	
Aluminum cans	14.9	35.8	49.3	*n.a.*	
Magazines	31.8	36.4	31.8	*n.a.*	
Regular paper	40.3	41.7	18.1	*n.a.*	
Pop bottles	40.7	25.4	33.9	*n.a.*	
Milk jugs	45.6	23.5	30.9	*n.a.*	
Other plastic containers	46.3	34.3	19.4	*n.a.*	
Metal cans	52.4	27.0	20.6	*n.a.*	
Glass bottles and jars	58.0	27.5	14.5	*n.a.*	
Use of Drop-off Recycling Facilities					
	% all hhs	% who knew	% who used	% all hhs	% who knew
Knows where drop-off bins are located	82.4%			80.5%	
Has taken material to drop-off bins	73.0%	88.6%		63.1%	78.4%
Percent satisfied with aspects of drop-off bins[2]					
Overall			98.7%	*n.a.*	*n.a.*
Distance from House			91.2%	*n.a.*	*n.a.*
Cleanliness of Drop-Off Site			88.7%	*n.a.*	*n.a.*
Type of Materials Accepted			87.2%	*n.a.*	*n.a.*
Frequency of Pickup			86.3%	*n.a.*	*n.a.*

Notes

[1] Percent of those who reported having any of this product in their home.

2 Percent satisfied or very satisfied among those who have used the bins

n.a . = not asked in this version of the questionnaire

3.b) Recycling Attitudes

3.b.i) Views toward recycling programs and policies

Phase III of the study also sought to provide an update regarding recycling policy views based on a new random sample of Logan Metro Area households regarding three main topics: recycling behavior, views on existing and proposed programs, and attitudes toward recycling.

The survey instruments for the new random sample (NRS) and the follow-up sample (FUS) included a number of questions designed to evaluate residents' views toward recycling, including existing and possible future recycling programs in Cache County. Some of the questions were duplicated on the two surveys and are shown in Part A of Table 5. Part B of Table 5 includes questions specific to the NRS questionnaire. The first section in Table 5 shows the responses to various statements from the surveys for the sample groups combined that suggest a willingness to recycle and perceived responsibility for recycling.

Part A of Table 5 shows responses to statements about recycling programs and policies for the combined NRS and FUS surveys. The convenience of recycling remains an important consideration, as 69 percent of those surveyed agreed/strongly agreed that they would recycle more if it were more convenient. Strong support (shown by those agreeing and strongly agreeing) is also evident for certain aspects related to policy, where majorities think that the county has an obligation to provide recycling services (72%), would support making curbside recycling a universal service (67%), and would support an expansion of county recycling efforts (70%).

Residents also expressed fairly consistent views with regard to how a change in service (to a 60 gallon can and curbside recycling) should be reflected in the fee charged to households. Over two-thirds felt the fee should be the same if they switch from their current 90 gallon service to a 60 gallon can + curbside recycling. Also, people generally disagreed that those willing to recycle should pay extra for curbside service (55.6%). More mixed views are evident, however, with regard to other aspects related to the costs of recycling programs. For instance, survey respondents were relatively evenly split between agree/strongly agree (37%), neutral (30%), and disagree/strongly disagree (32%) that all households should help pay for the costs of recycling programs. A somewhat similar split is shown with regard to views that the standard service should be to have 60 gallon trash cans and households should pay extra for a 90 gallon trash can, with 43 percent disagreeing, 33 percent agreeing, and 25 percent expressing a neutral opinion.

Part B of Table 5 shows responses to statements about recycling programs and policies for the NRS survey. Similar sentiments to those expressed above are shown in these responses. There is a broadly held view that an expansion of recycling efforts will improve environmental conditions in Cache County (75 percent agreeing). Views are somewhat mixed regarding whether current programs are sufficient, with 34 percent disagreeing that this is the case, only 15 percent agreeing, and 49 percent expressing a neutral view.

Table 5: Attitudes toward Recycling Programs and Policies

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean Score
	Percent of Respondents Who					
Part A: Willingness to Recycle **						
I would recycle more if it were more convenient.	2.7	11.4	16.8	**51.9**	17.3	3.70
All households should help pay for the costs of recycling programs.	9.2	22.7	**30.3**	27.6	10.3	3.07
Those willing to recycle should pay extra for curbside service.	17.1	**38.5**	25.7	15.0	3.7	2.52
The standard service should be to have 60 gallon trash cans and curbside recycling service.	9.7	**32.8**	24.7	23.7	9.1	2.88
If I switched to a 60 gallon can and curbside recycling service, I should pay the same fee.	1.1	8.1	19.5	**57.3**	14.1	3.76
I would support making curbside recycling a universal service for all Cache County households.	2.2	7.1	24.5	**47.8**	18.5	3.74
I think the county has an obligation to provide recycling services.	0.5	5.4	22.2	**50.3**	21.6	3.87
I would support an expansion of county recycling efforts.	0.5	4.3	25.0	**54.3**	15.8	3.80
Part B: Views Toward Recycling Programs ***						
Existing recycling programs in Cache County are sufficient.	1.0	33.7	**49.0**	13.5	1.9	3.10
Expanding our current level of recycling will improve environmental conditions in Cache County.	0.0	3.7	20.6	**52.3**	23.4	4.05
If I pay extra for curbside recycling service, I should pay less for my regular trash pickup.	1.0	3.8	21.0	**60.0**	14.3	4.02
Recycling progams should pay for themselves.	0.9	2.8	28.3	**50.9**	17.0	3.94
As we open a new landfill, trash disposal will become more expensive.	1.9	12.6	32.0	**48.5**	4.9	3.72
I should be able to get a 40 gallon can at an even lower fee.	2.0	12.7	35.3	**46.1**	3.9	3.73
I would support making Greenwaste collection a standard part of households service.	1.0	7.7	25.0	**49.0**	17.3	3.98
Greenwaste should be disposed of through backyard composting.	2.9	26.9	**49.0**	1.9	13.5	3.21
County communites should provide a curbside 'Spring Cleanup' pickup.	0.0	1.9	14.4	**52.9**	30.8	4.35

NOTES:
* = Combined New Random Sample (NRS) and Follow Up Sample (FUS) results (N=192)
** = NRS sample only (N=109)
Modal answer categories noted in bold.

