DOES OUTREACH MATTER? EXAMINING THE RELATIONSHIP BETWEEN OUTREACH EFFORTS AND RECYCLING AMOUNTS

By Tarna Gahan-Hunter

This research project seeks to determine the extent to which outreach and enforcement activities impact the per capita recycling tonnage of municipalities in Wisconsin. The Wisconsin Department of Natural Resources (DNR) requires that Responsible Units undertake public outreach and education efforts to increase the effectiveness of the recycling program. In addition to outreach programs, Responsible Units use enforcement activities to implement mandatory recycling. In 2002, a report on recycling in Wisconsin found that outreach had not improved in the past ten years. Research suggests that outreach programs may increase recycling amounts. Building upon this research, this project uses data collected from the DNR and the 2000 Census to determine if a relationship exists between the type of outreach and enforcement activities used and the effectiveness of the recycling program. This study is important to both measure the success of the current outreach programs, and to provide research on what type of outreach programs are the most effective for future implementation.

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by

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A Field Project Submitted
In Partial Fulfillment of the Requirements
For the Degree of

Master of Public Administration

at

The University of Wisconsin Oshkosh
Oshkosh WI 54901-8624

November 2008

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INTRODUCTION

Recently, the nation has seen a greater shift in the trend toward "going green." This term describes many different activities related to preserving the environment and natural resources. Recycling is being used by local and state governments to address environmental concerns regarding waste production (Recycling, Government Accountability Office Report, 2007). The United States is generating more waste now than ever before—Americans generated about 251 million tons of trash and recycled 82 million tons of materials, which is 32.5 %. They estimated residential waste (including waste from apartment houses) to be 55 % to 65 % of the total municipal solid waste generation. Waste from schools and commercial locations, such as hospitals and businesses, amounted to 35 to 45 %. (Environmental Protection Agency Website, 2008). In response to this dilemma, federal and state governments have implemented a number of programs designed to increase recycling rates and divert solid waste from landfills (EPA website). Recycling coordinators across the country cite public outreach as one of the three primary methods used to increase recycling in their communities (Recycling, GAO Report, 2007), yet the usefulness of these outreach methods needs further research. In order to address the current recycling effort in the U.S., which may not be as effective as it could be, recycling managers need to rethink their recycling programs and focus on outreach efforts to increase recycling in their areas. This study seeks to understand if a relationship exists between recycling outreach and an increase in materials recycled.

Much of the research on recycling indicates that several factors affect recycling behavior—factors such as the demographic composition of a community and the socio-

cultural background of its residents have been found to be least influenced by recycling education (De Young 1990; Margai 1997). It has been found that young, female, single-family dwelling; high income earning, well educated, and politically liberal individuals generally have higher rates of recycling (Barr, 2006). Recognizing this strong relationship between recycling behavior and demographics should give managers insight into how to address subpopulations of municipalities in order to increase recycling within their communities (Berger, 1997).

Psychological factors such as altruism, self-preservation and environmental citizenship have also been shown to have an effect on environmental behavior. Hopper and Nielsen (1991) used Schwartz's (1977) model of normative influences on altruism to determine if one could view recycling as an altruistic behavior. Their study came to the conclusion that recycling could be viewed as an altruistic behavior. Other researchers have argued that one's belief in environmental problems could be perceived as a personal threat to one's well-being and health (Steel, 1996). Using this theory, recycling behavior could be viewed as an act of self-preservation. Lastly, Selman (1996) found that individuals who have a sense of belonging in society and conform to certain characteristics expected from society have greater recycling behavior. Vining and Ebreo (1990) found that awareness of others' recycling behavior shapes the behavior of an individual's recycling behavior. Therefore, if one's neighbors are recycling, it will be more likely for that individual to recycle. However, one's attitude towards recycling does not necessarily mean that person recycles. Studies have also shown that many individuals embrace positive beliefs regarding the environment, yet only a limited few behave accordingly (Gamba & Oskamp, 1994; Scott, 1999; Vining & Ebreo, 1990).

One of the biggest predictors of increased recycling among communities is convenience. Studies have shown that a strong relationship exists between the amount an individual recycles and the distance that individual must travel to recycle. The last decade has seen a birth of curbside recycling programs in order to increase recycling rates. Research illustrates a strong association linking curbside collection to improved recycling rates. (Derksen, Gartell, 1993; Guagnano, Dietz & Stern, 1995). Although, studies suggest that even if a municipality participates in curbside recycling, they are still not meeting their full recycling potential (Miranda, Everett, Blume, and Barbeau, 1994).

One of the ways government agencies and legislatures have sought to increase recycling among their residents is by implementing policies that encourage recycling activities using voluntary and mandated standards or monetary incentives (DeYoung, 1990, Margai 1999). Recycling managers can expect to reasonably influence attitude and behavior toward recycling through outreach efforts. Skumatz and Green (2001) found that outreach methods including mailing brochures, billboards and newspaper ads did increase recycling participation, while electronic outreach such as television and radio did not have a positive impact. Austin et al. (1993) found that people who recycle have procedural knowledge that can be broken into the following group characteristics:

1. They are better informed about what materials are recyclable
2. They know where they can recycle
3. They understand the importance of recycling more than non-recyclers

How do we get individuals to this point? Literature quantifying the relationship between outreach and recycling behavior is scarce, but research suggests that outreach programs may increase diversion rates in four ways. These may be achieved through: (a)

informational, (b) attitudinal, (c) behavioral, and (d) change in beliefs (Goldenhar & Connell 1993). Each of these areas has different outcome expectations as discussed below.

