NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP **SYNTHESIS 394**

Reducing Litter on Roadsides

A Synthesis of Highway Practice

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SUBJECT AREAS
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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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FOREWORD

Highway administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to highway administrators and engineers. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire highway community, the American Association of State Highway and Transportation Officials—through the mechanism of the National Cooperative Highway Research Program—authorized the Transportation Research Board to undertake a continuing study. This study, NCHRP Project 20-5, "Synthesis of Information Related to Highway Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an NCHRP report series, *Synthesis of Highway Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

PREFACE

By Donna Vlasak
Senior Program Officer
Transportation
Research Board

This synthesis reports on the state of the practice in reducing roadside litter as it involves state departments of transportation (DOTs). The report provides information concerning the prevention and removal of roadside litter, unfulfilled needs, knowledge gaps, and underperforming activities. It covers enforcement, education, awareness, and engineering methods for both litter prevention and collection. The synthesis focuses on state DOT personnel involved in roadside litter prevention and their contractors who conduct litter prevention and removal programs. Also, as roadside litter prevention appears to be a multiple stakeholder activity, policy makers and practitioners from other government agencies and environmental organizations, as well as groups and volunteers may be interested in this synthesis.

A 46-question survey was distributed to maintenance personnel in all 50 U.S. states, Puerto Rico, and 10 Canadian provinces. A literature search was also undertaken. Together, the North American survey and the literature review provide a comprehensive snapshot of the state of the practice in roadside litter abatement. Four case studies were undertaken highlighting DOT litter prevention programs considered leaders in the field.

Gerry J. Forbes, Intus Road Safety Engineering, Milton, Ontario, Canada, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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REDUCING LITTER ON ROADSIDES

SUMMARY

The term "litter" is generally defined as misplaced solid waste, although different jurisdictions have their own definitions. Regardless of the definition used, litter has been a persistent problem in the United States since at least 1953 when Keep America Beautiful (KAB), a nationwide nonprofit organization, was formed with a mandate of litter prevention. As the number of vehicle-miles of travel increases, so too does the potential for roadside litter. At present, roadside litter appears to be omnipresent.

The impacts of roadside litter and litter collection are staggering. The estimated cost of collecting roadside litter exceeds $130 million per year by state highways alone, and approaches $500 million by all levels of government. These figures are fairly dated at this time, as evidenced by the Georgia Department of Transportation (DOT), which reported $14 million spent on litter collection in 2006, and a trend of increasing costs at a rate of 20% per year.

A recent survey in Utah determined that 8% of drivers have been involved in a collision caused by road debris, and 47% of drivers have had their vehicles damaged by road debris. In 2003, Forbes 2003 in "The Safety Impacts of Vehicle-related Road Debris," estimated that vehicle-related road debris (i.e., litter on the road) is conservatively responsible for 80 to 90 fatalities and 25,000 crashes on North American roads each year. Australian data from 2005–2006 (Fire & Emergency Services Authority of Western Australia) indicated that 540 bush fires were caused by discarded cigarettes. Furthermore, the Royal Society for the Prevention of Cruelty to Animals in Great Britain dealt with 11,589 litter-related incidents in 2006. An Iowa survey of Adopt-A-Highway (AAH) volunteers and DOT maintenance garage employees noted 26 reports of injuries caused by debris/features (vegetation, uneven ground, etc.) along the roadside. An emergent roadside litter concern is the toxic litter from clandestine and portable crystal methamphetamine laboratories. The materials from these facilities frequently are discarded along the roadside, and the extremely toxic materials are a threat to the environment, and a hazard for maintenance personnel and volunteers. Roadside litter affects on loss of tourism and increased vehicle–animal crashes resulting from animals attracted to discarded food along the roadside are possible but have not been studied.

In some states (e.g., Texas, Tennessee, and Mississippi), DOT staff have developed a multitude of enforcement, public education, and awareness strategies to address the growing concern with litter. In other states (e.g., Georgia and Washington), state departments other than the DOT spearhead roadside litter prevention programs, considering roadside litter as a subset of all litter. In either case, these programs are costly and often divert funding from other DOT programs for congestion mitigation, roadway maintenance and preservation, and road safety.

Although it is clear that North America has a roadside litter problem, and that DOTs have developed programs to address the problem, it is unclear what programs are in effect, what organizational structures work, what resources are required, and which programs are producing results. The lack of program evaluations in particular is troublesome because

this has resulted in undocumented program successes and limitations. As a result, despite the commitment demonstrated by most DOTs and community members to develop solutions, the approach to roadside litter prevention has been piecemeal.

This synthesis is a state-of-the-practice report on reducing litter along roadsides as it involves state DOTs. The report provides information for state DOTs on the state of the practice concerning the prevention and removal of roadside litter, and identifies unfulfilled needs, knowledge gaps, and underperforming activities. The scope of this research was limited specifically to *roadside* litter, and therefore focused primarily on DOTs and their contractors who conduct litter prevention and removal programs. It does not include the broader topic of litter prevention in all public spaces and waterways. The research was concerned with enforcement, education, awareness, and engineering methods for both litter prevention and litter collection.

A 46-question survey was distributed to United States and Canadian maintenance personnel. Questions included were related to litter prevention and abatement measures, litter collection methods, program evaluation and performance measures, legislation and enforcement, and promotional material for litter prevention efforts. A literature search was also undertaken. Together, the North American survey and the literature review provide a comprehensive snapshot of the state-of-the-practice in roadside litter abatement. From this snapshot, trends and patterns concerning successful practices and knowledge gaps could be identified for practitioners.

The literature is replete with research on the effects of messaging, trash can design and placement, and penalties leading to litter reduction. The majority of these studies, however, are not measures of success as they apply to roadside litter. Programs such as AAH and activities such as conducting litter collection before roadside mowing have been studied and found effective. Other measures such as container deposit laws and establishing local KAB affiliates have documented successes, but they are generally outside of the mandate of the DOT. Research purports that advertising and education materials reflect a social norm that littering is not commonplace (i.e., visual messages would show a clean environment as opposed to a littered environment).

The survey was circulated to all 50 states and Puerto Rico, as well as to the 10 provinces and three territories in Canada. Each nonresponding jurisdiction was sent a reminder note 2 days before the specified deadline for responses. Subsequent to the deadline for submissions, all nonresponding jurisdictions were contacted by telephone in an effort to obtain a survey response. Although participants were initially given a specified period to respond, deadline extensions were permitted to increase the response rate. The response rate from the American jurisdictions was 63%.

The survey of state DOTs reveals that the cost of roadside litter collection and disposal is about $430 to $505 per centerline-mile. Additionally, the selection of education and encouragement strategies for roadside litter prevention share no cross-jurisdictional commonality. However, enforcement and litter collection trends are apparent, with monetary fines and community service being levied as typical penalties; AAH, prison work crews, and community service are typical collection methods.

The case studies clearly support the need for a multistakeholder approach that uses solid data to select and implement multiple, targeted antilitter strategies. Advertising campaigns (for education and encouragement) might benefit from being comparable to traditional private sector commercial advertising, with slogans and other advertising materials that deliver a straightforward, unapologetic message concerning the unacceptability of roadside littering.

Research that demonstrates a drop in overall litter rates over time may be an indication that litter prevention programs in the United States are working. Furthermore, a shift from intentional to accidental litter is significant and is a strong indicator that campaign efforts might now be better directed toward accidental litter prevention efforts.

The national effort to address the roadside litter problem is at present largely fragmented and underresearched. Synergy that could be created by better coordination of roadside litter prevention efforts is lacking. One of the primary obstacles in developing effective litter prevention campaigns, and in attracting funding for these programs reported in survey responses, is the lack of reliable data on the roadside litter problem. Evaluations are produced by only a few roadside litter prevention programs, and typically they use the frequency or density of visible roadside litter as the sole measure of success. Other performance measures could be considered, such as injuries to workers and volunteers, motor vehicle crashes, roadside fires, and so on, were reported lacking as well.

The costs and impacts of roadside litter might be better documented and widely publicized. The cost of roadside litter and litter collection in the United States is staggering and likely would be surprising to the general public and decision makers. Publicizing the impacts of roadside litter likely would bring greater resources to bear on the roadside litter problem.

CHAPTER ONE

INTRODUCTION

BACKGROUND

The word "litter" entered the mainstream in the 1950s by means of the American Public Works Association and is generally defined as misplaced solid waste, although different jurisdictions have their own definitions. Regardless of the definition used, litter has been a persistent problem in the United States since at least 1953 when Keep America Beautiful (KAB) was formed with a mandate of litter prevention. As the number of vehicle-miles of travel increases, so too does the potential for roadside litter. At present, roadside litter appears to be omnipresent.

The impacts of roadside litter and litter collection are staggering. In the mid-1990s, the estimated cost of collecting roadside litter exceeded $130 million per year for state highways alone (Andres and Andres 1995). An earlier study (FHWA 1974) estimated that $500 million is spent annually by all levels of government on the collection of roadside litter from the 3.79 million miles of highways in the United States. More recently, the Georgia Department of Transportation (DOT) reported collecting about 2 million bags of litter from their Interstate system each year (Haines 2006). This translates to $14 million on litter collection in 2006, with costs increasing at a rate of 20% per year.

A recent survey in Utah determined that almost 80% of drivers have encountered road debris causing them to swerve from their intended path, 8% of drivers have been involved in an accident caused by road debris, and 47% of drivers have had their vehicles damaged by road debris (Dan Jones & Associates 2008). Forbes (2003) estimated that vehicle-related road debris (i.e., litter on the road) is conservatively responsible for 80 to 90 fatalities and 25,000 crashes on North American roads each year. Perhaps the most tragic incident involving roadside litter occurred in the Mont Blanc Tunnel connecting France and Italy through the Alps. A 1999 fire in the tunnel resulted in 39 deaths and more than $1 billion in losses to the region (Leistikow et al. 2000). The cause of the fire was reported to be a discarded cigarette that entered the engine compartment of a truck and lit the paper air filter on fire. The tunnel was closed for repairs and upgrading for 3 years.

Australian data from 2005–2006 indicated that 540 bush fires were caused by discarded cigarettes (FESA 2006). In addition, in 2006, the Royal Society for the Prevention of Cruelty to Animals (Great Britain) (2007) dealt with 11,589 litter-related incidents. Iowa surveyed nearly 3,000 Adopt-A-Highway (AAH) volunteers and DOT maintenance garage employees to identify the potential safety hazards posed by debris and features along the roadside (Iowa Department of Transportation 2000). Of the 1,180 respondents, 26 reported past injuries to themselves or to someone in their group. The most serious injuries reported were a sprain, a cut requiring stitches, and a snake bite. The most common injuries were small cuts, scratches, and rashes.

Additionally, toxic litter from clandestine and portable crystal methamphetamine laboratories is an emergent concern for road authorities. Operators of these facilities frequently discard used laboratory equipment and paraphernalia along the roadside, and the extremely toxic materials used to make the illegal drug are a threat to the environment, as well as a hazard for maintenance personnel and volunteers. To date, a limited number of people have been injured after coming across discarded materials from such laboratories ("Meth-Lab Litter Poses Hazard . . ." 2006).

Finally, roadside litter may be a determinant of crime rates in urban areas. In a study concerning the crime rate at bus stops in downtown Los Angeles and adjoining neighborhoods, Liggett et al. (2001) found that litter was positively correlated with incidence of crime. This research supports the "broken windows" theory, which posits that if small antisocial issues (e.g., litter) are not addressed, then larger antisocial issues will follow (e.g., increased crime) because the existing smaller issues convey a message that antisocial behavior is tolerated (Kelling and Coles 1996).

The impacts of roadside litter are serious but not always obvious. Apart from the previously noted impacts of roadside litter and litter collection, the following impacts have not been studied: loss of tourism owing to littered roadsides, and the increased potential for vehicle–animal collisions resulting from animals attracted to discarded food at the roadside.

Roadside litter is a serious problem in North America, and addressing the problem is a significant social cost. DOT staff has developed a multitude of enforcement, public education, and awareness strategies to address the growing

concern with litter. State DOTs that are visibly active in the prevention of roadside litter include Texas (Don't Mess With Texas), California (Don't Trash California), Tennessee (Stop Litter: Tennessee's Had Enough), and Mississippi (Pick It Up Mississippi, I'm Not Your Mama!). These states and many others have AAH, Sponsor-A-Highway, and inmate collection programs in place. These programs are costly, however, and often divert funding from other DOT programs for congestion mitigation, roadway maintenance and preservation, and road safety.

Roadside litter is a subset of litter prevention in all public spaces and waterways, and although the DOT is responsible for litter removal, it is not always the lead agency in roadside litter prevention programs. Programs such as Washington State's "Litter and It Will Hurt" and Georgia's "Litter. It Costs You" address roadside litter but are spearheaded by the Departments of Ecology and Community Affairs, respectively and not the DOT.

Although it is clear that North America has a roadside litter problem, and that DOTs have developed programs to address the problem, it is unclear what programs are in effect, what organizational structures work, what resources are required, and which programs are producing results. A July 2007 report from KAB (Beck 2007b) documents that programs such as AAH are effective but that more research is required for DOTs and other agencies to make informed decisions regarding roadside litter reduction.

The lack of program evaluations in particular is a concern, because this has resulted in the successes and limitations of programs going undocumented. This in turn limits the ability to achieve the following:

- Confidently replicate successful programs.
- Adapt and test litter prevention programs with potential for success.
- Eliminate programs or program elements that do not (appear to) work.

Despite the commitment demonstrated by most DOTs and community members to develop solutions, the current situation has resulted in a piecemeal approach to roadside litter prevention.