With regard to the monetary aspects of recycling programs, over two-thirds of respondents agree that recycling programs should pay for themselves. Respondents also expressed a willingness to have the costs of participating in a recycling program partially covered by the provider in terms of reduced costs for individual households. For example, nearly three-fourths agreed that when paying extra for curbside recycling should be translated into reduced costs for regular trash pickup. And, half of the respondents agreed that a 40 gallon can should be available for an even lower fee than other can sizes currently available, the standard 90 gallon can and smaller 60 gallon can.

Survey participants were also asked a few questions regarding the Greenwaste Program. About two-thirds of residents expressed a willingness to support making Greenwaste collection a standard part of waste collection service. Over eighty percent were in favor of county communities providing curbside seasonal clean-ups like a 'Spring Cleanup'. Views generally are mixed, however, as nearly half of respondents had a neutral response regarding whether Greenwaste should be disposed of through backyard composting.

In sum, with regard to policy views, most people support current recycling programs and want to expand them. There was, however, more disagreement between respondents about whom should pay (everyone vs. just those using service) and how pricing should work (should you lower regular waste fees for those who recycle?). In particular, most support making curbside recycling + 60 gallon part of a standard service in principle, but this becomes more complex when a price tag is attached. More specifically, 71% of general public sample support the service if it would be the same price and 80% of experimental households were willing to pay $1 more per month. People making connections to landfill issue (and expect some cost increases in future).

3.b.ii) Views on the costs and benefits of recycling

Previous research suggests that people's perceptions of the costs and benefits associated with recycling can influence their support of recycling programs and their own personal recycling behavior, especially when recycling might not be perceived as convenient.

To determine the views of valley residents toward recycling, the survey included a number of questions designed to measure whether they personally feel a responsibility to recycle (personal norms), whether they feel recycling produces costs or benefits to society (views on the efficacy of recycling in general), whether recycling is convenient (personal benefits and costs), and other attitudes regarding concern about solid waste management issues (generalized environmental concern).

Table 6 summarizes the percent of respondents in each sample group that strongly agree or agree (or strongly disagree or disagree) with a set of statements regarding recycling's costs and benefits. Some of the questions were duplicated on the two surveys and are shown in Parts A and C of Table 6. Part B of Table 6 includes questions specific to the NRS questionnaire.

Proponents and opponents of public recycling programs have articulated a number of possible benefits and costs associated with recycling. Generally, Cache County adults appear to evince the sense that recycling has positive benefits and is something that they should be doing. With regard to perceived personal responsibility for recycling or the perceived costs and benefits of recycling, results show some interesting patterns. For instance, clear majorities feel that recycling is something they think they should do (87 percent), and disagree that recycling is not very important to them (73 percent). People generally report that recycling provides some personal satisfaction, including feeling better when recycling (73 percent) and feeling guilty when throwing away recyclable materials (61 percent). Over half of the respondents said that they were eager to participate in a recycling program (53.7 percent).

Recycling programs are widely believed to have both costs and benefits associated with them, Time and space considerations, however, remain prominent with regard to recycling. For instance, while almost half did not agree that recycling takes too much time (49.8 percent), 26.7 and 23.5 percent responded either neutrally or in agreement, respectively. With regard to household space requirements, 36 percent disagreed that recycling takes up too much space, while 38 agreed and 25 percent expressed a neutral view.

The results shown here suggest that most county residents agree with statements suggesting that recycling improves environmental quality and can extend the life of the landfill. In terms of concerns regarding future waste issues, when asked about whether they were concerned about the environmental impacts of household waste disposal and landfills in general, it is apparent that 62 percent of households worry about the environmental impacts of trash disposal and 81 percent think that if they recycle more, it would help extend the life of the landfill. Concerns about regular waste disposal were positively related to individual support for expanded recycling programs. In addition, forty nine percent agreed that a possible fee increase in monthly trash costs may occur in the next five years.

Part B of Table 6 shows responses to statements about perceived responsibility for recycling and costs and benefits of recycling for the NRS survey. Respondents agree with the idea that recycling conserves energy (74 percent). 74 percent express agreement with the sentiment that everyone has a responsibility to recycle. In fact, nearly three-fourths reported that they would like to see their household recycle more of its waste.

While people express a sense of personal responsibility toward protecting the environment, costs are still apparent to many, especially in financial terms and those involving time. Efficacy concerns are expressed by parts of the population as well.

With regard to specific costs associated with environmental protection, respondents were asked about their willingness to pay higher prices and taxes, and whether they would accept cuts in their standard of living. While majorities expressed an unwillingness to pay higher taxes (51 percent) and accept cuts in standard of living (55 percent), over half responded that they would be somewhat willing to pay higher prices to protect the environment. Clearly, environmental issues are prominent on the minds of county residents and are important issues for policymakers.