Informational: Informational programs are aimed at providing people with recycling information such as the type of products to recycle, when recyclables are picked up, where to drop off recyclable products, and so forth. An effective informational program may boost recycling participation, but this may be short-lived as peoples' memories fade unless the program is recurring. Environmental and behavior knowledge has a significant role in impacting recycling behavior (Schahn & Holzer, 1990).

Attitudinal: Outreach programs may also try to change people's attitudes towards recycling by providing reasons and a rationale for recycling. A Responsible Unit may provide information on the landfill capacity of the area in hopes that people may then choose to divert their waste from the landfill to increase its life span. The effectiveness of such an educational program would increase participation in recycling and the volume of recyclables and is much more long lasting than informational programs.

Behavioral: A third area of recycling education is to change people's behavior. To this end, residents may be instructed on how to sort out waste for recycling and how to change their consumption patterns so less waste is generated in the first place. If effective, such a program may in fact decrease the overall volume of waste and, therefore, recyclables.

Beliefs: The focus of the educational program under this approach is to influence the beliefs of residents. If people believe that recycling is important not just to themselves

but to posterity and that it contributes to keeping the environment safe and clean, then they will be more willing to participate in the program.

This study seeks to examine Wisconsin's municipal recycling programs and the impact outreach activities performed by them have on per capita recycling for the community. First, a brief history will be given of Wisconsin's recycling law and role of the municipal recycling program. Next, I will analyze data from the 2005 and 2006 recycling reports from the RUs. Finally, the results will be assessed and discussed.

WISCONSIN RECYCLING

The Resource Conservation and Recovery Act (RCRA) was enacted by Congress in 1976 and amended in 1984. The act's primary goal is to protect human health and the environment from the potential hazards of waste disposal. In addition, RCRA calls for conservation of energy and natural resources, reduction in waste generated, and environmentally sound waste management practices. (Environmental Protection Agency) This led to new federal regulations being introduced in the 1980's regarding the construction of solid waste disposal facilities (Wisconsin Legislative Reference Bureau, 2001). The state began to experience a decrease in landfill capacity, along with an increase in solid waste being generated (Wisconsin Legislative Reference Bureau, 2001). In order to address this growing program, Wisconsin passed 1989 Wisconsin Act 335, which created Wisconsin's current recycling law. Wisconsin's recycling law has been phased in with three bans in 1991, 1993 and 1995. The 1991 ban outlawed the disposal of lead acid batteries, major appliances or waste oil in a solid waste disposal facility or landfill. The second ban in 1993 prohibited the disposal of yard waste and the last ban in 1995 stated that "no person may landfill, burn with or without energy recovery, or convert into fuel any of the following waste materials: (a) aluminum containers; (b) corrugated paper or other container board; (c) foam polystyrene packaging (d) glass containers; (e) magazines; (f) newspapers; (g) office paper; (h) plastic containers; (i) steel containers; and (j) containers for carbonated or malt beverages (Wisconsin Legislative Fiscal Bureau, 2007). Currently, recycling is mandatory for most recyclables in the state of Wisconsin.

The recycling law is administered by the Department of Natural Resources (DNR) and establishes several responsibilities for local governments pertaining to recycling. Local units of government, which are referred to as "responsible units", are accountable for the implementation and management of local recycling programs. Under the recycling law, the responsible unit is the geographic area (city, village, or town), unless a county decides to create a responsible unit. Currently, every municipality in the state is included in one of the 1,062 responsible units. The first three priorities of solid waste management policy in Wisconsin are:

1. Reduction of the amount of solid waste generated
2. Reuse of solid waste
3. Recycling of solid waste

The responsible units were charged with addressing these goals and received state grants for this purpose. One of the grant requirements in the recycling law is outreach. The DNR, in its administrative code NR 544.04, requires that responsible units undertake public education and outreach as part of efforts to ensure the effectiveness of their recycling programs (DNR Register 2000). Such efforts are to include, "program start up and continuing program information, and consumer and youth education" (DNR 2000, 176). However, the DNR requirements give considerable flexibility to responsible units in how they pursue their outreach programs and what they include in their educational material. Responsible units have thus pursued a variety of outreach and educational programs. The extent to which these educational programs are reaching the targeted audience and making a difference in recycling behavior has, to our knowledge, not been systematically evaluated in Wisconsin. The result is that while few question the need for

such programs, scarce public resources may be going to fund programs that may not be achieving the desired impact.

STUDY AND SAMPLING STRATAGEM

The DNR requires each responsible unit to submit a report each year detailing their recycling program. This report includes information on how much the responsible units recycled, various outreach and enforcement efforts, and program procedures, such as whether they have curbside recycling pickup or drop off facilities only.