SYNTHESIS OBJECTIVES

This synthesis is a state-of-the-practice report on reducing litter on roadsides. The synthesis involves state DOTs and provides information on the state of the practice concerning the prevention and removal of roadside litter, and identifies unfulfilled needs, knowledge gaps, and underperforming activities. The primary audience for this synthesis is DOT personnel involved in roadside litter prevention. As roadside litter prevention is a multiple stakeholder activity, however, policymakers and practitioners from other government agencies and environmental organizations, as well as interest groups and volunteers may be interested.

SYNTHESIS SCOPE

The scope of this research was limited specifically to *roadside* litter, and therefore focused primarily on DOTs and their contractors who conduct litter prevention and removal programs. It does not include the broader topic of litter prevention in all public spaces and waterways. The research was concerned with enforcement, education, awareness, and engineering methods for both litter prevention and litter collection. Furthermore, stakeholder involvement, volunteer efforts, and other cooperative and collaborative organizational structures were investigated.

A 46-question survey was distributed to maintenance personnel in the United States and Canada. Survey questions were related to litter prevention and abatement measures, litter collection methods, program evaluation and performance measures, legislation and enforcement, and promotional material for litter prevention efforts. The response rate was 63%. A literature search was also undertaken. Together, the North American survey and the literature review provide a comprehensive snapshot of the state of the practice in roadside litter abatement. From this snapshot, trends and patterns concerning successful practices and knowledge gaps may be identified for practitioners.

REPORT ORGANIZATION

This first chapter of this synthesis report contains introductory information, including background, objectives, and scope. Chapter two includes a review of the literature, which was conducted to determine whether relevant information was available that addressed roadside litter activities performed by state DOTs, as well information collected on roadside litter attitudes and behaviors. Chapter three documents the survey process and results obtained. Chapter four provides four case studies from DOT litter prevention programs that are considered leaders in the field. Chapter five summarizes the synthesis findings and conclusions, including future research that may be considered to understand the extent and usefulness of litter reduction strategies performed by state DOTs.

CHAPTER TWO

LITERATURE REVIEW

Literature in the field of littering is generally plentiful, but not necessarily specific to roadside litter, as littering may affect all public spaces and waterways. Any reports in the field of litter prevention and abatement were reviewed and are included in the synthesis if they were applicable to roadside litter prevention or if they had the potential to provide useful information on roadside litter program development. The literature may be broken down into the following broad categories: reports on existing practices, visible litter studies, behavior and attitude studies, evaluation, and performance measurement studies.

EXISTING PRACTICES

Bitgood et al. (1988) describe four major approaches to litter control:

- Environmental education: media and education campaigns to increase awareness and promote attitude/behavior change.
- Prompting: providing specific instructions of what to do or what not to do (e.g., "Do not litter").
- Environmental design: planning and designing facilities to encourage appropriate behavior (e.g., providing well-placed trash receptacles).
- Consequence control: positive or negative feedback such as incentives for good behavior and fines or penalties for poor behavior.

Drawing on previous research in each of these approaches to litter control, the authors determined that consequence control is the most effective technique, but that it is not necessarily the most cost-effective approach. Combining approaches is the recommended strategy to improve litter control.

A critical review of environmental behavior research by Dwyer and colleagues (1993) examined both antecedent (preventative) and consequence (remedial) strategies for behavior modification for littering and other environmentally related behaviors. With respect to antecedent strategies, commitment, modeling, and goal-setting resulted in consistent and significant changes in behavior. Furthermore, these strategies produced residual effects lasting 9 to 12 weeks following intervention removal. With respect to consequence strategies, almost all strategies produced beneficial effects in the short term. The general trend in the research, however, is for the consequence strategy effects to fade immediately after the intervention is removed.

The first appearance of a comprehensive review of existing practices specific to roadside litter is a 1998 survey by Washington State that was conducted to benchmark Washington's litter abatement programs against other states and to identify methods of operation that would improve the quality and efficiency of Washington's program (Bremer 1998). A summary of the survey results is as follows:

- DOTs played the primary role in litter management in 52% of the states. Remaining activities were coordinated by volunteer organizations and various state agencies.
- Twenty-six states had a state-run litter program; seven limited their involvement to grant management.
- Seventy-four percent of states participated in the KAB program.
- Ninety-four percent of states used correctional work crews for litter collection.
- Forty-eight states had AAH programs (Maine and Vermont did not have programs at the time).
- Only three states had state-sponsored youth litter programs.
- Ten states had beverage container deposit legislation (i.e., a "bottle bill").

The AD Council (2006) contrasted the need for an information campaign on littering and pollution in the 1960–1980 time period versus the needs of today. They noted that although the campaigns in the 1960–1980 period was directed at educating people about littering and raising awareness, today's campaigns must focus on behavior and attitude change.

A developing practice is the use of closed-circuit television cameras (CCTV) to apprehend and fine illegal dumpers in some American jurisdictions (Virginia Department of Environmental Quality 2007). Whether the fines will be upheld in the court system is unknown at this time. CCTV enforcement of illegal dumping laws in Scotland has resulted in convictions and is being expanded to enforce littering from vehicles (Black 2006). Similarly, CCTVs have been used to enforce illegal dumping laws in Ireland (Tobin Consulting Engineers 2008). Under the Irish rules, the registered owner of a littering vehicle is charged with the offense, and the monitoring body is required to erect signs warning the

public that the area is under surveillance by CCTV. The Irish system of video surveillance for illegal dumping is similar to the video surveillance systems used to capture red light camera violations in the United States.

Spacek (2008) has conducted a comprehensive examination of littering in the United States leading to an American State Litter Scorecard, which ranks the states with respect to environmental quality indicators and litter abatement programs. The examination and subsequent rankings are based on overall littering in each state and are not specific to roadside litter. The rankings are based on eight objective factors: state livability scores, litter taxation, beverage container laws, recycling laws, antilitter slogans, environmental spending, per capita waste disposal, and percentage of litter-influenced fatal vehicle crashes. Spacek uses fatal crashes coded as "Object not fixed" under the first harmful event (i.e., the first injury or damage-producing event that characterizes the crash type, but not necessarily the first event that causes the crash) from the "2005 National Traffic Safety Facts" to identify litter-related fatal crashes in each state. This approach is insufficient and may have produced misleading results, because several non-fixed objects are not considered litter that are often struck by motor vehicles. These objects can include, for example, traffic control devices used for road construction, trees and tree limbs that have fallen on the roadway during storms and high winds, animals, and accident debris. Additionally, four subjective factors (political culture, public corruption, government performance, and highway/transportation performance) are intended to get a sense of "what is going on" in litter abatement using supplementary public sector evaluations.

The objective and subjective rankings for all states are reproduced in Table 1. The 10 best objective states all have above-average livability scores, and 9 of the 10 have average litter-influenced fatal vehicle crashes. The 10 worst-performing states on the objective ranking all have below-average livability scores, and half of the states have normal to exceptionally high litter-related fatal crashes. Antilitter slogans do not appear to be associated with objective performance, as only 5 of the top 10 states adopted a slogan, and 7 of the bottom 10 states also had adopted a slogan.

On the subjective ranking, the 10 best-performing states included nine non-Sunbelt states and seven states with low public corruption convictions. The 10 worst subjective performers included nine Sunbelt states. Spacek does not provide any reasons why the Sunbelt states generally score worse than the non-Sunbelt states; however, previous research (Bullard 2000; Boyce 2001) attributes poor environmental quality (which would include litter) in the Sunbelt to racial and income inequalities. Spacek indicated that his analysis merely contributes to a poorly researched issue and should not be seen as a definitive causation study. Spacek's desire is that the scorecard will provide an incentive for other researchers to provide more attention to issue.

TABLE 1
AMERICAN STATE LITTER SCORECARD

Rank	Objective Factors	Subjective Factors
1	Vermont	Minnesota
2	New Jersey	Iowa
3	Connecticut	New Hampshire
4	Minnesota	Vermont
5	Wyoming	Connecticut
6	Massachusetts	Oregon
7	Maine	Utah
8	Maryland	Nebraska
9	New Hampshire	Washington
10	Virginia	Virginia
11	Iowa	Maine
12	Kansas	Wyoming
13	Delaware	Maryland
14	South Dakota	New Jersey
15	Nebraska	Massachusetts
16	Washington	Colorado
17	Idaho	Kansas
18	Rhode Island	Idaho
19	New York	Wisconsin
20	Utah	Delaware
21	Wisconsin	South Dakota
22	Alaska	North Dakota
23	Hawaii	Rhode Island
24	Oregon	New York
25	Ohio	Missouri
26	North Dakota	Indiana
27	Missouri	Ohio
28	Colorado	Michigan
29	Illinois	Arizona
30	Indiana	Pennsylvania
31	California	Hawaii
32	Pennsylvania	Illinois
33	Florida	Montana
34	Georgia	Alaska
35	Michigan	Florida
36	Montana	California
37	Arizona	Georgia
38	Texas	Texas
39	Oklahoma	Oklahoma

Rank	Objective Factors	Subjective Factors
40	North Carolina	New Mexico
41	Tennessee	North Carolina
42	Kentucky	Kentucky
43	Alabama	Tennessee
44	South Carolina	Nevada
45	Louisiana	West Virginia
46	New Mexico	South Carolina
47	Arkansas	Arkansas
48	West Virginia	Alabama
49	Nevada	Louisiana
50	Mississippi	Mississippi

Source: Spacek (2008).

Litter abatement campaigns in America have been studied (Rai University 2008) and found to be unsuccessful because of the following reasons:

- Littering is not important or of much interest to most people.
- People generally had little previous involvement with the issue.
- Antilittering behavior produces only slight personal benefits and does not lead to a personal efficacy because litter cleanup depends on the collective action of many people.
- Proper litter conduct may result in personal costs and inconvenience.
- The personal benefit-to-cost ratio is low.
- The demand for a litter-free environment is not strong or universal.
- The litter abatement message is difficult to develop as it must be tailored to each target group.

VISIBLE LITTER STUDIES

Visible litter composition studies are the most prevalent type of research that is documented. DOTs and their state colleagues have been performing visible litter studies since at least the 1990s. Florida, Georgia, New Jersey, Texas, and several large municipal centers have conducted litter composition studies. The reasons for conducting these studies include determining the composition of litter, identifying the likely sources of litter (i.e., deliberate or accidental), identifying the locations and facilities where litter accumulates, as well as establishing baseline conditions against which to measure changes in litter rates over time. Stein and Syrek (2005) have synthesized the results from numerous visible litter surveys conducted in the United States and report the following:

- Fifty-five percent of all litter is deliberate, consisting mostly of convenience packaging and products. The remaining litter is accidental, resulting from uncovered trucks, unsecured loads, loss of vehicle parts, trash can spills, and human carelessness.
- The sources of roadside litter vary greatly depending on type of roadway. For example, 50% of the litter on urban freeways and 53% of litter on rural freeways appear to be accidental, whereas accidental litter on rural local roads and rural state highways is 36% and 39%, respectively.
- Past surveys have revealed that 97% of litter comes from four sources: pedestrians (42%), vehicle occupants (20%), uncovered or unsecured loads on trucks (21%), and open vehicle beds where items had been improperly stowed (14%).

The Institute for Applied Research (IAR), in an analysis of 62 litter surveys using similar methodologies, has determined that the average rate of litter has been decreasing at about 2% per year (IAR 2006). The analysis accounted for major factors that significantly affected litter rates (i.e., traffic volumes, median income, number of vehicle occupants, rain-temperature index, population, distance from the city, and the duration of any litter programs in service). In this same research, the IAR evaluated the cost-effectiveness of five major methods or strategies for controlling litter. The cost-effectiveness of the five strategies is shown in Figure 1.

The two most expensive ways to remove or prevent litter from streets and roadsides are paid litter pickup programs, which cost $1.29 to remove one item of litter, and beverage container deposits, which only reduce beverage container litter at a cost of $4.24 per item. Paid litter pickup programs immediately reduce litter by 90%, but litter builds back up again to near precleaning levels within 7 to 31 weeks. Deposit programs immediately reduce fresh container litter, but they have no effect on the major components of litter, such as takeout food packaging.

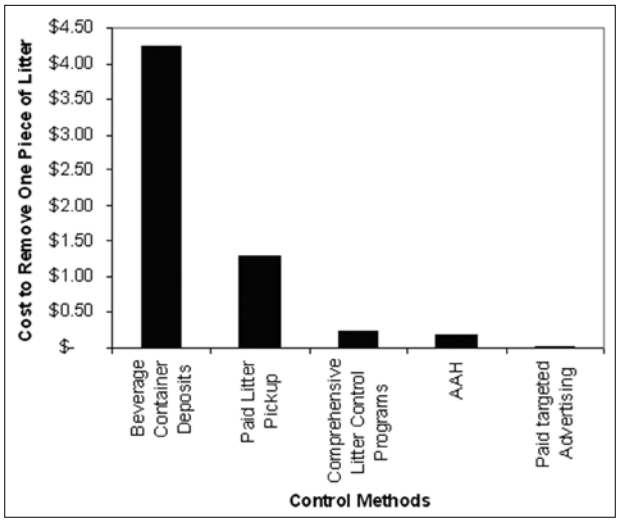


FIGURE 1 Cost-effectiveness of popular litter abatement strategies (*Source*: IAR 2002). *Note:* AAH = Adopt-A-Highway.

AAH programs and state-run comprehensive litter control programs are less expensive (about $0.18 to remove or prevent an item of litter) but have limitations. AAH programs usually cover 35% or less of state maintained highways and do not touch most rural local roads or urban city streets. Comprehensive programs have proven effective statewide, achieving statewide reductions in litter of more than 50%. It can take up to 15 years of aggressive and consistently well-funded litter prevention campaigns for a state to realize such significant results.

Paid advertising programs targeting the age groups identified as primarily responsible for causing litter are the most cost-effective approaches. They prevent littering from occurring at a cost of $0.02 per item. They are flexible and provide quick results (70% reductions in litter in 6 years), but they need to be adequately supported and sustained to achieve good results. They are not as cost-effective for smaller jurisdictions with fewer than 500,000 persons (Stein and Syrek 2005).