Table 6: Attitudes toward Recycling

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean Score
	Percent of Respondents Who					
Perceived Personal Responsibility for Recycling *						
Recycling is something I think I should do.	0.0	3.7	9.0	57.4	29.8	4.13
I feel guilty when I throw away newspapers, plastic and glass.	4.3	13.3	21.3	45.2	16.0	3.55
Recycling is not very important to me.***	28.0	45.7	18.3	6.5	1.6	2.10
I feel better when I recycle.	2.1	4.8	19.7	48.9	24.5	3.89
Recycling should be a personal decision.	3.2	19.0	13.8	53.4	10.6	3.49
Recycling takes too much time.***	13.4	36.4	26.7	23.0	0.5	2.60
Recycling requires too much household space.	8.5	27.7	25.5	35.1	3.2	2.97
I am eager to participate in a recycling program.	1.1	8.5	36.7	38.8	14.9	3.57
I worry about the environmental impacts of where my trash goes.	1.6	6.9	29.1	43.4	19.0	3.72
If I recycled more, it would help extend the life of our landfill.	0.5	1.6	17.5	54.5	26.5	4.04
I expect my monthly trash fees to increase over the next five years.	2.1	21.9	26.7	41.2	8.0	3.31
Perceived Costs and Benefits of Recycling						
Recycling is a major way to conserve resources.	0.9	2.8	19.6	**53.3**	20.6	4.01
Everyone has a responsibility to recycle.	3.7	0.0	22.4	**52.3**	21.5	3.97
I would like to see my household recycle more of its waste.	0.9	2.8	22.6	**56.6**	17.0	4.00
It is just too difficult for someone like me to do much about the environment.*	14.0	**51.4**	26.2	7.5	0.9	2.42
I do what is right for the environment, even when it costs more money or takes more time.	1.0	20.0	**49.5**	27.6	1.9	3.31
There is no point in doing what I can for the environment unlessothers do the same things.*	8.5	**42.5**	23.6	23.6	1.8	2.85
Expressed Willingness Related to Environmental Protection ****						
To protect the environment, how willing would you be to…		Very Willing	Somewhat Willing	Not Willing		
Pay higher prices?		8.8	54.1	37.0		2.28
Pay higher taxes?		6.6	42.3	51.1		2.44
Accept cuts in your standard of living?		8.5	36.4	55.1		2.46

NOTES:
* Combined NRS and FUS samples (N= 194)
** NRS Sample only (N=109)
*** Reverse score for pro-environmental response
**** Slight difference in question wording across two surveys

3.c) Results of the 60 Gallon Can and Curbside Recycling Experiment

Participants in both the new random sample (NRS) and the follow-up sample (FUS) were eligible to participate in an experiment that involved coupling a 60 gallon trash can with curbside recycling for three months to see whether their household could get by with a smaller trash can (the current standard size is 90 gallons). Participants in the experiment were contacted after the completion of the three month period in the fall of 2005. They were asked to complete a questionnaire that included questions about their use of the blue recycling can, whether they noticed any change in the amount of waste their household generated, views about the feasibility of a 60 gallon can for the average household in Cache County, their level of satisfaction with aspects of the service, and concerns they had with the size of the 60 gallon waste receptacle.

3.c.1) Lessons from Participation Rates and Characteristics of Participants

The responses to our offers to participate in the experiment provide some important information regarding household receptivity to a curbside + 60 gallon can service. Overall, 23 percent of Logan Metro Area households already participate in one or both programs. Another 36 percent were willing to try the combined service with some financial incentives. A final group of roughly 41 percent of Logan Metro Area households were sufficiently worried about their ability to get by with the smaller can as to turn down our invitation to participate.,

Because we had information about household characteristics from the baseline survey, we were able to examine whether or not households that chose to participate in the experiment were systematically different from households that did not participate.

The results in Table 3 above illustrate that there were very few significant differences between households that participated in the 60 gallon can experiment and those that refused to participate. In particular, households in each group had similar incomes, education levels, rates of homeownership, and household size. Although we expected bigger households to be less willing to try the smaller garbage can (assuming that their waste stream was larger), the results showed that households willing to participate in the experiment were actually slightly larger on average than those who turned down our offers.

The only notable differences between the two groups were that households refusing to participate were somewhat less likely to have children living at home, were somewhat older, and had lived in Cache County for a longer period of time on average. This suggests that age (and not household characteristics) was the primary determinant of whether a person would agree to participate in the 60 gallon can experiment.

At the end of the three month experimental period, all of the participating households were approached to complete a follow-up survey. Over 90 percent (n=of these households completed the follow-up survey. In the analysis below, evaluation of the 60 gallon can + curbside recycling service is based on this sample of 69 participants.

3.c.2) Waste Disposal Behavior

Table 7 provides basic information regarding the waste disposal behavior of the two sets of households that were eligible to participate in the study. Most of these households began with a 90 gallon black trash can, and switched to the smaller 60 gallon black can and the 90 gallon blue recycling can. As a baseline, it is important to briefly note their typical weekly use of their waste receptacle prior to participating in the experiment.

For the participants from the NRS, 35.2 percent reported their trash can was usually completely full, 26.7 said almost full, 25.7 indicated over half full, and 12.4 percent responded that their can was less than half full. For participants from the FUS, 27.2 percent responded that their trash can was usually completely full, 28.4 indicated almost full, 30.9 said over half full, and 13.6 percent reported that their can was less than half full.