This study uses the 2005 and 2006 responsible unit's annual reports from 1,009 of the 1,062 responsible units (95 % of the total). These data were merged with 2000 U.S. Census Bureau data for each responsible unit (RU). Some reports were eliminated because of lack of accurate census data. In addition to lack of census data, a handful of responsible units did not report tonnage for municipal recycling and these responsible units were also eliminated from the database. The dataset includes 1,009 RU's: 612 towns (60.7 %), 238 villages (23.6 %), 127 cities (12.7 %), and 32 counties (3.2 %). The size of the responsible units range from 88 residents to 590,370 residents. The sample responsible unit population is 96.8 % white, with an average median household income of $45,398 (a range of $20,625 to $161,292).

This analysis has two major parts. The first part looks at the % change in recycling from 2005 to 2006 to determine if the recycling unit's outreach efforts had a positive effect on the change in recycling tonnage. It will consist of two models—the first model measures the impact of the responsible unit's use of newspaper, radio, and direct mail outreach activities on the change in per capita recycling. The second model seeks to measure the effect enforcement actions (verbal warnings, written warnings, and citations) have on per capita recycling. The second part will look at the effect that these

outreach and enforcement activities have on per capita recycling. It is anticipated that the higher the responsible unit's outreach activities, the more likely the responsible unit will generate more per capita recycling tonnage than RU's that don't use these outreach activities.

HYPOTHESES

The following four hypotheses identify the expected relationships between both the per capita 2006 annual recycling tonnage recycling among the responsible units and amount of change in recycling tonnage that occurred between 2005 and 2006 across the RUs.. The first two hypotheses use the dependent variable "% change in per capita recycling from 2005 to 2006". The second two hypotheses use the dependent variable "2006 annual per capita recycling." Regression models for the four hypotheses along with statistics and definitions of all the variables used can be found in the appendix.

- **Hypothesis 1 (H1): The responsible unit's outreach efforts have a positive influence on the change in recycling from 2005 to 2006.**

- **Hypothesis 2 (H2): The responsible unit's enforcement efforts have a positive influence on the change in recycling from 2005 to 2006.**

Outcome (Dependent) Variable:

a) The % change in recycling from 2005 to 2006.

Program (Independent) Variables:

a) Outreach done by placing an ad in a newspaper (H 1)
b) Outreach done by placing an ad on the radio (H 1)
c) Outreach done by mailing direct mail (H 1)
d) Enforcement Action (citation) (H 2)
e) Enforcement Action (written warning) (H 2)
f) Enforcement Action (verbal warning) (H 2)
g) If the responsible unit has curbside pickup
h) If the responsible unit is a town
i) Median household income

- **Hypothesis 3 (H3): The responsible unit's outreach efforts have a positive influence on the responsible unit's per capita annual recycling tonnage.**

- **Hypothesis 4 (H4): The responsible unit's enforcement efforts have a positive influence on the responsible unit's per capita annual recycling tonnage.**

Outcome (Dependent) Variable:

a) Per capita recycling in 2006

Program (Independent) Variables:

a) Outreach done by placing an ad in a newspaper (H 3)
b) Outreach done by placing an ad on the radio (H 3)
c) Outreach done by mailing direct mail (H 3)
d) Enforcement Action (citation) (H 4)
e) Enforcement Action (written warning) (H 4)
f) Enforcement Action (verbal warning) (H 4)
g) If the responsible unit has curbside pickup
h) If the responsible unit is a town
i) Median household income

RESULTS

Do recycling outreach and enforcement activities have an impact on recycling from one year to the next?

According to the model, which measured the change in recycling tonnage from 2005 to 2006 in relation to the level of outreach and enforcement actions taken, neither outreach efforts nor enforcement actions had an impact. The Adjusted R Square is -.003 for the model measuring outreach actions. Specifically, outreach done by newspaper (t-value = .034, p-value = .929), radio (t-value = 1.435, p-value = .1520, and mail (t-value = -.354, p-value = .723) all show no statistically significant relationship to change in recycling tonnage. The other independent variables (curbside recycling, if the RU is a town, median household income) were also found to be unrelated to change in per capita recycling tonnage between 2005 and 2006.

The second hypothesis measured the enforcement activities undertook against an RU on its per capita recycling tonnage change between 2005 and 2006. The adjusted R Square is -.004 and an analysis of each of the independent variables showed no statistically significant relationship between any of the independent predictors and the dependent variable; citation (t-value = .719, p-value = .472); verbal warning (t-value = .817, p-value = .414); and written warning (t-value = -.695, p-value = .487). The other independent variables showed similar results to the previous model and are not statistically significant. This leaves us with the conclusion that outreach and enforcement actions did not have an effect on the change in recycling from 2005 to 2006.

Do outreach efforts and citation actions effect the amount of per capita recycling among the responsible units?