A further synthesis of visible litter studies was prepared by Beck (2007b) who summarized the key findings from 12 visible litter surveys as follows:

- Miscellaneous paper and plastics were ranked either the highest or second highest percentage of litter in five of 10 studies with these data available.
- Vehicle debris and packaging accounted for a large amount of the visible litter—vehicle debris was in the top five for seven of the 10 studies.
- Beverage containers and related litter were ranked first or second in only two studies.
- The proportion of litter that is considered deliberate appears to be decreasing over time.

The Georgia Visible Litter Study (Beck 2007a) presents a novel way to frame the roadside litter issue in the context of establishing priorities for litter reduction efforts. The concept is to determine that road users are most likely to be exposed to litter by considering the amount of litter on a facility and the likelihood of someone seeing it. Determining the potential for exposure to litter was calculated by accounting for roadway miles, vehicle and pedestrian daily traffic, and estimated traveling speeds. The exposure-adjusted litter rates show that urban freeways and residential streets present the greatest exposure to litter. Each type of facility contributes about the same exposure to litter, and together they constitute 53% of all exposure to roadside litter.

The Ohio Litter Study (Davey Resource Group 2004) attempted to determine the magnitude of biohazardous roadside litter, including bottles filled with unknown liquids that appeared to be human urine, plastic bags containing material appearing to be human feces, syringes, needles, dead animals, and diapers. Study participants observed but did not collect any biohazardous material. All of the previously mentioned categories of hazardous material were identified in the survey; only the urine-filled bottles were of sufficient magnitude to permit reliable estimates of statewide quantities (see Table 2).

BEHAVIORS AND ATTITUDES

To develop targeted and effective litter prevention programs, researchers have attempted to determine who litters and why they litter. Research conducted in 1968 for Keep America Beautiful, Inc. identified specific demographic variables related to littering. Among the findings was that twice as many males litter as females, and that adults under the age

TABLE 2
ESTIMATE OF URINE-FILLED BOTTLE LITTER IN OHIO IN 2004

Location		Containers per Year		
		Mean	Low	High
Interstate and U.S. Routes	Rural	374,429	205,004	543,854
	Urban	65,535	33,877	97,194
State Routes	Rural	425,140	162,807	687,474
	Urban	55,070	762	109,378
County Roads	Rural	0	0	0
	Urban	47,179	16,021	78,338
Interchanges	Rural	1,212	0	2,742
	Urban	3,807	1,090	6,523
Sum		972,372		

Source: Davey Resource Group (2004).

of 35 are twice as likely to litter as people ages 35–49 and three times more likely to litter than people over the age of 50. Much of the research conducted during the past 30 years supports those conclusions.

Beck (2007b) assembled and compared eight litter attitude studies that were completed between 1968 and 2006. All of the studies were conducted between 1997 and 2006, except for the KAB survey conducted in 1968. The following trends and patterns can be noted in the review:

- Litter is considered a problem by the majority of respondents in all of the studies conducted since 1997. This may be an indication that litter awareness campaigns have been effective in increasing the percentage of people who believe litter is a problem from 36% in 1968 to 57% and to 87% in the latter studies.
- The majority of studies support the notion that young people are more prone to litter.
- Five studies indicated that males litter more than females, two studies reported no difference in the propensity to litter by gender, and one study did not report these data.
- The percentage of respondents who personally litter is between 43% and 52%. This statistic must be used with caution because many of the attitude surveys focused on the 18- to 45-year-old age cohort, and in four of the studies it was concluded that admissions to littering decreased with age.
- The propensity to report someone who litters and the belief that enforcement would stop littering are increasing with time.

A study by Grasmick et al. (1991) examined a relationship between a sense of threat and the likelihood to litter. They hypothesized that

> threats of shame and embarrassment function in much the same manner as the threat of legal sanctions in generating compliance with the law. Shame, a self-imposed sanction, and embarrassment, a socially imposed sanction, increase the subjective cost of the illegal behavior [littering] and, thus, reduce the likelihood that the behavior [littering] will occur (p. 234).

In this same research, Grasmick and colleagues (1991) surveyed independent samples of Oklahoma residents before and 2 years after the introduction of a litter prevention campaign. The campaign stressed threats of shame and embarrassment for littering and included an AAH program and a Don't Lay That Trash on Oklahoma program. The latter program emphasized the moral obligations to keep the state clean. The researchers found that a higher proportion of respondents in the post-campaign group would not litter in the future, and said that they would feel guilty littering. Also, a higher proportion of respondents in the post-campaign group believed that they would not be respected if they littered. The researchers suggested that the threats of shame and embarrassment significantly reduce the reported inclination to litter.

Torgler et al. (2008) investigated the relationship between environmental participation and littering in Europe, and demonstrated that membership in an environmental organization increases the probability of stating that littering is never justifiable. The researchers suggest that it may be possible that encouraging individuals to become active in environmental organizations could prevent littering.

EVALUATIONS OF STRATEGIES AND MEASURES FOR LITTER PREVENTION

Huffman and colleagues (1995) group litter prevention strategies into two categories:

- Antecedent (preventative) strategies: external stimuli that prompt people to dispose of waste items in a desirable way, including prompts, written signs and verbal appeals, community involvement and modeling and environmental design.
- Consequence strategies: the rewards of desirable disposal behaviors or the negative penalties of littering.

In a review of 40 articles and 59 studies concerning litter reduction strategies, Huffman and colleagues concluded that both types of strategies are generally effective in reducing litter. The consequence strategies generally outperformed the preventative strategies.

Environmental Conditions

There is a well-developed school of thought that the extent of littering in an area or society is largely based on perceived social norms. For example, people are more likely to litter in areas that are already littered than in areas that are generally litter free (Finnie 1973; Krauss et al. 1978; Reiter and Samuel 1980). This is because a littered environment reflects a social norm that littering is tolerated, whereas a clean environment reflects a society that is intolerant of littering.

Messaging

Reiter and Samuel (1980) compared the effect of two types of litter prevention signs (threatening versus cooperation) on the littering behavior of users of a public parking lot in Sacramento, California. They hypothesized that the presence of the sign would reduce the litter rate and that signs with a cooperative message would be more effective in reducing litter than signs bearing a threatening message. The threatening message was "Littering Is Unlawful and Subject to a $10 Fine"; the cooperative sign showed a man placing trash into a receptacle, with the caption "Pitch In." The research-

ers found that both signs produced lower litter rates relative to a no-sign condition. However, the cooperative sign was no more effective than the threatening sign.

The results of the present report are consistent with studies that have shown that polite formulations appealing for help can be effective in reducing littering behavior (Geller et al. 1976; Reich and Robertson 1979; Durdan et al. 1985).

In a study concerning the effects of a newspaper media campaign on litter reduction, Schnelle and colleagues (1980) conducted an experiment in a small town in Tennessee. The newspaper campaign consisted of a one-page feature article appealing to citizens to clean up the town, followed by daily updates on progress. The researchers found that newspaper advertising produced immediate reductions in the amount of measured litter. One month subsequent to the cessation of the advertising, however, measured litter approximated preexperimental conditions.

Also with respect to messaging, Durdan and colleagues (1985) evaluated the effectiveness of various written litter prevention prompts in a university cafeteria setting and found that:

- Prompting resulted in a significant decrease in litter.
- Positively worded prompts ("please be helpful") were more effective than negatively worded prompts ("please don't litter").
- Specificity of the prompt had no reliable effect on littering behaviors (e.g., "Clear your own table" versus "Place your tray and dishes in the tray holders along the west hall").

The researchers also observed that the convenience of disposal facilities contributed to a decrease in littering.

Cialdini (2003) examined the effectiveness of environmental protection messaging in the context of the social norms presented. The researcher describes two kinds of social norms: injunctive norms that outline behaviors that are socially acceptable, and descriptive norms that outline behaviors that are typically performed. Cialdini posits that messaging is most effective when the injunctive and social norms presented are complementary and not contradictory. For example, a television commercial showing an individual being fined for littering (the injunction norm) would be more effective if the scene showed a clean environment rather than an already littered environment (the descriptive norm). Field experiments conducted as part of the research supports the hypothesis.

The Texas DOT's Don't Mess With Texas campaign is a comprehensive litter campaign that employs several social marketing methods and techniques. It is generally regarded as a best practices model for DOT litter prevention efforts, and the campaign has reduced the amount of visible litter on Texas highways by 72% in 6 years (Texas Department of Transportation 2008). The DOT asserts that the success is the result of, at least in part, the use of athletes and musicians who are admired by the target audience.

There is no universally accepted pictogram or symbol for litter prevention, but the "tidyman" symbol (see Figure 2) is used globally to remind people and entities to be thoughtful in disposing of their solid waste. The pictogram was first used by Budweiser in the 1950s to encourage people not to litter. The tidyman pictogram is used by many companies on their product packaging, and has been adopted by Pitch-In Canada and Keep Britain Tidy as their primary logos. The use of this symbol is not limited to one country, transcends language barriers, and therefore makes it a good candidate for inclusion in litter prevention materials. Also, it is a positive message depicting the act of proper trash disposal, as opposed to a negative message (e.g., "don't litter), which some research suggests is more effective.

Indeed, the *Manual on Uniform Traffic Control Devices* (FHWA 2003) uses a similar symbol for the Litter Receptacle sign (see Figure 3*a*). The *Ontario Traffic Manual* (Ministry of Transportation 2000) proposes a different symbol to advise motorists against littering (see Figure 3*b*).

Roadside Advertising

Roadside advertising is intended to educate drivers that littering is illegal, act as a deterrent to littering, and prompt witnesses to report litterers to the appropriate authorities. Roadside signs also remind motorists that the community is addressing litter, and it promotes a sense of social responsibility.

The Victoria Litter Action Alliance (VLAA) in Australia in conjunction with VicRoads and Victoria Environmental Protection Agency developed a series of approved roadside litter prevention signs designed for permanent placement on roads with a speed limit up to 110 kilometers per hour (Victoria Litter Action Alliance 2006). Focus group testing undertaken to develop the messages for roadside signs found that the most effective signs:

- Appear in a series where the message is built upon by each sign viewed (signs could be repeated or varied in the series; a sign appearing once only on a stretch of road was more likely to be missed).
- Are used sparingly to avoid visual pollution and diluting the impact.
- Include signs that address littering and illegal dumping separately, as research shows that people differentiate between the acts of littering and illegal dumping.
- Include a phone number, such as a toll-free number, to act as a deterrent against littering.

(*a*) (*b*)

FIGURE 2 International Tidyman Pictograms: (*a*) Traditional symbol; (*b*) Modern variation.

(*a*) (*b*)

FIGURE 3 Official traffic control devices concerning litter: (*a*) Litter receptacle sign; (*b*) No littering sign. [*Sources:* (*a*) FHWA 2003; (*b*) Ministry of Transportation 2000].

- Have the clarity of an immediate and short message, a phone number, and applicable logos.

Dowling (2005) reported on the effectiveness of a short-term community roadside litter campaign in Australia, which included the following: a publicized launch of the campaign, mobile billboards installed for 3 weeks, six permanent roadside signs, a litter-reporting hotline promoted by means of radio, newspaper advertisements, brochures, and distribution of free car litterbags. The campaign produced an average litter reduction of about 65%. The authors attribute the good results not solely to the roadside advertising, but also to the integration of multiple measures that engage the target audience in different ways.

Trash Receptacles

Research indicates that in some settings disposal-facility availability contributes to more use of the facility and less litter (Finnie 1973; Baltes and Hayward 1976; O'Neill et al. 1980; Mielke 1985; Takahashi 1996). Finnie (1973) is the most relevant to the roadside litter problem, as part of this

experiment involved placing litter receptacles along highways and city streets. Placing litter receptacles along the highway reduced litter an average of 28.6% and was effective for at least 6 miles along the highway. Curiously, when signs preceded the litter receptacles, the average reduction was only 25.2% compared with a 32% reduction when signs were not present.

The most recent effort in this regard comes from the IAR, which evaluated the effectiveness of receptacles in reducing litter and found that receptacles average a 40% reduction in litter in both urban and rural settings. Nonetheless, litter receptacles do not by themselves prevent litter, as about 50% of littering occurs within 26 feet of a receptacle (Victoria Litter Action Alliance n.d.).

Some studies have even investigated the impact of specially designed waste receptacles (e.g., Geller et al. 1980; O'Neill et al. 1980). The research of O'Neill and colleagues (1980) compared the effects on littering of a conventional waste receptacle and a specially designed receptacle, and found that the experimental receptacles collected significantly more waste than the conventional receptacles. The researchers concluded that the specially designed container most likely draws people's attention to desirable waste disposal. The O'Neill et al. research was conducted in an American football stadium, and the results may not be transferable to other locations.

In more recent research, de Kort et al. (2008) examined the effects of trash can design on littering behavior. The researchers understood that social and personal norms have the ability to affect behavior, but they contend that these norms are effective only if they are a focus at the correct time. Therefore, experimental trash cans were designed to activate a social or personal norm, which was expected to guide individuals toward antilittering behavior. Two experimental trash cans were tested: (1) a typical trash can supplemented with a sign conspicuously placed over the can with an antilittering message (an explicit message); and (2) a typical trash can with a mirror mounted over the can (an implicit message). (Individuals who see their reflection in a mirror experience increased self-awareness, including greater attention to personal norms.) The field study indicated that both trash can designs effectively activated personal norms and reduced litter by about 50%.

Deposits on High Litter Items

Container deposit legislation (CDL), also known as a "bottle bill," is a law that requires sellers of plastic bottles and beverage containers to charge a refundable deposit on drink containers, such as aluminum cans and plastic bottles. This results in an empty beverage container retaining some cash value, which makes it less likely to be discarded, and promotes the collection of discarded containers by private interests (who wish to redeem collected containers for the cash). Both actions result in a reduction of containers in the litter stream. The success of CDL is a contested issue in litter prevention. While proponents tout the litter reduction effects, opponents are quick to posit that CDL is not cost effective and addresses only a portion of the litter stream.