Table 7: Waste Disposal Behavior, Experimental Groups, Summer 2005

Indicator	**% NRS sample**	**% FU sample**
Size of Trash Container in Household		
60 gallon can	13.3	14.6
90 gallon can	80.0	85.4
Other	6.7	0.0
	100.0	100.0
Pre-experimental Trash Can Use (how full typically)		
completely full	35.2	27.2
almost full	26.7	28.4
Over 1/2 full	25.7	30.9
less than 1/2 full	12.4	13.6
Hazardous Waste Disposal		
Knows where to take hazardous wastes	49.5	*n.a.*
Has taken hazardous wastes to landfill1	48.1 (23.8)	*n.a.*

NOTES
1 Percent of those who know where to take wastes (% of all households in parentheses)

Participants in the 60 gallon can experiment with curbside recycling were asked a number of questions regarding their use of the smaller trash can and recycling container. Table 8 shows percentages related to responses from various questions on the survey in this vein. Of those participating in the experiment, over two-thirds reported that they either used their blue container either 'a lot' (41.9 percent) or usually filled it all the way (27.4 percent). Only 2 households (3.2 percent) reported that they never used the blue container. 87 percent of households responded that they recycled more once they had the 90 gallon blue recycling container.

Table 8: Results of Experimental 60 Gallon-Can and Curbside Recycling Program

Indicator		Percent of Experimental Participants
How much did you use your blue container?		
	Never used it	3.2
	Used it a little	6.5
	Used it some	21.0
	Used it a lot	41.9
	Usually filled it all the way	27.4
	Total	*100*
Did you recycle more once you had the blue container? (percent yes)		87.1
How did the blue container affect the amount of regular trash generated by your household?		
	No change	3.3
	Haven't noticed much difference	9.8
	Noticed a slight decrease	26.2
	Notice a significant decrease	60.7
	Total	*100.0*
In a typical week, how full was your 60 gallon trash container?		
	Completely full	11.5
	Almost full	44.3
	Over half full	32.8
	Less than half full	11.5
	Total	*100.0*
During the past three months, how difficult was it for your household to fit your trash into the black 60 gallon trash container?		
	Very difficult	1.6
	Somewhat difficult	0.0
	A little difficult	26.2
	Not difficult	72.1
	Total	*100.0*
Assuming you could continue the regular curbside recycling service in the future, how difficult would it be for your household to get by with a black 60 gallon trash container?		
	Very difficult	1.7
	Somewhat difficult	8.5
	A little difficult	11.9
	Not difficult	78.0
	Total	*100.0*
Agreement with statement: "I think most Cache County households could survive with 60 gallon trash can + curbside recycling."		
	Strongly Disagree	0.0
	Disagree	6.6
	Neutral	29.5
	Agree	32.8
	Strongly Agree	31.1
	Total	*100.0*

Participant households reported noticing a decrease in the amount of regular trash that their household generated, including 60.7 percent who noticed a 'significant decrease' and 26.2 percent who noticed a 'slight decrease.' They were also queried about how full their 60 gallon trash container was in a typical week. 11.5 percent reported that their can was completely full, while 44.3 percent and 32.8 percent reported it was almost or over half full, respectively.

When asked about whether they experienced difficulties during the three month experimental trial period with regard to fitting their trash into the black 60 gallon container, 72.1 percent reported it was not difficult and 26.2 percent responded a little difficult. Further, three-fourths of participants answered that, if coupled with recycling, it would not be difficult for their household to get by with a 60 gallon black trash can. In fact, two-thirds said that they thought it might be possible for other households in Cache County to survive with a 60 gallon trash can and curbside recycling.

Figure 1 shows responses of the participants in the experiment to various aspects of the experimental service involving the 60 gallon can and curbside recycling. Over ninety percent were satisfied or very satisfied with the following aspects: the ability to fit their trash in a 60 gallon trash container, the time required to set recyclables aside, the types of recycling materials accepted, the convenience of curbside recycling, and the reliability of the recycling pickup. Though lower percentages, 80 percent were satisfied with the space required for storing the blue recycling can and 83.6 percent expressed satisfaction with the every other week pickup schedule.

Finally, with regard to concerns that experimental participants had regarding the 60 gallon trash cans, questions were asked about the importance of the following issues: inadequate space for trash in a typical week, inadequate space for trash during holidays or during spring/fall clean-up, inadequate space for trash during summer yardwork season, and being unable to fit some large items into the container. These results are shown in Figure 2.

While space considerations were minimal overall (i.e., fully 87 percent responded with definitely not or mot much of a concern), other concerns remain. Participants expressed concern regarding inadequate space for trash during holidays or during spring/fall cleaning, with 37.1 percent indicating this was somewhat of a concern and 14.5 percent saying a serious concern. Concern was also evident regarding space during the summer yardwork season, with 31.1 percent saying this is somewhat of a concern and 9.8 percent indicating this to be a serious concern. Some participants expressed concern about an inability to fit large items into the container, which for roughly a third of respondents represented either somewhat or a serious concern.

3.c.3) Conclusions from 60 Gallon Can Experiment

Results of this experimental study indicate that a sizeable share of Logan Metro Area households remain skeptical of their ability to rely in 60 gallon cans and curbside recycling as the waste disposal options for their household. However, those who try the service find that it works better than expected. Main concerns outlined by these households with regard to the 60 gallon cans include their size during so-called bottleneck periods (e.g. holidays, etc.) and the bi-weekly schedule and space concerns related to the curbside recycling service.