The Adjusted R square for the outreach model is .228, showing that 22.8 % of the variance in the amount of per capita recycling tonnage each responsible unit generated in 2006 can be explained by the independent variables. The model, as a whole, is statistically significant (F-value = 50.638, p-value = .000). The variables curbside recycling (t-value = 7.169, p-value = .000), if the responsible unit is a town (t-value = -7.956, p-value = .000), and median household income (t-value = 9.566, p-value = .000) are all statistically related to variation in per capita recycling tonnage across RUs. More specifically, towns, on average, generate 0.019 tons of per capita recycling material less than the average for cities, villages and counties. Additionally, RUs that provides curbside pickup generated, on average, .018 tons of per capita recycled material more than RUs that did not provide curbside pickup in 2006. Finally, consistent with other research, income is positively related to recycling; wealthier responsible units generate more recycled materials than less affluent responsible units.

The outreach predictors show a surprising relationship to per capita recycling. Outreach involving newspaper ads had no statistically significant relationship with recycled materials generated in 2006. Outreach made through the mail and radio were both significant at the 95 % confidence level. Radio outreach had a t-value of -2.143 and a significance of .032. Mail outreach had a t-value -2.110 and a significance level of .035. Thus, while the measures are significant, their coefficients are negative – opposite of my hypothesis meaning that controlling for the other independent variables, RUs that

used radio and mail advertising generated less per capita recycled material than RUs that did not employ these forms of outreach.

The second model seeks to determine if there is a relationship between a responsible unit's enforcement actions and per capita recycling. This model is also statistically significant (F-value = 48.805, p-value = .000). The model has an Adjusted R Square of .222, meaning that 22.2 % of per capita recycling can be explained by the independent variables. Curbside recycling (t-value = 7.032, p-value = .000), median household income (t-value = 7.032, p-value = .000), and whether a responsible unit is a town (t-value = -7.387, p-value = .000) are all statistically related to recycled material generated across RUs. The relationships are consistent with the previous model. Again, the relationship between towns and per capita recycling is negative, showing that towns have less per capita recycling tonnage on average that cities, counties and villages. The relevance of curbside recycling is also displayed in this model, showing that RUs who provide curbside recycling have higher on average per capita recycling tonnages. Even though the overall model is significant, the focuses of the analysis – the effect of enforcement actions on recycling efforts were found to be statistically insignificant. Neither Verbal warnings (t-value = 1.291), citation enforcement (t-value = -.239), nor enforcement using written warnings (t-value = -1.083) were related to per capita recycling tonnage.

DISCUSSION

The results indicate there is a strong relationship between communities providing curbside recycling and higher recycling rates. This has been demonstrated in numerous studies, and supports the idea that the easier the activity is for someone to do, the more likely they are to do it. This study also shows a strong relationship between median household income and higher recycling rates. Although, the study supports a relationship among these variables, it does not show that outreach and enforcement activities currently being undertaken by the RUs have an impact on increased recycling rates. Does this mean that outreach does not impact the amount people recycle? Not necessarily…there are a number of explanations which may account for these results.

The first two models measuring the change in recycling from 2005 to 2006 show no relationship among any of the independent variables and the dependent variable, which suggests that outreach and enforcement activities do not have an effect on recycling levels. Perhaps, if the change in recycling was looked at over a longer period of time, there may have been a more significant finding. Using the one year span did not support that any of the outreach activities used in 2005 led to increased recycling in 2006, in fact the overall per capita recycling tonnage for the sample decreased between 2005 and 2006 for the recycling categories measured. Further studies may choose to pick a smaller sample of RUs and track the data over a five or ten year period following the recycling tonnages and recycling outreach activities.

The third and fourth hypotheses measured the per capita recycling among the RUs to determine if there was a relationship between the outreach and enforcement activities

undertaken by the RUs and the level of per capita recycling tonnage. The outreach model illustrated that there was a negative relationship between outreach done by radio advertisement and direct mails, meaning that those RUs which employed these methods of outreach have lower per capita recycling rates than the average recycling per capita recycling rates.

One explanation for this could be that RUs which provide additional outreach to their communities are doing so because they currently have lower per capita recycling rates and are using outreach in an attempt to increase their recycling rates. Another explanation, one that has become the focus of recycling programs across the nation, is that the type of outreach typically used by recycling programs is not effective. For example, the DNR periodically conducts a survey of Wisconsin households to gauge the effectiveness of Wisconsin's recycling program. The last survey was completed in 2006 and showed that the overall satisfaction with the information provided by local recycling RUs has decreased. In 1998, 69 % of survey respondents said they thought the level of recycling information was "excellent" or "good". In 2006, only 61 % of the respondents thought the level of recycling information was "excellent' or "good". In addition to a decrease in the satisfaction with the recycling material, according to the survey respondents, the amount of recycling material being mailed out has also been stagnant. Approximately 30 % of the respondents said that it had been more than 12 months since they had received information on recycling in the mail. Graphs depicting the survey response for recycling information satisfaction, the amount of recycling information received and the %age of survey respondents who recalled the recycling advertisement by the DNR can be found in the appendix.