The effects of CDL on litter reduction in seven states are shown in Table 3. Beverage container litter reductions have consistently been between 70% and 84%, and total litter has been reduced between 34% and 47%. An ancillary positive impact of CDL was discovered by Baker et al. (1986) who studied the effect of CDL in Massachusetts on the incidence of lacerations in urban children. Records of emergency room visits for lacerations and fractures were reviewed before and immediately after implementation of CDL. A case-control study of children 18 years of age or younger who presented to the Emergency Service of Children's Hospital, Boston, for the treatment of lacerations was undertaken. The incidence of total sutured lacerations did not change substantially after the legislation; however, glass-related lacerations fell by 60% as a result of the reduced incidence in lacerations occurring outside of the home.

Ireland implemented a plastic bag levy to reduce the incidence of plastic bags in the litter stream. It is estimated that plastic bags formed 5% of litter in the Republic of Ireland before the tax, and according to the national litter pollution monitoring system, the proportion of plastic bag litter had fallen to 0.22% by August 2004 (a 95.6% reduction) (Keep Wales Tidy 2006). Taxes on plastic bags are also in effect in Belgium, Denmark, Italy, Switzerland, and Taiwan (China). In North America, the province of Quebec is considering a tax on plastic bags (CBC 2007).

TABLE 3
EFFECTS OF CONTAINER DEPOSIT LEGISLATION ON LITTER REDUCTION

State	Beverage Container Litter Reduction	Total Litter Reduction
New York	70%–80%	30%
Oregon	83%	47%
Vermont	76%	35%
Maine	69%–¬77%	34%–64%
Michigan	84%	41%
Iowa	76%	39%
Massachusetts	N/A	30%–35%

Source: Container Recycling Institute (2007).
Note: N/A = not available.

Adopt-a-Highway Programs

The results from the studies in Florida provide evidence of the strong connection between volunteer-adopted road programs and reductions in litter (Florida Center for Solid and Hazardous Waste Management 1997). In 1995, the litter density for large litter items on adopted sites was 36% less than on nonadopted sites, and the adopted sites had 33% fewer items per site than nonadopted sites. In 1996, the litter density for large litter items was 20% less on adopted sites than on nonadopted sites, and adopted sites had 19% fewer items per site than nonadopted sites. The data for 1997 did not show a statistically significant difference between the amount of litter on adopted and nonadopted sites.

Consecutive state litter surveys from New Jersey indicate that AAH is an effective litter reduction strategy (Stein and Syrek 2005). AAH sites were 9% cleaner than non-AAH sites from February through April, and 15% cleaner than non-AAH sites during June and July, when pickup activities are more prevalent.

A more comprehensive analysis by KAB (Beck 2007b) examined data from seven visible litter surveys. They determined that AAH programs are effective at reducing litter rates (see Table 4) by about 13%. Only the Mississippi AAH program was ineffective in reducing the prevalence of roadside litter; if this result is considered an outlier and is removed from the data set, AAH programs provide an average reduction of 31% of visible litter items.

TABLE 4
EFFECT OF ADOPT-A-HIGHWAY PROGRAMS ON LITTER RATES

		Visible Litter per Mile	
State	Year	AAH vs. non-AAH	Percent Difference
Hawaii	1993	No data provided	54% lower
Pennsylvania	1999	1,582 vs. 2,969	47% lower
Mississippi	2000	3,600 vs. 1,900	89% higher
North Carolina	2001	1,250 vs. 1,350	7% lower
New Jersey	2004	1,532 vs. 1,756	13% lower
Georgia	2006	1,074 vs. 1,236	13% lower
Tennessee	2006	311 vs. 610	49% lower
Average			13% lower

Source: Modified from KAB (2007).
Note: AAH = Adopt-a-Highway.

Keep America Beautiful Communities

The results for 272 combined small and large county samples showed that KAB sites are 8.5% cleaner than non-KAB sites (IAR 2006). When split into freeway/rural and urban street categories, the urban KAB sites had a 10.3% lower rate, compared with the freeway/rural sites, which were 7.4% lower. Similarly, Beck (2007b) reviewed six visible litter surveys conducted since 1990 that provided the data to measure the litter rates in KAB versus non-KAB communities. The results are shown in Table 5 and indicate that KAB communities have a 12% lower visible litter rate per mile than non-KAB communities.

TABLE 5
EFFECT OF KEEP AMERICA BEAUTIFUL SITES ON LITTER RATES

		Visible Litter per Mile	
State	Year	KAB vs. non-KAB	Percent Difference
Louisiana	1990	No data provided	24% lower
Kentucky	1998	1,413 vs. 1,707	17% lower
Pennsylvania	1999	2,751 vs. 1,980	39% higher
Mississippi	2000	1,800 vs. 2,100	14% lower
North Carolina	2001	950 vs. 1,450	35% lower
Tennessee	2006	1,124 vs. 1,389	19% lower
Average			12% lower

Source: Modified from KAB (2007).
Note: KAB = Keep America Beautiful.

In a 2006 survey in Victoria, Australia, 83% of respondents had evaluated their litter management programs, up from around 70% in the 2004 survey. However, the majority of respondents undertook the evaluation themselves using observations, litter counts, and face-to-face surveys. Analysis of the methods used showed a strong reliance on *informal* rather than formal methods. An increased emphasis on the evaluation of programs and initiatives could provide valuable input into future policy, program, and regulatory developments (Victoria Litter Action Alliance 2006).

Roadside Mowing

Roadside mowing has been investigated as a factor in visible litter rates (Florida Center for Solid and Hazardous Waste Management 1997; Beck 2007a, b). The Florida Litter Survey found that, as grass height increased, the amount of large

litter (litter that was 4 square inches or larger) increased and the amount of small litter decreased (Florida Center for Solid and Hazardous Waste Management 1997). For large litter, the litter density at sites with a grass height of 3 to 6 inches was 22% higher than the litter density at sites with a grass height of less than 3 inches. Furthermore, long grass had 21% more large litter items per site than short grass. The litter density and total number of items per site for small litter items are shown in Table 6. These results are not surprising because roadside mowing typically involves maintenance workers collecting large items before mowing (to avoid damage to the mowing equipment), or requires mowing over large items and shredding them into several smaller items.

TABLE 6
EFFECT OF ROADSIDE MOWING ON LITTER RATES IN FLORIDA

Grass Height (inches)	Litter Density	Number of Items per Site
<3	167	158
3 to 6	134	128
>6	100	100

Source: Data from Florida Center for Solid and Hazardous Waste Management (1997).
Note: The results are dimensionless, because they have been normalized.

The Georgia Visible Litter Survey (Beck 2007a) confirmed the Florida results. In Georgia, mowed areas were found to be more than twice as littered than nonmowed areas (when measuring items per mile). However, roadside mowing was not considered a factor in the amount of litter found on Tennessee roadsides, where 43 mowed sites and 52 nonmowed sites were compared (Beck 2007c). The average number of items per mile for the mowed sites was 1,513, whereas the average number of items per mile for the nonmowed sites was 1,400. The researchers assumed that the mowed sites were possibly cleaned before mowing, and this yielded the comparable litter rates.

There is a trend in the roadside maintenance industry, particularly in the southern states, to move toward xeriscaping—landscaping in ways that do not require supplemental irrigation and promote water conservation. In some instances, xeriscaping involves the use of nontraditional roadside plantings and treatments that may affect the visibility of roadside litter or the ability of the roadside to capture and retain litter. This area of roadside litter requires further study.

Incentives

Burgess et al. (1971) evaluated the effectiveness of six different antilitter procedures on children in neighborhood theaters. The procedures included providing litterbags, providing litterbags with instructions to use them, providing extra trash cans, showing a special antilitter film before the feature attraction, and providing incentives for the appropriate deposit of litter. The incentive resulted in the removal of more than 90% of all litter and far outperformed the other five procedures investigated. The transferability of incentives as a measure to reduce roadside litter is uncertain.

Overall, there is a dearth of information concerning the impacts of legislation and enforcement on littering and litter rates.

CHAPTER THREE

SURVEY RESULTS

SURVEY PROCEDURES

The survey was designed to focus on state DOTs and their practices and principles as they relate to litter prevention and abatement programs. The questionnaire included 46 questions and is included in this report as Appendix A.

The survey was circulated digitally by means of electronic mail as a PDF file. The survey questionnaire was transmitted to the AAH coordinators or the state maintenance engineers for each state and Puerto Rico in late May 2008. Additionally, the survey questionnaire was circulated to maintenance personnel in the 10 provinces and three territories of Canada. Potential respondents were given a 2-week period to respond. After the initial circulation of the survey, and 2 days before the deadline for responses, a reminder was sent to jurisdictions that had not responded to the first contact. Subsequent to the deadline for responses, telephone contact was made with all nonresponding jurisdictions in an effort to obtain a survey response. Therefore, although participants were initially given a 2-week period to respond, deadline extensions were permitted to increase the response rate.

The responses are summarized by the number or percentage of respondents who selected the different answers for each question. The percentages were calculated as the number of answers to each question divided by the number of responses for that question (i.e., the percentages for different questions may be based on a different number of respondents). Also, several questions permitted multiple responses, in which case the sum of the percentages in the question may be more than 100%. Responses of "Not sure/do not know" were removed from the total number of responses. For example, if 37 responses were received to a question, but four of the responses were "do not know," then the total number of responses used to calculate the percentage of responses was 33.

Thirty-nine responses were received from 32 states, six provinces, and one territory for a 58% overall response rate. The response rate from American jurisdictions (63%) was higher than that for Canadian jurisdictions (54%). The tabulated survey results are in Appendix B. The survey examined the following issues and questions:

- Scope of the roadside litter problem
- General program parameters
- Legislation
- Enforcement
- Education and encouragement
- Performance measures.

The following sections present the survey results organized into these six areas.

SURVEY RESPONSES

Scope of Roadside Litter Problem

Each jurisdiction was asked several questions concerning the magnitude of the litter problem on their roadsides. The questions concerned expenditures on litter collection and disposal, litter citations issued, convictions, and the amount of litter collected. The results are shown in Table 7.

Many of the respondents did not provide an answer or did not know how many citations were issued for roadside littering, how many convictions were made, or how many workers or volunteers may have been injured while collecting roadside litter. The low response rate to the citations and convictions questions may be expected because the survey was sent to DOT employees who may not be aware of enforcement statistics. With respect to injuries that result from roadside litter collection, it is likely that workplace injuries are well documented but not easily parsed to the level of detail that permits identifying injuries that result from litter collection.

The average number of citations for littering appears to be dropping over time. The drastic drop in citations from 2006 to 2007 is not reflective of the actual data, because two of the jurisdictions that reported a relatively high number of citations in 2005 and 2006 did not report their citations in 2007. Nonetheless, the number of citations dropped by 10% from 2005 to 2006, which may be a result of decreasing litter rates or a decrease in enforcement.

TABLE 7
MAGNITUDE OF THE LITTER PROBLEM IN RESPONDING JURISDICTIONS

Question	Year 2007	2006	2005
a. How many citations were issued for littering and illegal dumping on roadways and roadsides in your jurisdiction? (N = 7[a] for 2007, N = 9 for 2006, N = 8 for 2005)	Range: 1 to 1,746 Avg: 418	Range: 0 to 9,655 Avg: 1,857	Range: 0 to 10,294 Avg: 2,067
b. How many of the citations indicated above resulted in convictions? (N = 5 for 2007, N = 5 for 2006, N = 5 for 2005)	Range: 1 to 1,519 Avg: 320	Range: 0 to 1,603 Avg: 338	Range: 0 to 1,097 Avg: 234
c. How many centerline-miles of road are under your jurisdiction? (N = 34 for 2007, N = 29 for 2006, N = 29 for 2005)	Range: 1,366 to 148,216 Avg: 20,512	Range: 1,366 to 57,483 Avg: 14,012	Range: 1,366 to 57,867 Avg: 14,050
d. How much litter was collected from the roadways and roadsides in your jurisdiction? (N = 18 for 2007, N = 16 for 2006, N = 16 for 2005)	Responses varied in reporting number of bags, pounds, cubic yards, etc.	Responses varied in reporting number of bags, pounds, cubic yards, etc.	Responses varied in reporting number of bags, pounds, cubic yards, etc.
e. What is the DOT's annual expense for litter collection on roadways and roadsides in your jurisdiction[b]? (N = 26 for 2007, N = 25 for 2006, N = 23 for 2005)	Range: $35,000 to $62,000,000 Avg: $6,048,841	Range: $30,000 to $55,000,000 Avg: $5,841,701	Range: $30,000 to $42,000,000 Avg: $5,143,111
f. What is the DOT's annual expense for disposal of litter that was collected on roadways and roadsides in your jurisdiction? (N = 6 for 2007, N = 5 for 2006, N = 5 for 2005)	Range: $5,000 to $400,000 Avg: $159,695	Range: $5,000 to $400,000 Avg: $221,192	Range: $5,000 to $335,410 Avg: $215,922
g. How many workers or volunteers have been injured while collecting roadside trash (e.g., struck by vehicle, cut by broken glass, etc.)? (N = 8 for 2007, N = 7 for 2006, N = 7 for 2005)	Range: 0 to 2	Range: 0 to 6	Range: 0 to 4

[a]N = the number of jurisdictions that responded to the question.
[b]For responses from Canadian jurisdictions, one Canadian dollar was assumed to equal one U.S. dollar.

The average number of convictions for littering offenses remained relatively stable in 2006 and 2007 (about 320 to 340 convictions). Only five jurisdictions provided both citation and conviction data, permitting an analysis of conviction rates for roadside littering offenses. For 2005, 2006, and 2007, the average conviction rates for responding jurisdictions are 70%, 71%, and 77%, respectively. It appears from the responses that the ability of the legal system to convert citations to convictions for litter-related crimes is improving.