Figure 1: Satisfaction with Experimental Service

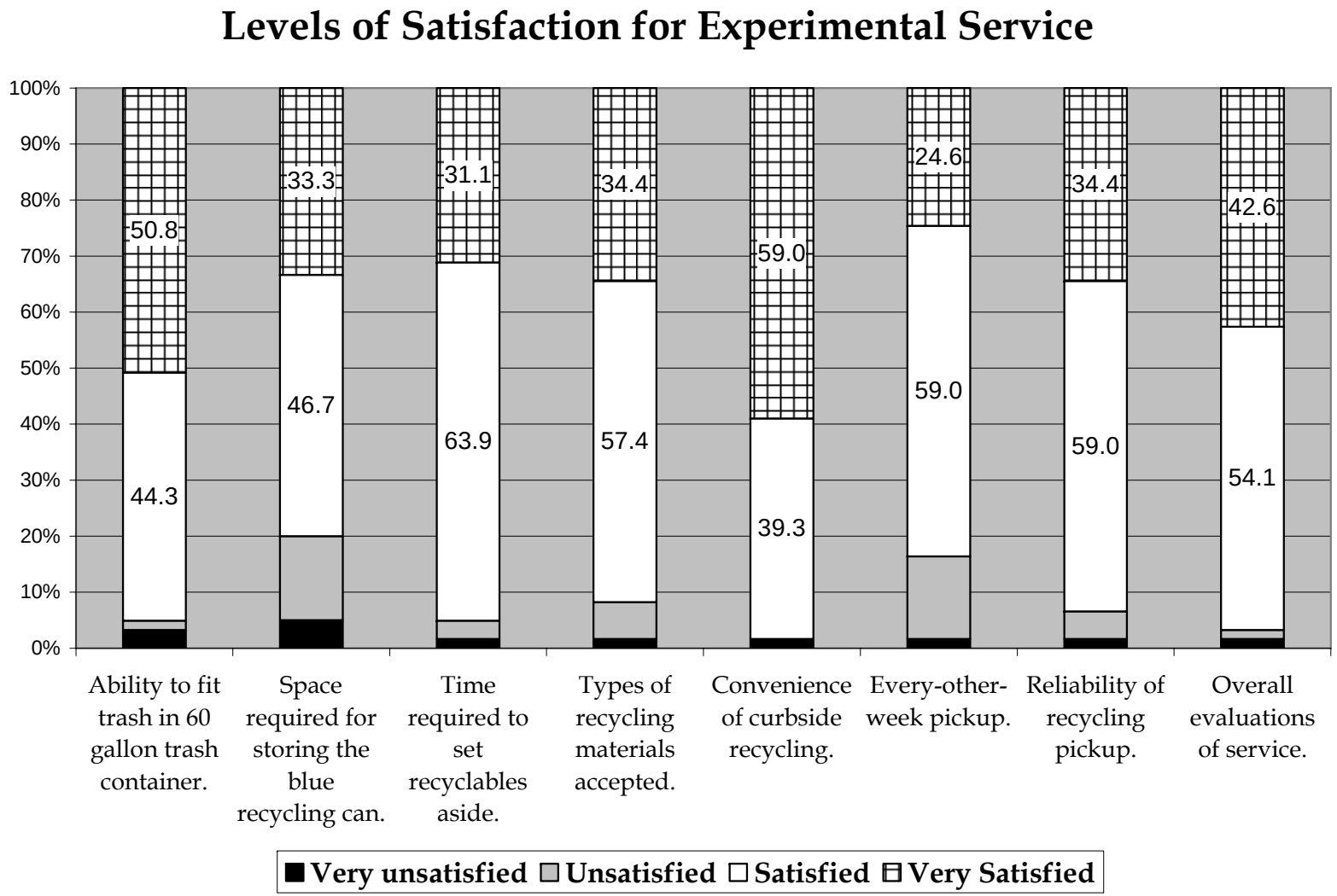
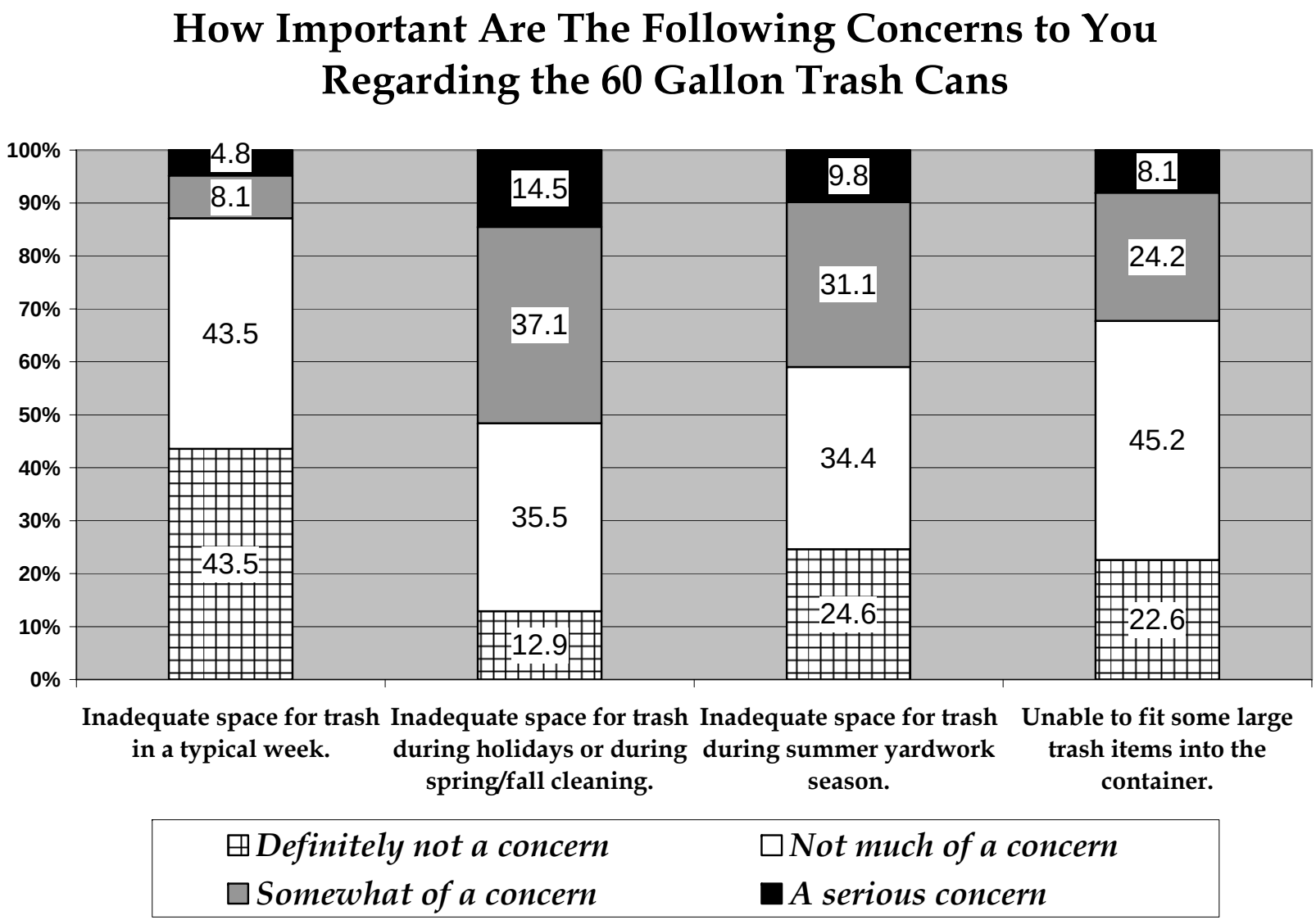