In addition to the decreased satisfaction with recycling outreach, the type of outreach being done may be the problem. In 2005, the DNR conducted an outreach program consisting of radio and television ads depicting a recycling hunter with the tag line "recycle away". When the survey respondents were asked if they recall these ads, 92 % of them answered "no". This highlights another factor of this study, and that is that it may not be that recycling outreach does not work, but the type of outreach Wisconsin RUs are currently employing is not working.

Research done with focus groups throughout the nation is showing that the traditional methods of public outreach for recycling programs are not working (Miller, 2003). The article states the seven deadly sins of public outreach programs, with the first one being that "environmental education will increase participation". People understand they should recycle, and those that choose not to, traditional outreach may not work. Jamieson and VanderWerf (1993) found that there is no clear causal relationship between providing information and changing behavior. They cited two main reasons for this. The first is that lifestyle changes require role models and the second is that people may ignore information or interpret it so it reinforces existing attitudes, beliefs or values. This supports the theory that sending out a recycling pamphlet once a year may not have a positive impact on recycling rates, but implementing an outreach program that seeks to actual change concrete knowledge and attitudes may be more effective, along with creating actual role models for the public.

This may sound like a rather large undertaking, but this is exactly what the Anheuser-Busch Recycling (ABR) did for the community of St. Charles, Missouri. ABR instituted a word-of-mouth recycling program, which first looked at the demographics of

the community and how the community operated. Using key people in the community to spread the word and setting up different types of outreach to get residents talking about recycling created concrete knowledge and created role models for the residents—people they looked up to were recycling, were talking about recycling and this made them want to recycle also. St. Charles, Missouri experienced a 25 % increasing in the amount the community recycled, which was due solely to the word-of-mouth outreach campaign. Although, this type of campaign may not be useful for some or even most communities, being more creative and looking at outreach as a tool to change behavior instead of solely provide information may be a good first step.

CONCLUSION

Even though this study did not show a relationship between outreach and enforcement efforts and increased recycling rates, it did produce some very important results—that the current methods of recycling outreach may not be effective. Residents, for the most part know they should recycle, but that is not always enough. Wisconsin RUs are faced with the same challenge facing recycling programs across the nation and that is to increase recycling rates. This study suggest that making recycling convenient and paying attention to demographics are extremely important in increasing recycling in communities. Additionally, outreach programs should be inventive and focus on modeling behavior and changing concrete attitudes and beliefs. Looking for long term changes in attitudes and beliefs will raise the likelihood that these values will be passed on throughout the generations, which will decrease the amount of funding outreach programs will need and increase the amount of overall recycling tonnage.

APPENDIX A
Statistical Analysis

Table A-1 **Statistics**

	N		Mean	Std. Deviation
	Valid	Missing	Valid	Missing
Outreach Newspaper 2005	1009	0	.2646	.44135
Outreach Radio 2005	1009	0	.0981	.29762
Outreach Mail 2005	1009	0	.6591	.47426
Citation 2005	1009	0	.0337	.18054
Written Warning 2005	1009	0	.2111	.40829
Verbal Warning 2005	1009	0	.3944	.48897
Per capita Recycling Tonnage 2006	1009	0	.0721	.03624
Per capita Recycling Tonnage change from 2005 to 2006	1009	0	.0483	.43108
Curbside Recycling	1009	0	.6848	.46481
Outreach Newspaper 2006	1009	0	.2656	.44188
Outreach Radio 2006	1009	0	.1001	.30028
Outreach Mail 2006	1009	0	.6928	.46158
Verbal Warning 2006	1009	0	.4529	.49803
Citation 2006	1009	0	.0396	.19522
Written Warning 2006	1009	0	.2002	.40035
Town Dummy	1009	0	.6065	.48876
Population Served	1009	0	5365.0178	24296.81509
Median Household Income	1009	0	45398.8008	12144.75638

- **Hypothesis 1 (H1): The responsible unit's outreach efforts have a positive influence on the change in recycling from 2005 to 2006.**

Table A-2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.056(a)	.003	-.003	.43169

a Predictors: (Constant), Median Household Income, Outreach Radio 2005, Outreach Mail 2005, Curbside Recycling, Outreach Newspaper 2005, Town Dummy

ANOVA(b)

Table A-3

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.584	6	.097	.522	.792(a)
	Residual	186.732	1002	.186		
	Total	187.316	1008			

a Predictors: (Constant), Median Household Income, Outreach Radio 2005, Outreach Mail 2005, Curbside Recycling, Outreach Newspaper 2005, Town Dummy
b Dependent Variable: Per capita Recycling Tonnage Change from 2005 to 2006

Coefficients(a)

Table A-4

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	-.005	.060		-.090	.929
	Outreach Newspaper 2005	.001	.033	.001	.034	.973
	Outreach Radio 2005	.069	.048	.048	1.435	.152
	Outreach Mail 2005	-.010	.029	-.011	-.354	.723
	Curbside Recycling	.011	.034	.012	.319	.750
	Town Dummy	.007	.033	.008	.223	.823
	Median Household Income	9.15E-007	.000	.026	.776	.438

a Dependent Variable: Per capita Recycling Tonnage Change from 2005 to 2006

- **Hypothesis 2 (H2): The responsible unit's enforcement efforts have a positive influence on the change in recycling from 2005 to 2006.**