The amount of litter that is collected from North American roadsides is highly variable from jurisdiction to jurisdiction, and is not measured in any industry-standard metric. Jurisdictions reported the amount of litter collected using weight (tons or pounds), volume (cubic yards), area (acres), truckloads, and bags. This makes for a difficult comparison among jurisdictions. Nonetheless, the data were collected for 3 consecutive years, so some short-term time trends can be ascertained. For example, in 60% of the responding jurisdictions, the amount of collected litter increased from 2005 to 2006. A decrease in the amount of collected litter was observed in this same period for only 20% of the respondents. From 2006 to 2007, only 31% of respondents experienced an increase in the amount of litter collected, whereas 46% of respondents experienced a decrease in the amount of litter collected. The number of jurisdictions on which these percentages are based is relatively small; therefore, the results should not be extrapolated.

Several respondents indicated that the annual expense for disposal of collected litter (Question 8f) was included in the annual expense they reported for the collection of roadside litter (Question 8e). Therefore, discussion on annual expenditure will concern expenditures for collection and disposal (i.e., total costs reported in Questions 8e and 8f). The annual cost of collecting and disposing of roadside litter in the responding jurisdictions in 2007 ranged from $12,000 to $62 million, with an average of $6,070,886. Normalizing these data across jurisdictions through centerline-miles yields the averages shown in Figure 4.

The number of injured workers or volunteers performing roadside litter collection was not reported by most responding jurisdictions. Those that did respond indicated that the annual number of injuries was less than 10 for all years.

Most jurisdictions provide multiple modes of roadside litter collection, with DOT maintenance staff and volunteer groups being the most prevalent modes (see Table 8).

TABLE 8
ENTITIES RESPONSIBLE FOR ROADSIDE LITTER REMOVAL

Entity	No. of Responses	Percentage
DOT	35	90
State police	4	10
Private contractor	18	46
Other agencies under contract (i.e., Conservation Corps, Division of Forestry)	10	26
Volunteer groups	36	92
Prison work crews	25	64
Individuals conducting community service	23	59
Other	7	18

Note: $N = 39$.

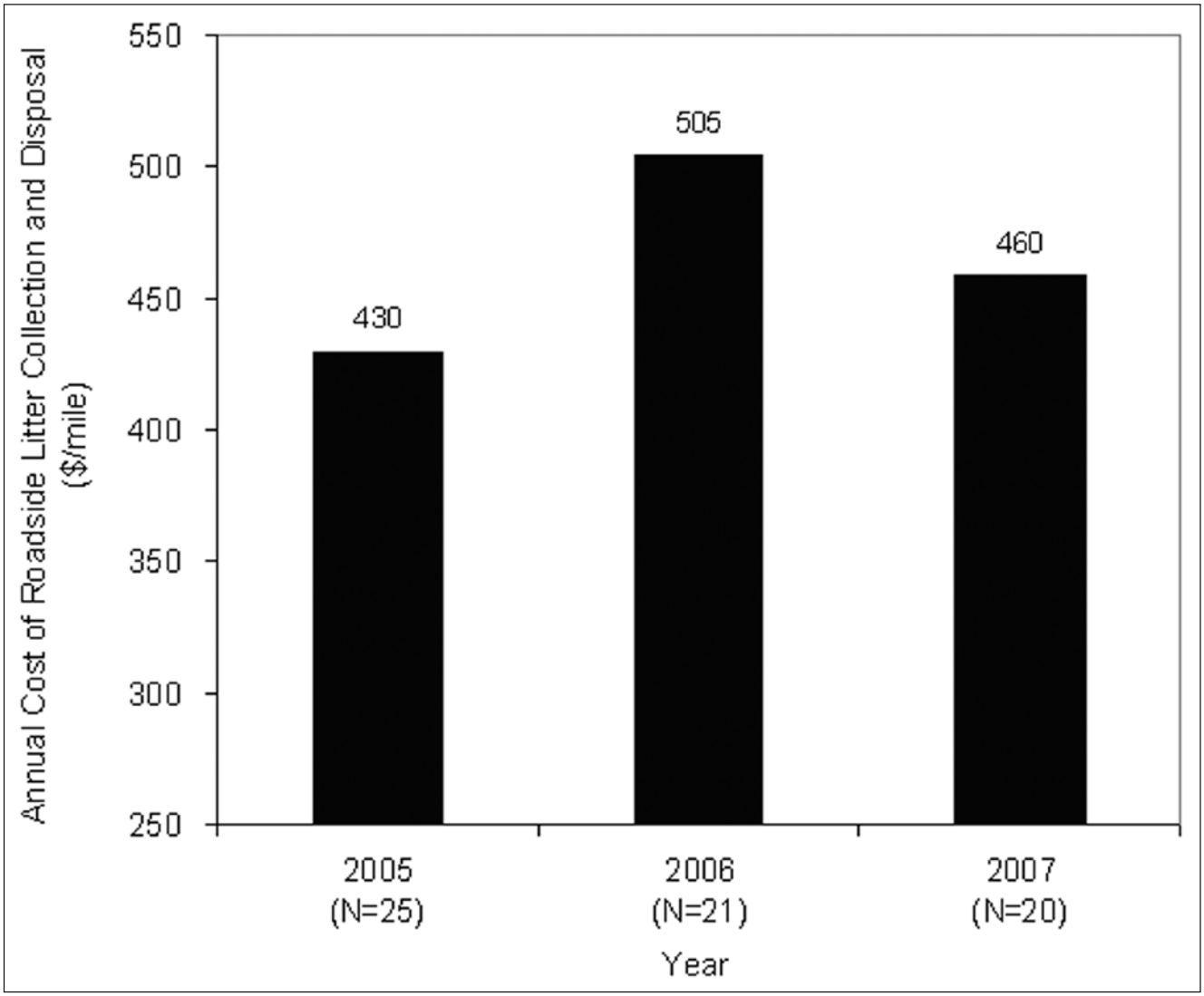


FIGURE 4 Annual cost of litter collection and disposal for responding jurisdictions.

Seven jurisdictions ($N = 35$) have completed studies that examine the impact of roadside litter on tourism, economic development, or other social and community features. An additional jurisdiction has one such study in development and another is planning to conduct a study. Details were provided on only a few of the studies conducted to date.

As an example, Mansfield University in Pennsylvania conducted one of the impact studies. It was a statewide telephone survey of 1,102 randomly selected Pennsylvania adults who are proportionally representative with respect to geographic region, sex, and political affiliation. The margin of error for the survey is 3%. The survey reveals the following:

- Eighty-five percent of people notice litter and trash along the roadside in Pennsylvania.
- More than 90% of people are bothered by roadside litter, with almost 70% indicating that they are bothered "a lot" by roadside litter.
- More than 53% of people believed that beautifying the roadsides would help attract businesses and tourists to the state.

In a follow-up survey conducted 2 years later, Mansfield University asked people about the biggest trash problem in their community: roadside litter was cited as the largest trash problem.

General Program Parameters

The literature review and general knowledge on social marketing indicate that interagency cooperation is an important component of a successful litter abatement strategy. The responding jurisdictions indicated that the DOT cooperates with many different agencies and groups, including the following that were specifically mentioned by one or more respondents:

- Keep [Insert State Name Here] Beautiful
- International Adopt-a-Highway Association
- Department of Corrections
- Department of Natural Resources
- Department of Environment (or similar)
- Tourism board
- State police
- Outdoor Advertising Association
- Soft Drink Association and Malt Beverage Association
- Local governments
- Maintenance contractors
- 4-H clubs
- Multimaterial Stewardship Board (the group responsible for recycling in the jurisdiction)
- Volunteers, local groups, and private companies that may participate in AAH or similar programs.

In their continuing antilitter efforts, 19 of the 37 respondents (51%) employ an antilittering slogan, and three respondents (8%) are considering one at this time. The in-service slogans are listed here:

- Arizona: Don't Trash AZ!
- California: Don't Trash California
- Delaware: Keep Delaware Beautiful. Don't Be A Litterbug
- Kentucky: Adopt-A-Highway . . . Make It Yours
- Minnesota: Don't Waste Our State
- Maryland: Keep Maryland Beautiful
- Montana: No More Trash!
- Mississippi: Pick It Up Mississippi, I'm Not Your Mama
- New Mexico: Toss No Mas and Don't Trash NM
- Ohio: A Scenic View Depends on You
- Tennessee: Stop Litter: Tennessee's Had Enough
- Texas: Don't Mess With Texas
- Utah: Litter Hurts!
- Virginia: Littering Is Illegal
- Vermont: Green Up
- Washington State: Litter and It Will Hurt
- Wyoming: Wyoming's View Is Up To You
- Puerto Rico: Keep The Island Clean! Put Litter In Its Place.

Antilittering websites are used by 59% of respondents (23 of 39), with another two respondents considering the implementation of a website for antilittering.

Funding for roadside litter programs is primarily secured from the state budgets, most likely the DOT highway maintenance budget. One or two respondents receive program funding from highway user revenue funds, general funds, motor vehicle registrations, Environmental Protection Agency trust funds, gas taxes, and taxes of beverage containers. Jurisdictions that have implemented a Sponsor-A-Highway program also receive funding from private corporations or organizations and individuals who become sponsors.

A surprising low number of DOT respondents (11 of the 34 states) indicated that they are affiliated with KAB. This is likely because the DOT is not directly affiliated with KAB, although many of the states have state KAB affiliates. Fourteen of the respondents indicated that they were affiliated with other national antilittering groups. The national antilittering organization most often cited was the International Adopt-A-Highway Association. Several of the "yes" responses to this question referred to participation in the "Keep [Insert State Name Here] Beautiful" affiliates of KAB.

Legislation

Definitions of littering were provided by respondents; sometimes in a relatively simple sentence, and sometimes

as a lengthy explanation. Simple definitions included the following:

- Leaving any trash or discarded item on any public or private land or waterway.
- Anything unnaturally lying on the road or roadsides, including paper, glass, metals (including bumpers and car hoods), tobacco products, furniture, and so on.
- Carelessly discarded refuse, such as wastepaper.

An example of a more lengthy definition comes from the California Litter Abatement Plan:

> Litter is…
>
> All trash, cigarette butts, refuse, junk, garbage and scrap. Any articles of material deposited within the right of way, intentionally or unintentionally. Any article or material abandoned by the owner or the person in possession thereof, not including dust, smoke, or other like products emitted or produced during the normal operations of any mining, extractive, primary or manufacturing industry.
>
> For the purpose of the Plan, litter is deposited on land or in waterways if it is placed, put, left, dropped, thrown; or, is allowed to fall there or be blown from a moving motorized vehicle or trailer. Only clear water or feathers from live birds may escape a vehicle. Illegal dumping is a substantial component of the overall litter issue in California. While the term "litter" is often used to refer to acts of a spontaneous or unintentional nature that involve items of a smaller size and quantity, illegal dumping is generally premeditated and includes items of a larger size and quantity (Caltrans 2007).

One jurisdiction provided a definition for littering and a subsequent definition for "criminal littering," which is differentiated by the offender's intent (criminal littering is intentional or reckless). Yet another respondent differentiated littering from illegal dumping where discarding trash that weighs more than 5 pounds is considered illegal dumping and is subject to steeper fines.

Table 9 includes the responses for which court attends to littering cases. Littering is a criminal offense in 18 of the 31 responding jurisdictions (58%). The principal differences between a civil and criminal offense are as follows:

- Criminal matters generally involve breaking a law, result in the state prosecuting a defendant, and carry a burden of proof "beyond reasonable doubt." The penalties for criminal offenses are fines and imprisonment, as well as other noncustodial punishments.
- Civil maters are usually between two private entities, resulting from one party damaging or causing injury to the other party, with the burden of proof being "the balance of probability" or a "preponderance of the evidence" (which is much lower than for criminal matters). The penalties for civil matters are monetary restitution, including the loser paying the winner's court costs.

TABLE 9
COURT ATTENDING TO LITTER CASES

Court	No. of Responses ($N = 39$)	Percentage of All ($N = 39$)	Excl. DK ($N = 31$)
Civil offence only	13	33	42
Criminal offence only	6	15	19
Both civil and criminal offence	12	31	39
Not sure/do not know	8	21	—

DK = don't know; — = not applicable.

Respondents were asked whether littering within their jurisdiction is a strict liability offense. Strict liability, also known as absolute liability, is liability without regard to fault or negligence. Strict liability as it applies to littering means that, under the law, the sole question is whether littering occurred—there is no relief from guilt or liability by arguing the littering was unintentional or the littering could not have been prevented by exercising reasonable care. Littering is a strict liability offense in 67% of the responding jurisdictions ($N = 18$).

Another legislative tool available to jurisdictions is "presumptive evidentiary rules," which refer to the ability to issue a citation to an individual or entity for littering without anyone witnessing the act of littering. Most often, the offender is inferred from either contact information on correspondence in the litter, or is assumed to be the operator or owner of a motor vehicle from which litter has been discharged. Sixty-eight percent of respondents use presumptive evidentiary rules in placing litter charges ($N = 21$).

The penalties for roadside littering in responding jurisdictions are shown in Figure 5. Monetary fines are by far the most prevalent method of penalizing those who litter, followed by community service (usually performed by collecting roadside litter), imprisonment, and restitution or restitution costs. Restitution doesn't have to be money – it can be to clean up the litter that was deposited without it counting as community service. The amounts of fines or hours of community service vary considerably across jurisdictions and in many cases are at the discretion of the trial judge.