Figure 2: Concerns about 60 Gallon Can Service



3.d) Evaluation of the Current Curbside Recycling Service

The final aspect of this third phase of research on recycling included a mail survey of current curbside recycling customers. As of February, 2005, over 1,400 households had signed up for regular curbside service. This survey was designed to acquire feedback regarding the convenience, efficiency, service quality, and other attributes of the curbside service.

Current recycling customers were queried about their evaluation of curbside recycling on a number of dimensions, including the space required for a recycling container, the time required to set recyclables aside, the types of materials that are accepted, the convenience of the service, the every other week pick-up schedule, the reliability of the pick-up service, customer service, and an overall evaluation of the curbside recycling service. These results are shown in Table 9 below.

Table 9: Evaluation of Curbside Recycling Service, Current Customers (2005)

	How satisfied have you been with these aspects of the Curbside Recycling Service?				
	Very Unsatisfied	Unsatisfied	Satisfied	Very Satisfied	Combined Satisfied
	percent of respondents				
Space required for recycling container	5	2	44	47	91
Time required to set recyclables aside	5	1	35	58	93
Types of materials that are accepted	6	9	49	35	84
Convenience of Service	5	1	27	67	94
Every other week pick-up schedule	7	10	39	42	81
Reliability of pickup service	5	2	29	64	93
Customer Service	5	0	40	52	92
Overall Evaluation	5	0	36	57	93

(N=212)

Overall, with regard to the curbside recycling program, current customers express high levels of satisfaction, with an 93 percent surveyed reporting being either satisfied or very satisfied. Over ninety percent of subscribers surveyed expressed satisfaction with space issues, time required for setting recyclables aside, the convenience of the service, the service's reliability, and customer service. Over eighty percent of those queried were satisfied with the types of materials that are accepted and the every other week pickup schedule. Current subscribers were especially pleased with the convenience of the service, not having to sort their recyclables, and that the service is curbside, meaning they do not have to travel to a drop-off site to recycle materials. Moreover, current customers support an expansion of recycling efforts in the county.

Current subscribers did, however, express concerns related to the service. Their main concerns were 1) materials not included in curbside pick-up, where 35% mentioned glass in open-ended comments, and 2) the pick-up schedule, which 23.5% mentioned in open-ended comments.

3.e) Willingness to Pay for Curbside Recycling Service—Economic Analysis

3.e.1) Introduction

The primary objective of the economic analysis for this project was to estimate (1) the typical household's willingness to pay (WTP) for the current voluntary, co-mingled curbside recycling program (CRP) in Logan city and (2) the WTP premium associated with a household's prior participation in the program. Estimation of the WTP premium is based on a separate treatment, whereby households who participated in the previous baseline survey (and who were not presently participating in the city's new voluntary CRP) were randomly selected to participate for three months (free of charge) in the city's program, at the conclusion of which their WTP for the CRP was elicited. This sub-sample of households is henceforth referred to as the "follow-up 1", or FU1 group.

Compared with two separate control groups of households, we are able to isolate the WTP premium associated with prior participation in the program. One control group – henceforth the "follow-up 2,"or FU2 sub-sample – consists of households who, like the FU1 group, both participated in the previous baseline survey and were not signed up for the city's voluntary CRP) at the time of the baseline survey. However, unlike the FU1 households, the FU2 households were *not* randomly selected to participate for three months in the program. These households were therefore interviewed about their WTP for recycling three months prior to the FU1 group. The second control group – henceforth the "new random sample," or NRS sub-sample – consists of randomly selected households throughout Logan who did not participate in the baseline survey and who were interviewed at the same time as the FU1 households.