Model Summary

Table A-5

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.046(a)	.002	-.004	.43192

a Predictors: (Constant), Median Household Income, Citation 2005, Curbside Recycling, Verbal Warning 2005 , Written Warning 2005, Town Dummy

ANOVA(b)

TableA-6

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.392	6	.065	.350	.910(a)
	Residual	186.924	1002	.187		
	Total	187.316	1008			

a Predictors: (Constant), Median Household Income, Citation 2005, Curbside Recycling, Verbal Warning 2005 , Written Warning 2005, Town Dummy

b Dependent Variable: Per capita Recycling Tonnage Change from 2005 to 2006

Coefficients(a)

Table A-7

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	-.009	.060		-.158	.874
	Citation 2005	.056	.078	.024	.719	.472
	Written Warning 2005	-.028	.040	-.026	-.695	.487
	Verbal Warning 2005	.026	.032	.029	.817	.414
	Curbside Recycling	.017	.034	.018	.483	.629
	Town Dummy	.005	.034	.005	.141	.888
	Median Household Income	8.20E-007	.000	.023	.700	.484

a Dependent Variable: Per capita Recycling Tonnage Change from 2005 to 2006

- **Hypothesis 3 (H3): The responsible unit's outreach efforts have a positive influence on the responsible unit's per capita annual recycling tonnage.**

Model Summary

Table A-8

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.482(a)	.233	.228	.03184

a Predictors: (Constant), Median Household Income, Outreach Radio 2006, Outreach Mail 2006, Curbside Recycling, Outreach Newspaper 2006, Town Dummy

ANOVA(b)

Table A-9

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.308	6	.051	50.638	.000(a)
	Residual	1.016	1002	.001		
	Total	1.324	1008			

a Predictors: (Constant), Median Household Income, Outreach Radio 2006, Outreach Mail 2006, Curbside Recycling, Outreach Newspaper 2006, Town Dummy
b Dependent Variable: Per capita Recycling Tonnage 2006

Coefficients(a)

Table A-10

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	.038	.004		8.508	.000
	Outreach Newspaper 2006	-.002	.002	-.020	-.682	.495
	Outreach Radio 2006	-.007	.003	-.062	-2.143	.032
	Outreach Mail 2006	-.005	.002	-.060	-2.110	.035
	Curbside Recycling	.018	.003	.231	7.169	.000
	Town Dummy	-.019	.002	-.261	-7.956	.000
	Median Household Income	8.35E-007	.000	.280	9.566	.000

a Dependent Variable: Per capita Recycling Tonnage 2006

- **Hypothesis 4 (H4): The responsible unit's enforcement efforts have a positive influence on the responsible unit's per capita annual recycling tonnage.**

Model Summary

Table A-11

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476(a)	.226	.222	.03198

a Predictors: (Constant), Median Household Income, Written Warning 2006, Curbside Recycling, Citation 2006, Verbal Warning 2006, Town Dummy

ANOVA(b)

Table A-12

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.299	6	.050	48.805	.000(a)
	Residual	1.024	1002	.001		
	Total	1.324	1008			

a Predictors: (Constant), Median Household Income, Written Warning 2006, Curbside Recycling, Citation 2006, Verbal Warning 2006, Town Dummy
b Dependent Variable: Per capita Recycling Tonnage 2006

Coefficients(a)

Table A-13

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	.033	.004		7.476	.000
	Citation 2006	-.001	.006	-.007	-.239	.811
	Written Warning 2006	-.003	.003	-.036	-1.083	.279
	Verbal Warning 2006	.003	.002	.039	1.291	.197
	Curbside Recycling	.018	.003	.228	7.032	.000
	Town Dummy	-.018	.002	-.247	-7.387	.000
	Median Household Income	8.28E-007	.000	.277	9.545	.000

a Dependent Variable: Per capita Recycling Tonnage 2006

APPENDIX B
Definitions of Variables

Table B-1

Definitions of Variables

Outreach Newspaper 2005	Question from the 2005 Annual recycling Report: "Did the Responsible Unit provide newspaper ads" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Outreach Radio 2005	Question from the 2005 Annual recycling Report: "Did the Responsible Unit provide radio ads or public service announcements" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Outreach Mail 2005	Question from the 2005 Annual recycling Report: "Did the Responsible Unit provide direct mailings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Citation 2005	Question from the 2005 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2005: Citations" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Written Warning 2005	Question from the 2005 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2005: Written Warnings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Verbal Warning 2005	Question from the 2005 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2005: Verbal Warnings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Per capita Recycling Tonnage 2006	The amount of tons recycled per capita in the respective responsible units for the categories newspaper, corrugated paper, aluminum, steel, glass, plastic, co-mingled paper, co-mingled containers and co-mingled paper containers.
Per capita Recycling Tonnage change from 2005 to 2006	The change in the amount of per capita recycling from 2005 to 2006.