Littering in some jurisdictions is subject to a straightforward monetary fine, which prescribes the minimum and maximum fine, but allows the judge to set the fine within the permissible range. For example, one respondent listed the penalty for roadside littering as $26 to $1,176 with a standard "waiver" penalty of $141; another reported a $50 to $500 fine. In other jurisdictions that penalty system is much more complex. As an example of the variability and complexity of state laws concerning roadside littering,

Pennsylvania can cite people for roadside littering under the Vehicle Code (covers litter dropped or thrown from a vehicle), the Crimes Code (covers litter that lands on public property without consent), or the Environmental Protection Code (touches on waste management and transportation). If charged under the Vehicle Code, the penalty is $300 for a violation and a requirement to remove the litter; if charged under the Crimes Code, the penalty is a $50 to $300 fine or up to 90 days' imprisonment; and if charged under the Environmental Protection Code, the penalty is $100 to $1000 per incident, and as a civil penalty a fine as high as $25,000 per incident.

In many jurisdictions, that penalty works on a sliding scale, with each subsequent offense garnering a harsher penalty (i.e., a higher fine, more demerit points, or more hours of community service). Penalties for serious littering offenses (as determined primarily by the magnitude of the offense and the intent of the offender) involve imprisonment for up to 12 months. The litter laws and penalties for littering and illegal dumping in Texas are shown in Figure 6.

The processing of litter citations through the legal system is typically undertaken in the normal court system (67% of respondents). Twenty-five percent of respondents have a special docket or environmental court to facilitate the processing of littering citations, and 8% of jurisdictions are considering implementing a special docket.

Respondents were asked about taxes that have been implemented in their jurisdictions to curb littering. Beverage container deposits (i.e., "bottle bills") are used in 12 of 34 jurisdictions (35%), with another jurisdiction considering the implementation of a beverage container law. A small percentage of jurisdictions (30%) place a tax on hard-to-dispose of materials and products. Tires were the only product specifically mentioned by respondents who use the hard-to-dispose-of tax. Finally, based on the survey results, 11% of jurisdictions place additional taxes on litter-generating industries. Other litter laws that respondents mentioned are applicable to roadside littering include environmental acts, solid waste regulations, and load securement laws.

Enforcement

Figure 7 shows that the enforcement of litter laws in the responding jurisdictions is carried out mainly by the state and local police ($N = 38$). In the states and provinces where designated government officials also provide enforcement, the officials included wardens from the Department of Natural Resources, Conservation Officers, and Environment and Fisheries Officers. The "other" personnel carrying out enforcement activities concerning litter are the county sheriff, local law enforcement personnel, and the Royal Canadian Mounted Police (the federal police force of Canada who are sometimes contracted to provide provincial and territorial policing in lieu of maintaining a provincial police force).

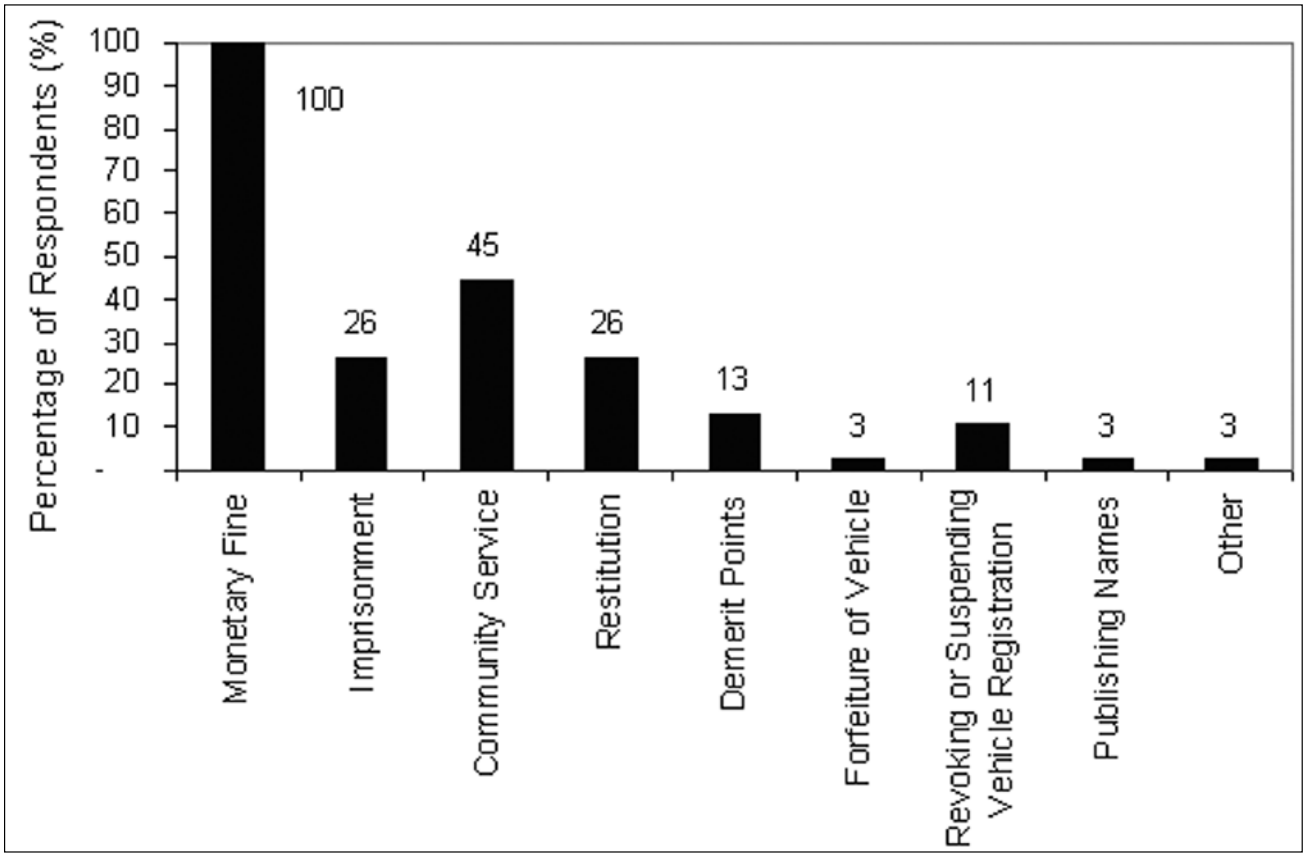


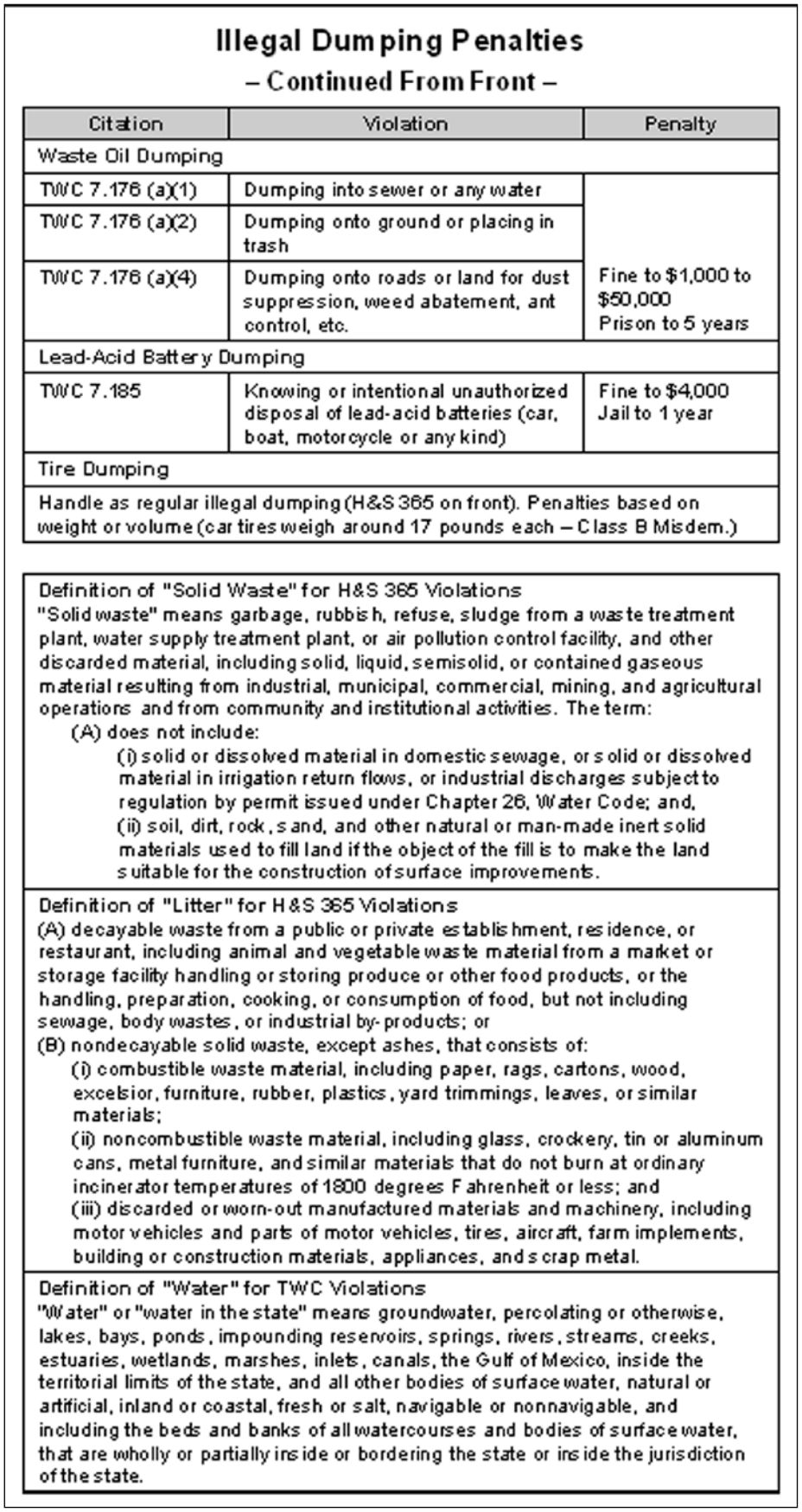
FIGURE 5 Penalties for roadside littering.

Illegal Dumping Penalties

Littering and illegal dumping are serious crimes in Texas and violations may take place at both misdemeanor and felony levels. Most of the violations are of provisions of the Texas Health & Safety Code ("H&S") or of the Texas Water Code ("TWC"). See back for definitions of "solid waste," "litter," and "water."

Citation	Violation	Penalty
Non-commercial dumping (i.e., not for economic gain)		
H&S 365.012 (d)	Under 5 pounds or 5 gal. (if liquid)	Fine to $500
H&S 365.012 (e)	5 to 500 pounds; 5 gal. to 500 cubic feet	Fine to $2,000 Jail to 6 months
H&S 365.012 (f)	500 to 1,000 pounds; 100 to 200 cubic feet	Fine to $4,000 Jail to 1 year
H&S 365.012 (g)	Over 1,000 pounds / 200 cubic feet	Fine to $10,000 State Jail to 2 yrs
Commercial dumping (i.e., for economic gain)		
H&S 365.012 (d)	Under 5 pounds or 5 gal. (if liquid)	Fine to $500
H&S 365.012 (f)	5 to 200 pounds; 5 gal. to 200 cubic feet	Fine to $4,000 Jail to 1 year
H&S 365.012 (g)	Over 200 pounds / 200 cubic feet	Fine to $10,000 State Jail to 2 yrs
Both commercial and non-commercial dumping		
H&S 365.012 (g)	Any waste contained in a closed barrel or drum	Fine to $10,000 State Jail to 2 yrs
Using someone else's dumpster without permission carries the same penalties as illegally dumping the same amount of solid waste. It can also be prosecuted as theft of services under Texas Penal Code 31.04.		
Dumping into or adjacent to water in the state		
TWC 7.145	Intentional or knowing discharge, into or adjacent to water that causes or threatens to cause pollution without a permit to do so	Fine: $1,000 to $100,000 Prison to 5 years
TWC 7.147	Discharge into water that causes or threatens to cause pollution without a permit (no culpable mental state)	Fine: $1,000 to $50,000 Jail to 1 year
Illegal Outdoor Burning		
TWC 7.177	Burning in violation of Texas Outdoor Burning Regulations, 30 T.A.C. 111 (b)	Fine: $1,000 to $50,000 Jail to 6 months

Information provided courtesy of Keep Texas Beautiful and John Ockels, Ph.D., Texoma Council of Governments. Cards provided courtesy of the Texas Department of Transportation. Call 800-CLEAN-TX for additional information.



Illegal Dumping Penalties

– Continued From Front –

Citation	Violation	Penalty
Waste Oil Dumping		
TWC 7.176 (a)(1)	Dumping into sewer or any water	Fine to $1,000 to $50,000 Prison to 5 years
TWC 7.176 (a)(2)	Dumping onto ground or placing in trash	
TWC 7.176 (a)(4)	Dumping onto roads or land for dust suppression, weed abatement, ant control, etc.	
Lead-Acid Battery Dumping		
TWC 7.185	Knowing or intentional unauthorized disposal of lead-acid batteries (car, boat, motorcycle or any kind)	Fine to $4,000 Jail to 1 year
Tire Dumping		
Handle as regular illegal dumping (H&S 365 on front). Penalties based on weight or volume (car tires weigh around 17 pounds each – Class B Misdem.)		

Definition of "Solid Waste" for H&S 365 Violations

"Solid waste" means garbage, rubbish, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations and from community and institutional activities. The term:

(A) does not include:

(i) solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows, or industrial discharges subject to regulation by permit issued under Chapter 26, Water Code; and,

(ii) soil, dirt, rock, sand, and other natural or man-made inert solid materials used to fill land if the object of the fill is to make the land suitable for the construction of surface improvements.