3.e.2) Household WTP for Curbside Recycling

A simple theory of household WTP underlies our empirical analysis. As in Aadland and Caplan (in press, a), household i, $i = 1,\ldots,N$, can be assumed to maximize an impure-public-good utility function by choosing recycling effort subject to a budget constraint. This creates a potential externality since households have no apparent incentive to fully internalize the marginal effect of their private recycling effort on the aggregate amount of recyclable material generated at the community level.[2] WTP_i for curbside recycling is ultimately derived by subtracting the household's minimum expenditure given that it participates in the CRP from its minimum expenditure given that it does not. In other words, WTP_i is defined by the amount of income household i would willingly forego so as to participate in a CRP and maintain its original (pre-CRP) utility level. The household's WTP for curbside recycling may be negative if the disutility of foregone leisure is sufficiently large relative to the utility gained from recycling.

[2] For a more formal treatment of this problem see Aadland and Caplan (in press, a). The technical appendix for that paper can be found at www.uwyo.edu/aadland/research/recycle/.

Our econometric approach follows Cameron and James (1987). WTP questions are set in the single-bounded dichotomous-choice (SBDC) format to elicit a household's WTP through a single dichotomous-choice question. The WTP question is,

> *"Would you be willing to pay $\$v_i$ per month, in addition to your current monthly garbage collection fee, to receive a blue recycling can and curbside pickup of recyclables every other week?"*

The bid v_i is chosen randomly from a set of predetermined values.[3] Based on the responses to the bid, the respondent's latent WTP may be placed in one of two regions: $(-\infty, v_i)$ in the event of answering "no" to the WTP question and $[v_i, \infty)$ in the event of answering "yes."

Prior to the WTP question, respondents were provided with the following "cheap talk" reminder statement,[4]

> *"As you prepare to answer the following question, please remember the following three things:*
>
> - *First, keep in mind your household budget. In a typical month, at what price would your household be able to afford curbside recycling?*
> - *Second, recall that there are alternatives to curbside recycling, such as drop-off centers and landfills, and*
> - *Third, in previous surveys we have found that the amounts that people said they were willing to pay for curbside recycling were often higher than the amounts that they actually were willing to pay when the service became available in their community. As you read the following questions, please imagine your household is actually paying the proposed fee."*

In addition to these three reminders, a sub-group of FU2 and NRS households were provided a fourth reminder in order to control for the possible offsetting effect of an explicit statement about the savings associated with reducing the household's garbage container size as a result of participating in curbside recycling.[5] The bullet point read,

- *"Finally, consider the fact that if your household currently uses a 90-gallon garbage container it may be able to switch to a 60-gallon container due to recycling, resulting in a $3.65 savings in your monthly garbage expenses."*

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[3] The bids were chosen with equal probabilities from the set of integers 2, 4, and 6. This set encompasses the range of feasible household fees that the Logan Environmental Department (LED) would consider charging (personal communication with Issa Hamud, Director of LED).

[4] See Aadland and Caplan (in press, b), List (2001), and Cummings and Taylor (1999) for a more formal treatment of the use of cheap talk in stated-preference surveys.

[5] Empirically, we find that this fourth bullet point is insignificant in explaining a typical household's WTP. The output for this result is available upon request from the authors.

Turning to our econometric model, we specify a reduced-form version of WTP_i, where the vector of explanatory variables $\mathbf{X}_i$ includes a host of household- and treatment-specific characteristics. A normally distributed random error term ε_i is added to capture the portion of WTP_i unexplained by $\mathbf{X}_i$, implying

$$WTP_i = \mathbf{X}_i\boldsymbol{\beta} + \varepsilon_i\,, \qquad (1)$$

where $\boldsymbol{\beta}$ is a vector of coefficients. The variance of the error terms is assumed constant across households. Using (1), we then define the binary variable $ACCEPT_i$, which equals one if the respondent accepts ν_i, and zero otherwise. As is standard in the literature, we assume that $ACCEPT_i = 1$ responses imply $WTP_i > \nu_i$ and $ACCEPT_i = 0$ responses imply $WTP_i \quad \nu_i$.

Next, we define the necessary probabilities for maximum-likelihood estimation. Using (1), the probability that household *i* accepts bid ν_i is

$$\begin{aligned} P_i &= \Pr[ACCEPT_i = 1] \\ &= \Pr[WTP_i > \nu_i] \\ &= \Pr[\varepsilon_i > \nu_i - \mathbf{X}_i\boldsymbol{\beta}] \\ &= \Phi\left(\mathbf{X}_i\boldsymbol{\beta} - \nu_i\right) \end{aligned}$$

for i = 1,…,N households, where Φ is the standard normal density function and the last equality follows from Φ's symmetry. The associated log likelihood function is

$$\text{Log L} = \sum_{i=1}^{N}\left\{ACCEPT_i \ln\left(P_i\right) + \left(1 - ACCEPT_i\right)\ln\left(1 - P_i\right)\right\} \qquad (2)$$

where Log L is estimated as a standard probit model.[6] The definitions of the explanatory variables used in equations (1) and (2), along with their sample means, are provided in Table 10.[7]

[6] NLOGIT version 3.0.10 is used to estimate equation (2).