Curbside Recycling	Data taken from the 2006 annual survey, which the question asked the responsible unit to identify whether they provided dual stream curbside recycling, single stream curbside recycling, or drop off. Respondents who indicated that they provide single stream or dual stream curbside recycling were coded "1" for providing curbside recycling and those who did not mark the box for curbside recycling were coded "0" for not providing curbside recycling.
Outreach Newspaper 2006	Question from the 2006 Annual recycling Report: "Did the Responsible Unit provide newspaper ads" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Outreach Radio 2006	Question from the 2006 Annual recycling Report: "Did the Responsible Unit provide radio ads or public service announcements" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Outreach Mail 2006	Question from the 2006 Annual recycling Report: "Did the Responsible Unit provide direct mailings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Verbal Warning 2006	Question from the 2006 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2006: Verbal Warnings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Citation 2006	Question from the 2006 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2006: Citations" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Written Warning 2006	Question from the 2006 Annual recycling Report: "Were any of the following actions taken to enforce your ordinance in 2006: Written Warnings" The question was answered yes or no, and was coded "1" for a yes answer and "0" for a "no" answer.
Town Dummy	A variable used to measure the relationship of towns compared to counties, cities and villages. Towns were coded "1" and counties, villages and cities were coded "0".
Median Household Income	The median household income of the geographic area taken from the 2000 census.