Definition of "Litter" for H&S 365 Violations

(A) decayable waste from a public or private establishment, residence, or restaurant, including animal and vegetable waste material from a market or storage facility handling or storing produce or other food products, or the handling, preparation, cooking, or consumption of food, but not including sewage, body wastes, or industrial by-products; or

(B) nondecayable solid waste, except ashes, that consists of:

(i) combustible waste material, including paper, rags, cartons, wood, excelsior, furniture, rubber, plastics, yard trimmings, leaves, or similar materials;

(ii) noncombustible waste material, including glass, crockery, tin or aluminum cans, metal furniture, and similar materials that do not burn at ordinary incinerator temperatures of 1800 degrees Fahrenheit or less; and

(iii) discarded or worn-out manufactured materials and machinery, including motor vehicles and parts of motor vehicles, tires, aircraft, farm implements, building or construction materials, appliances, and scrap metal.

Definition of "Water" for TWC Violations

"Water" or "water in the state" means groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, wetlands, marshes, inlets, canals, the Gulf of Mexico, inside the territorial limits of the state, and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or nonnavigable, and including the beds and banks of all watercourses and bodies of surface water, that are wholly or partially inside or bordering the state or inside the jurisdiction of the state.

FIGURE 6 Litter laws and penalties in Texas. (*Source:* Texas Department of Transportation).

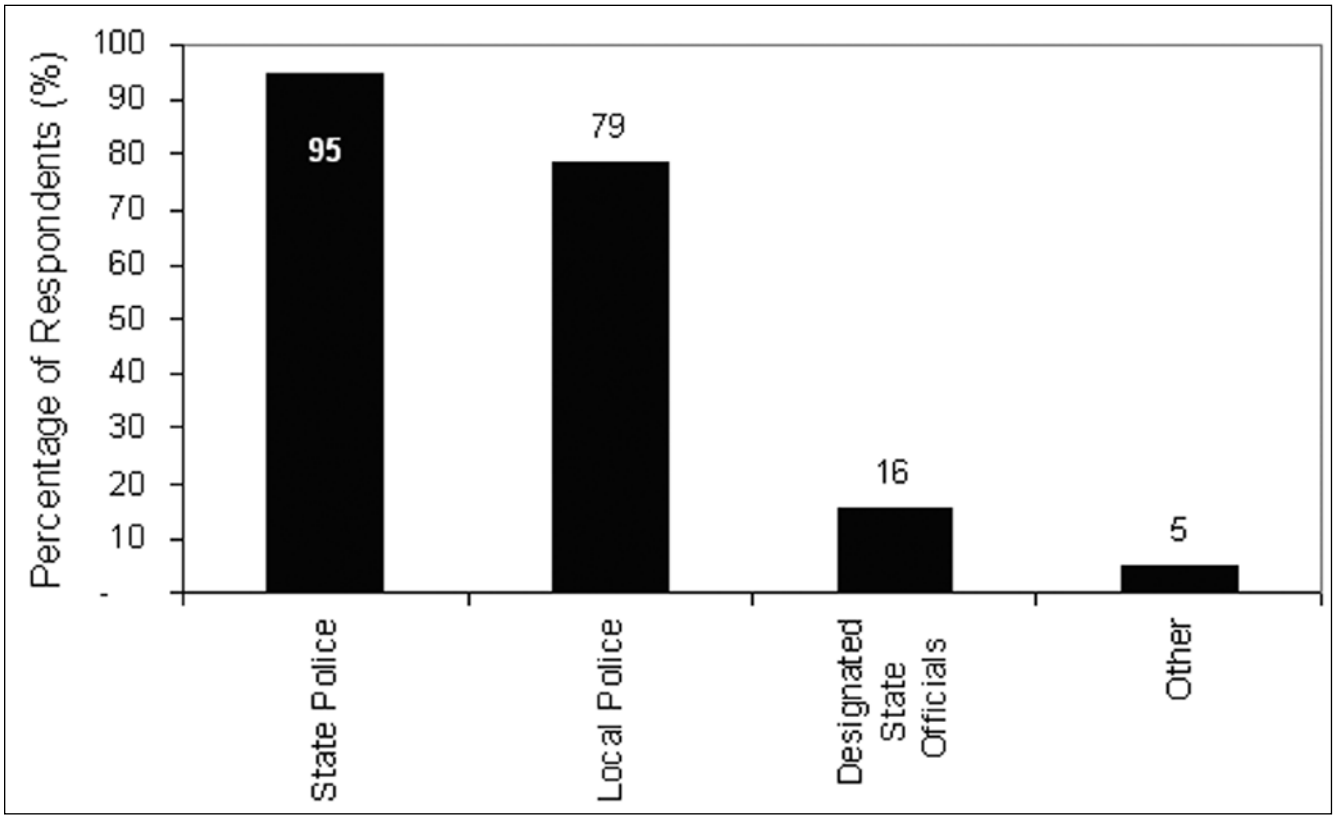


FIGURE 7 Enforcement of litter laws.

The listed enforcement personnel carry out campaigns that are specific to littering and illegal dumping in 35% of responding jurisdictions ($N = 37$), with frequent campaigns (twice a year or more frequently) being completed in only 14% of jurisdictions (see Table 10).

When an arrest is made for a littering offense, most jurisdictions (67%, $N = 18$) do not require a warrant.

TABLE 10
FREQUENCY OF LITTER ENFORCEMENT AND ILLEGAL DUMPING CAMPAIGNS

Frequency	No. of Responses	Percentage
Never	24	65
Less than once a year	4	11
Once a year	4	11
Twice a year	3	8
Three times a year	1	3
More than three times a year	1	3

Note: $N = 37$.

Respondents were asked whether they provided targeted enforcement of litter-prone vehicle types or litter "hot spots." Only 11 and 9 of the respondents ($N = 38$) provide regular enforcement of specific vehicles and hot spots, respectively. Three jurisdictions mentioned regular targeted enforcement other than those previously listed. However, these three responses actually were litter hot spots, but differed only in the entity that identified the hot spot (i.e., Department of Fisheries, maintenance personnel working with the police, and local agencies).

Litter hotlines that allow citizens to report roadside littering are being used or are being considered by 46% of respondents ($N = 35$). Incentive and reward programs to encourage citizens to report roadside littering are less common, with only 24% of respondents ($N = 34$) using or considering this technique.

Education and Encouragement

Well-placed trash receptacles encourage individuals to dispose of unwanted items properly. Seventy-six percent of respondents use trash receptacles for this purpose. Receptacles are normally placed at rest stops, truck parking areas, welcome centers, waiting areas, carpool lots, ferry areas, waysides and pullouts, vistas or scenic lookouts, and picnic areas. At least two jurisdictions indicated that they discontinued their trash receptacle program because of abuse (i.e., residents disposing of household garbage in the roadside receptacles).

In 9 of the 28 jurisdictions (32%) that provide roadside trash receptacles, an embellished or enhanced receptacle is used. The enhancements included bear-proof containers, exposed aggregate concrete to match the attractive setting, memorial images of DOT workers, and blue bins and the international recycling symbol for minirecycling centers. None of the embellishments were used to make the containers more noticeable.

Eleven of the 28 respondents providing trash receptacles have policies or laws that require the receptacles to be emptied on a regular basis. Respondents require containers to be emptied daily or more often, or require that there is "no overflowing trash" or that the containers be emptied "as often as necessary."

Promotional materials used to promote awareness and to educate people on litter abatement employed by respondents are shown in Figure 8. Posters and litterbags are the most prevalent promotion material, followed by billboards, bumper stickers, and education videos. Promotional items in the "other" category include key chains, pens, pencils, rulers, clips, notepads, magnets, and temporary tattoos. A sample of a pledge card message is shown in Figure 9.

Litter Pledge

I promise to do my part to make and keep Missouri litter free. I promise to keep my house, my yard, and my town clean and free of trash. I will throw my trash away and pick up trash when I see it. I will tell my family and friends about No More Trash!

FIGURE 9 Litter prevention pledge card (*Source:* No More Trash! http://mdc.mo.gov/nomoretrash).

Jurisdictions were asked about the mediums that are used to communicate the antilittering messages, and respondents provided the answers shown in Table 11. Roadside signs concerning litter fines are by far the most used medium with 84% of respondents using this medium. Public service announcements on radio and television are the next most prevalent mediums, followed by billboards and Internet advertising. One state mentioned the use of messaging on trash cans at the state fair, and dynamic message boards at the roadside as other mediums that are used for the antilittering effort.

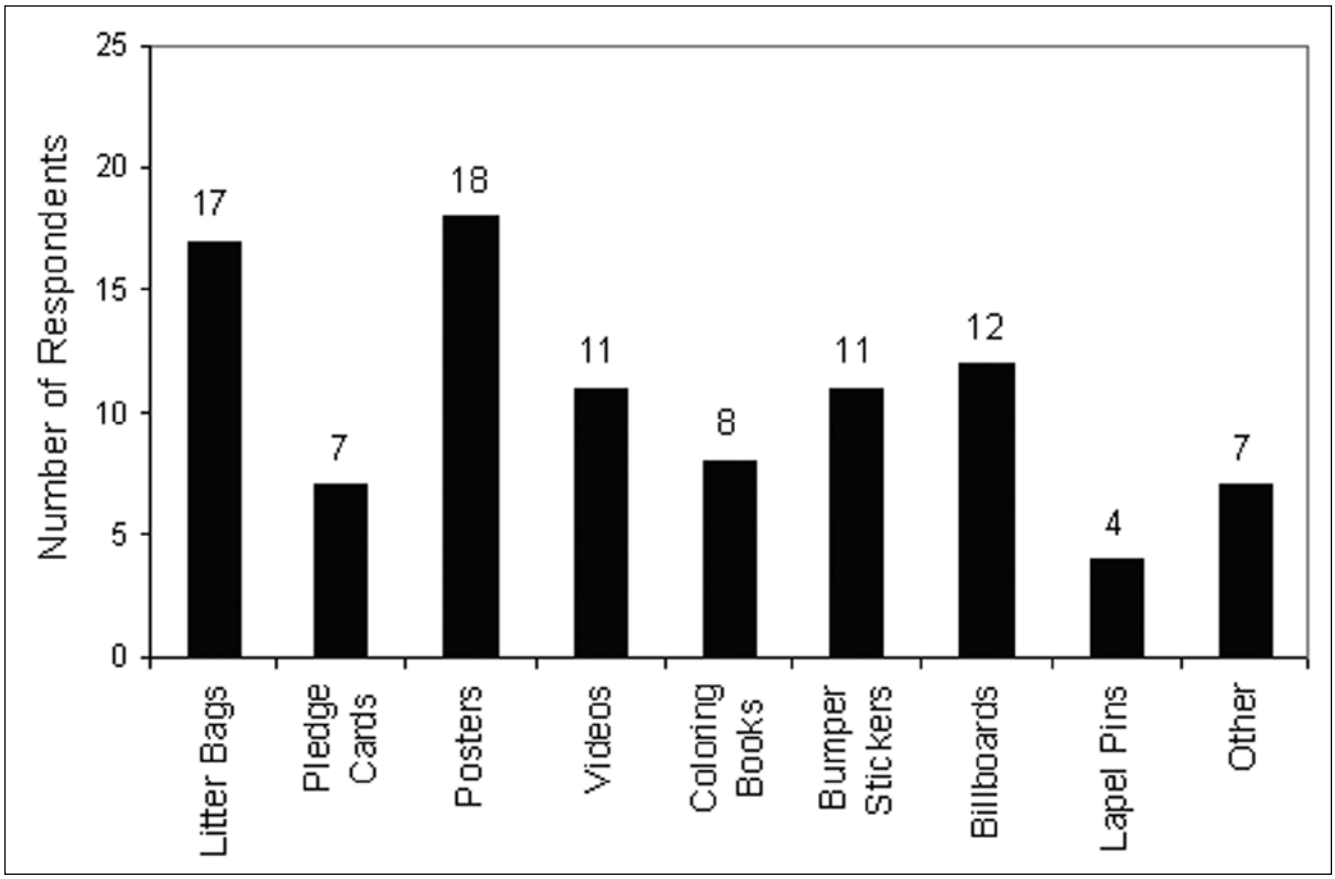


FIGURE 8 Antilitter promotional materials used by respondents.

TABLE 11
MEDIUMS USED TO COMMUNICATE LITTER PREVENTION MESSAGES

	Medium	Yes	No	Being Developed	Considering	Not Sure/ Do Not Know
a.	Public service announcements on television ($N = 38$)	14	23	0	0	1
b.	Public service announcements on radio ($N = 38$)	16	21	0	0	1
c.	Newspaper and/or magazine advertisements ($N = 35$)	8	26	0	0	1
d.	Advertisements on websites other than state/provincial DOT ($N = 37$)	10	25	0	0	2
e.	Billboards ($N = 36$)	11	24	0	1	0
f.	Roadside signs concerning littering fines ($N = 38$)	32	6	0	0	0
g.	Direct mail of flyers or brochures ($N = 36$)	6	27	1	0	2
h.	Including litter law information on state/provincial forms (i.e., motor vehicle registration or driver license renewals) ($N = 36$)	2	28	0	3	3
i.	Other mediums					

TABLE 12
GROUPS TO WHICH EDUCATION AND ENCOURAGEMENT CAMPAIGNS ARE DIRECTED

	Groups	Yes	No	Being Developed	Considering	Not Sure/ Do Not Know
a.	Elementary school children ($N = 34$)	14	18	0	1	1
b.	High school students ($N = 33$)	12	19	0	0	2
c.	College and/or university students ($N = 33$)	8	22	0	0	3
d.	Trucking associations ($N = 34$)	2	28	0	1	3
e.	Waste haulers ($N = 35$)	5	26	0	1	3
f.	Others	0	0	0	0	0

Responding DOTs apparently are producing education materials and encouragement messages and products for the general population. A small percentage of DOTs direct their antilittering efforts at students of any age, trucking associations, or waste haulers (see Table 12). Two jurisdictions mentioned that the general driving public was the specific target audience. Nonetheless, those efforts that are directed at students are directed mostly at elementary school children—ideally to educate impressionable school children early in life, who also will take the antilitter message home to their parents. Reflecting the trend to educate the general public rather than students, few DOT respondents offer antilitter scholarships or grants to individuals or groups (11%, $N = 36$).