[7] A host of additional explanatory variables were included in earlier estimations of equation (2), such as attitudes toward recycling and the environment, monthly household waste generation, and past recycling behavior, but were found to be insignificant in explaining variation in WTP. For information concerning these additional variables, refer to our survey instrument, available at (?). Both the input and output files for these earlier estimations are available upon request from the authors.

Table 10. Variable Definitions and Means.

Variable	Mean	Description
Educ1	0.37	1 = some college or trade school, 0 = otherwise.
Educ2	0.29	1 = bachelors degree, 0 = otherwise.
Educ3	0.18	1 = graduate school or professional degree, 0 = otherwise.
D1	0.41	1 = NRS sub-sample, 0 = otherwise.
D2	0.31	1 = FU2 sub-sample, 0 = otherwise.
Gender	0.41	1 = male, 0 = female.
Age	44.94	Age of respondent (in years).
HHsize	1.679	1 = 1 – 2 household members, 2 = 3 – 5 household members, 3 = 6 – 9 household members.
Inc1	0.36	1 = household income is $25,000 - $49,999, 0 = otherwise.
Inc2	0.41	1 = household income is $50,000 and up, 0 = otherwise.
Own	0.78	1 = household owns home, 0 = household rents home.
Cert	2.22	0 = 0 – 40 percent certain of WTP response, 1 = 41 – 70 percent certain of WTP response, 2 = 71 – 85 percent certain of WTP response, 3 = 86 – 100 percent certain of WTP response.
Tau	3.97	Bid value ν_i.

Note: Sample sizes range between 237 and 264 observations due to missing values.

In Table 11, we report our empirical results for estimating the typical (i.e., average) household's WTP for the Logan CRP. The marginal effects and associated standard errors (in parentheses) are reported for each explanatory variable. The Chi-Square statistic of 55.83 is significant at the 1 percent level, indicating that the included explanatory variables are together statistically significant in explaining variation in WTP across households. Ben-Akiva and Lerman's (1985) goodness-of-fit measure indicates that the average probability of correct predictions by the model is approximately 63 percent. Prediction successes (reported in Table 12) are generally in the 70 percent range, which is consistent with previous studies of household WTP for curbside recycling (Aadland and Caplan, in press, a).

Both the directions and sizes of the marginal effects reported in Table 11 are consistent with earlier WTP studies (Aadland and Caplan, in press, a). For instance, more highly educated, higher-income, and younger households are, all else equal, willing to pay more for curbside recycling. Likewise, households that are more certain of their WTP responses have a higher estimated WTP, and the larger the bid ν_i the less likely the respondent is to accept it. However, unlike in previous studies we find that male respondents are not necessarily willing to pay less than their female counterparts. Surprisingly, the larger its size the less a household is willing to pay for the CRP.

Table 11. Empirical Results.

Variable	Marginal Effect	
Constant	-0.0009	(0.278)
Educ1	0.248*	(0.148)
Educ2	0.145	(0.153)
Educ3	0.307*	(0.170)
D1	-0.074	(0.097)
D2	-0.204**	(0.105)
Gender	0.016	(0.083)
Age	-0.007**	(0.003)
HHsize	-0.157**	(0.067)
Inc1	0.200*	(0.120)
Inc2	0.351***	(0.135)
Own	0.049	(0.126)
Cert	0.205***	(0.049)
Tau	-0.081***	(0.025)
Mean WTP	3.295***	(0.814)
Sample Size	197	
Chi Square Statistic	55.830***	
Ben-Akiva & Lerman	0.626	
Log L	-108.328	

*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level.

Table 12. Prediction Successes and Failures.

	Predicted		
Actual	0	1	Total
0	74	30	104
1	26	67	93
Total	100	97	197

Note: The predicted and actual values of 0 and 1 correspond to values of $ACCEPT_i = 0$ and $ACCEPT_i = 1$, respectively, in equation (2).

Most importantly for this study, we find that having been in the FU1 treatment increases a household's WTP by approximately $0.20 per month over an FU2 household's WTP. Although the sign is as expected for the marginal effect of having been in the NRS sub-group (relative to the FU1 treatment group), it is not significantly different than zero. These results therefore suggest that households who were not presently participating in the city's CRP, but who had the opportunity to participate for three months free-of-charge before being queried about its value (i.e., the FU1 households), were willing to pay a $0.20 per month premium over similar households who were not extended the free three-month opportunity and who had been interviewed about their WTP three months earlier (i.e., the FU2 households). However, this

premium for the FU1 households does not exist when compared to a random sampling of households that were asked to value the program at the same point in time (i.e., the NRS households). Thus, the "premium effect" induced by free participation for three months seems to have been temporary.

Following Cameron and James (1987) we find that the typical household's WTP for the CRP equals approximately $3.30 per month. The corresponding standard error of 0.814 is calculated using the Delta Method (Greene, 2003, page 70), resulting in a 95% confidence interval for the $3.30 mean estimate of $1.67 – $4.93. These results for mean WTP are consistent with the previous literature (Aadland and Caplan, in press a).

3.e.3) Policy Implications

The average WTP estimate of $3.30 per month serves as a rough upper-bound on the monthly household fee that Logan city officials might consider charging households for the current co-mingled CRP. Given that the premium effect associated with providing non-participating households with a brief opportunity to participate in the program for free is relatively small and temporary, it may not be cost effective to offer this type of participation incentive. Only in a situation where households' information sets are incomplete (e.g., they are unable to incorporate in their WTP responses the full costs to their respective households of not recycling), would an investment in such an incentive scheme make fiscal sense.

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