APPENDIX C
Charts

Figure C-1

Outreach Activities by Responsible Units

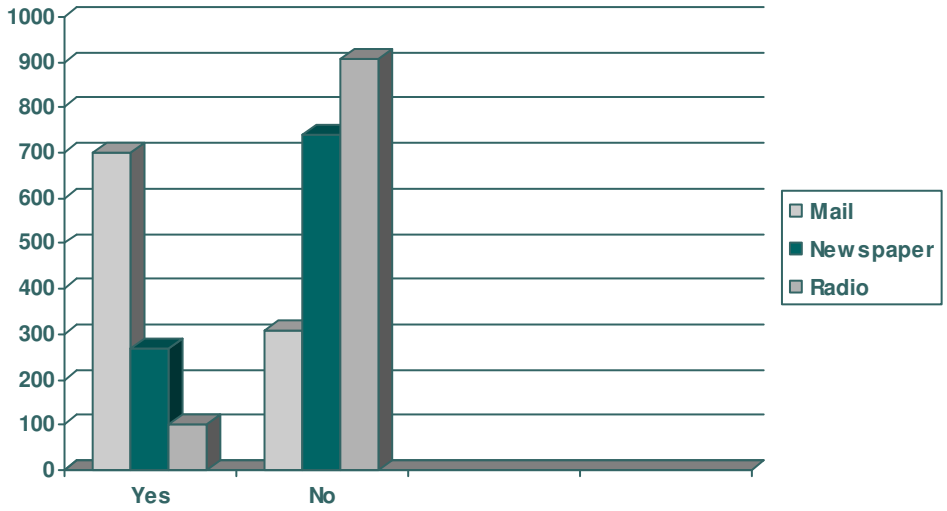


Figure C-2

Enforcement Activities by Responsible Units

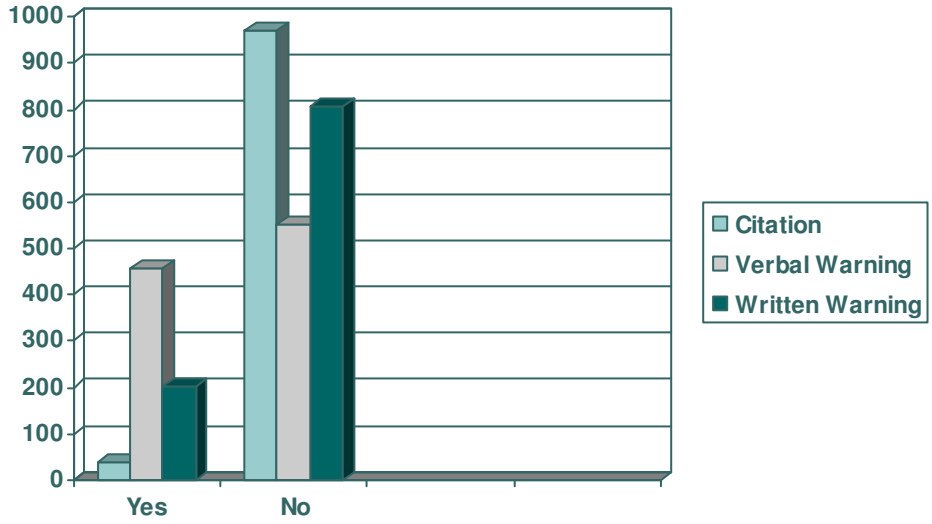


Figure C-3

Satisfaction with local recycling information

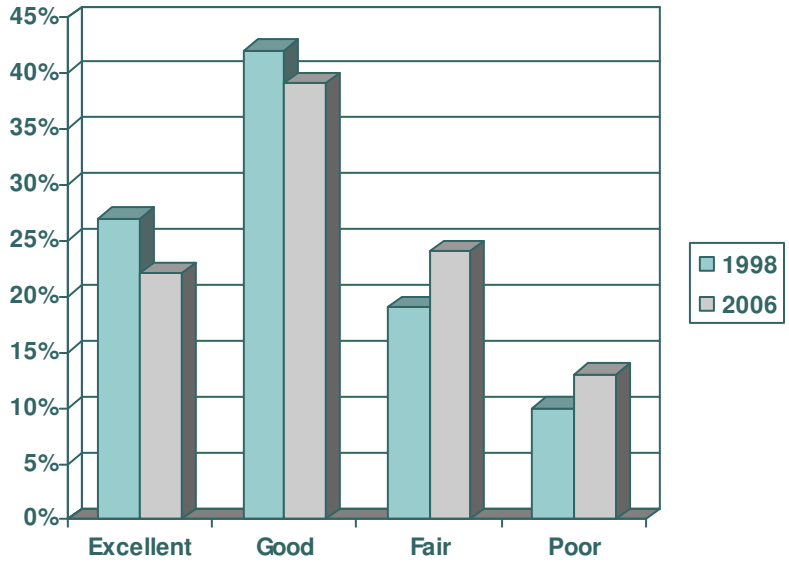


Figure C-4

Survey respondent's recall of DNR sponsored radio and television ads

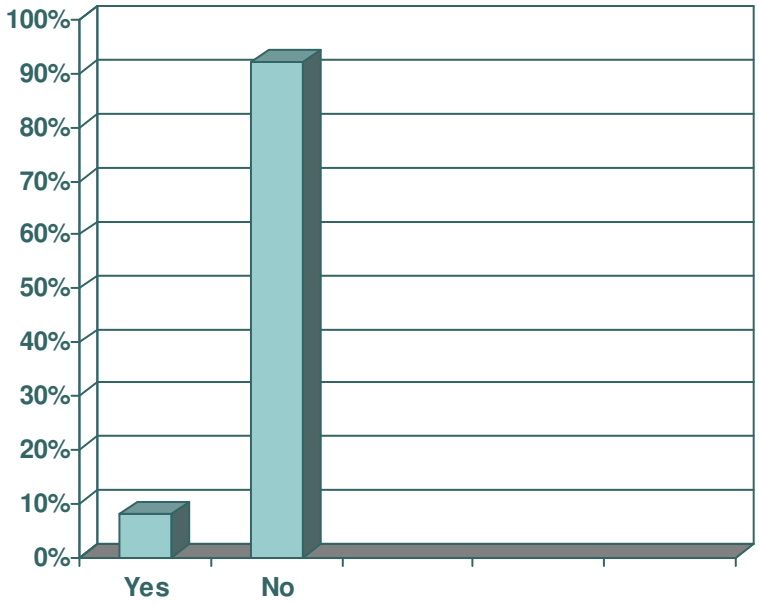
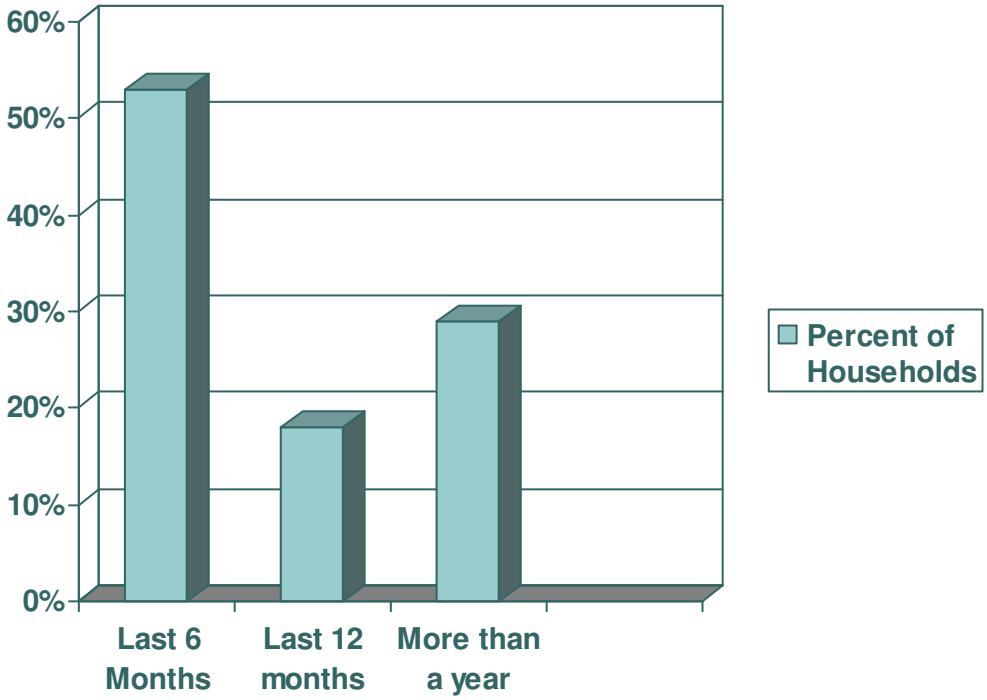


Figure C-5

The last time a household received information on recycling



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