Significant contributions to roadside litter reduction are recognized through an award or similar program by 23% of DOT respondents ($N = 35$), with another 3% of respondents currently developing such a program.

Cargo securement and covered load and spill prevention measures for private vehicles are employed, are being developed, or are under consideration by the majority of DOT respondents (see Figure 10).

In the responding jurisdictions, roadside litter collection is conducted by various groups (other than state DOT maintenance personnel or their contractors) with AAH volunteers, prison work crews, and individuals conducting community service being the most common (see Figure 11). Two of the respondents also indicated that they have Sponsor-A-Highway programs currently in development.

Conducting mowing operations before collecting roadside litter can take a single piece of litter and shred it into multiple pieces that become more visible and widespread. DOTs were asked if they routinely collect litter before mowing to minimize this occurrence, and 74% of respondents indicated that they did ($N = 35$).

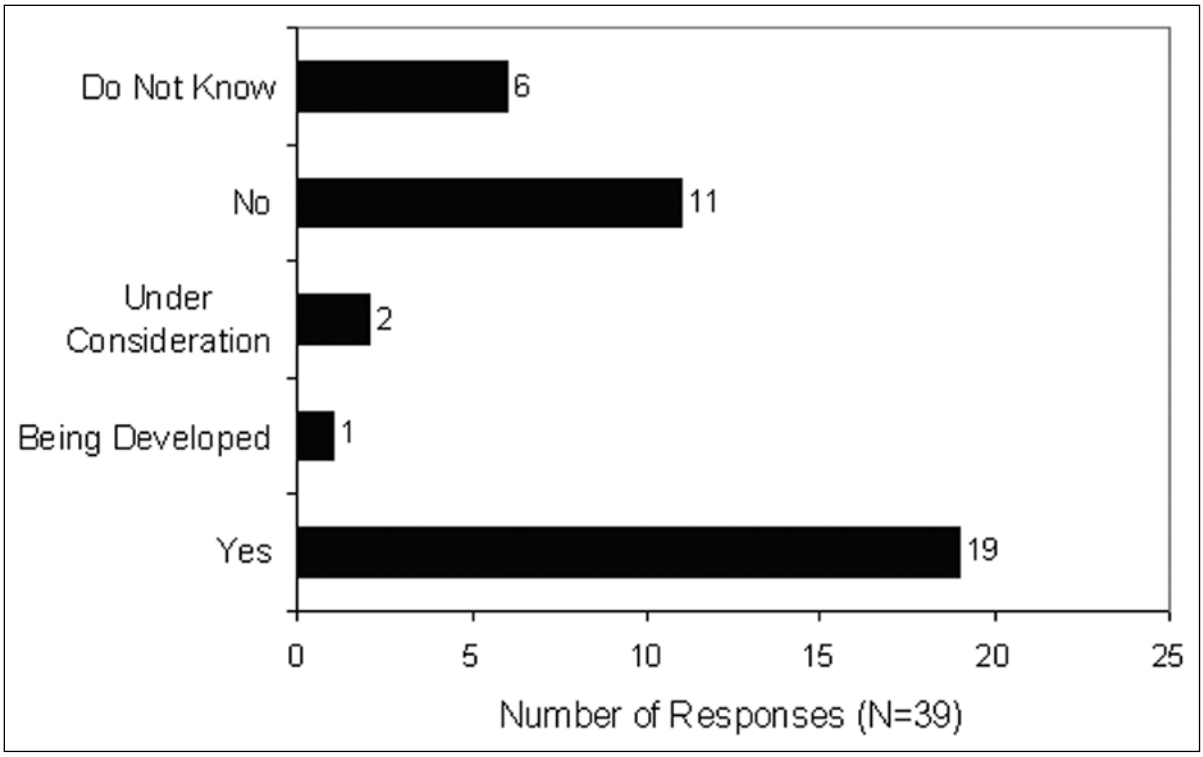


FIGURE 10 Does your DOT have “cover your load” measures?

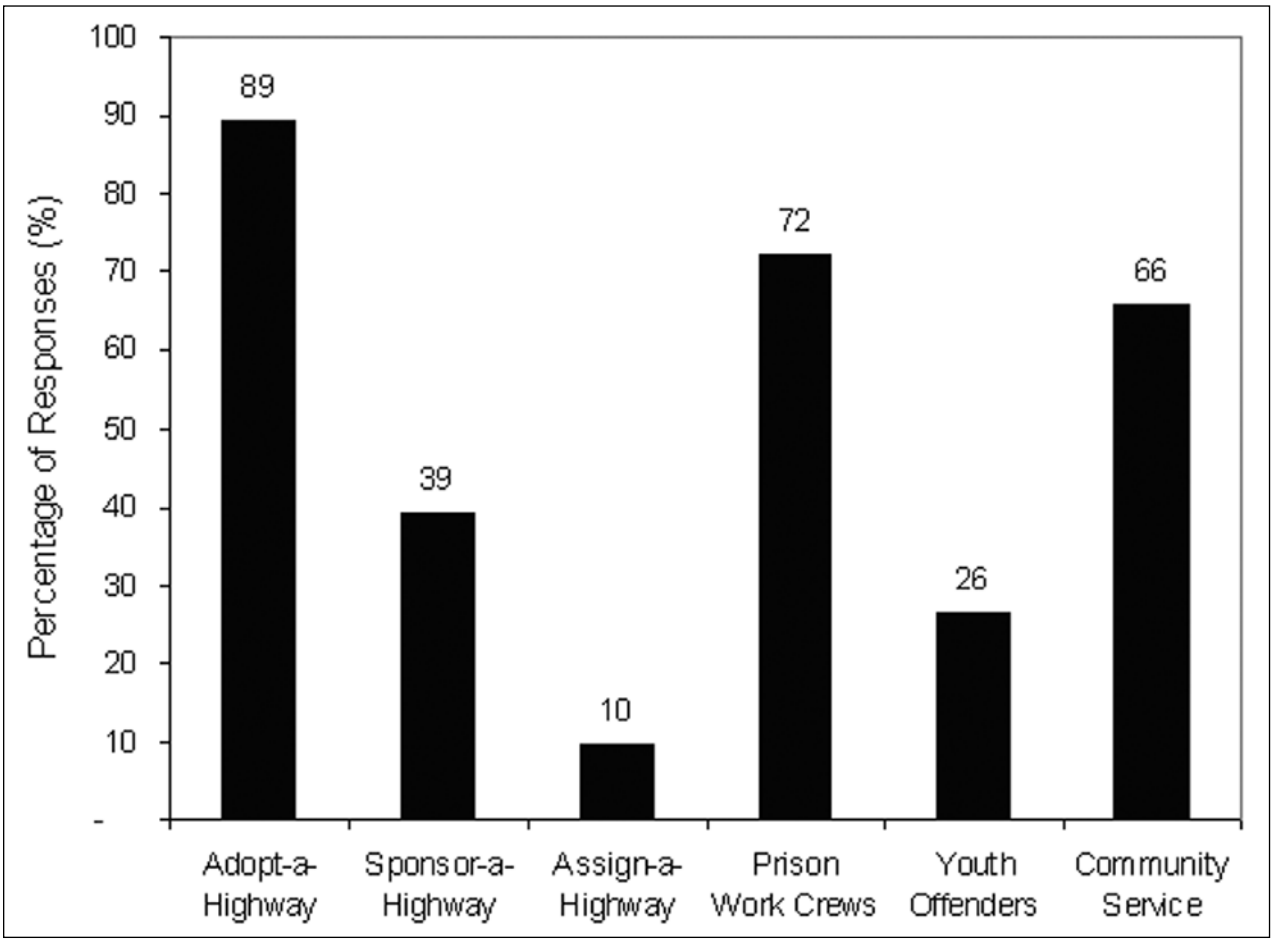


FIGURE 11 Roadside litter collection programs.

When queried about their most successful antilitter practices (based on either experience or research), respondents stated that AAH and Sponsor-A-Highway programs, litter collection (particularly before mowing), education, fines and enforcement, and public awareness and media campaigns are all successful practices. Some specific comments follow:

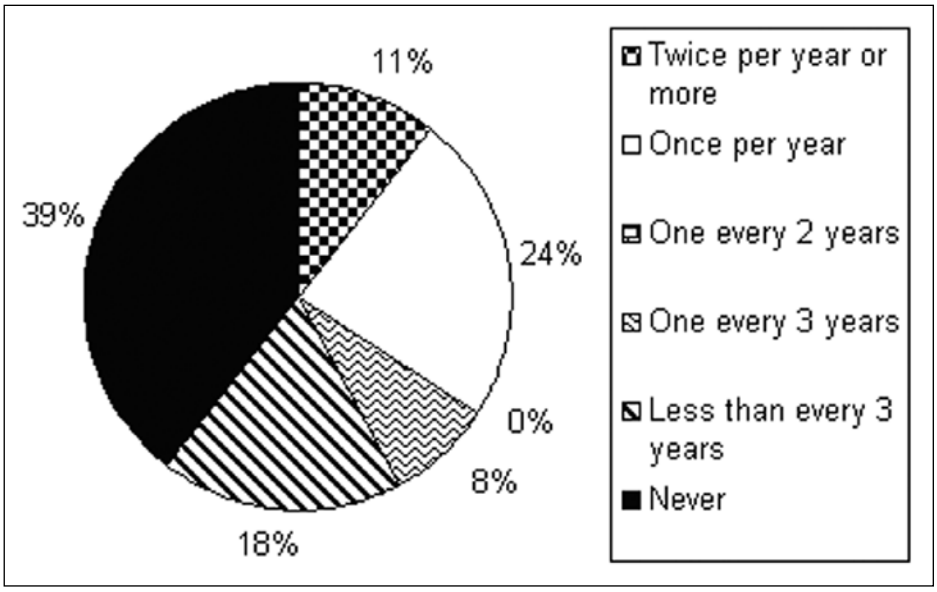
- Spring litter collection by paid staff and volunteers.
- Education, outreach, and enforcement all play a part. However, the most successful [practice] is just to go pick it up.
- Keep the highway clean and litter picked up and it will discourage littering.
- Don't Mess [With] Texas is an excellent model for successful antilitter practices that actually do change behaviors. Establishing an antilitter slogan as a statewide nonprofit organization goes a long way toward paving the way for corporate funding and the implementation of creative ideas without the political bickering and hesitancy that so often bogs down state and local governments.
- Seeing other people conduct litter-cleanups seems to have the best effect at reducing littering.
- School educational programs, publicized litter events (with T-shirts, caps, and meals typically provided).
- Our DMV campaign with free car litterbags was well received and therefore successful, as are articles that are placed in local newspapers or magazines.
- Having a strong, hard-hitting antilitter media campaign.

Similarly, when asked to give their opinion on the key elements of a successful roadside antilittering program, respondents mentioned education, advertising, public awareness, and enforcement (not necessarily in order of importance). Unordered examples of some specific detailed comments are as follows:

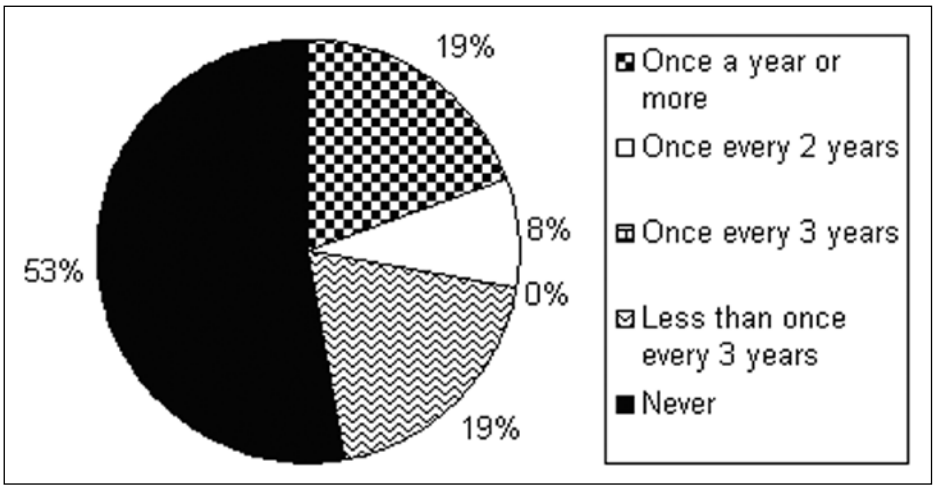
- Every element contributes. Just one element cannot make a significant impact by itself.
- Consistent and regular messages aimed at all age-groups, enforcement, educational advertisments using animals as victims of litter, and strategically placed disposal options.
- Community pride is necessary.
- Deposits on all bottles and cans.
- Partnering is key. Also, active implementation of littering fines. Washington State is a great example of partnering with the state patrol and the legislature and court system to raise fines; define "dangerous litter," which is subject to higher fines, and then actively implement those fines.
- Education, training, public involvement, public awareness, measuring success, and setting standards.
- Communication—using various type of mediums to educate and increase awareness of litter prevention. This includes all elements we have in place to reach all different ages and have available all different means of communication, meaning having information available visually (billboards, signs), electronically (e-mail blasts, viral marketing, website, online advertising on other websites where our target audience goes too), radio and television (spreading the litter prevention messaging while the public is driving or at home while they are relaxing), and outreach (events, music venues, games, theaters, etc.; having the one-on-one communication with the public, interacting with them with games and give-aways; going where they go to reach them).
- Motivated volunteers, community partners, creating awareness.
- Funding.
- Strong, repeated messages with real people and real images. The program must be well-budgeted and ongoing. There must be buy-in from law enforcement, as well as an effort by the courts to convict those who receive citations.
- A strong penalty system, recycling programs, and education.

Performance Measures

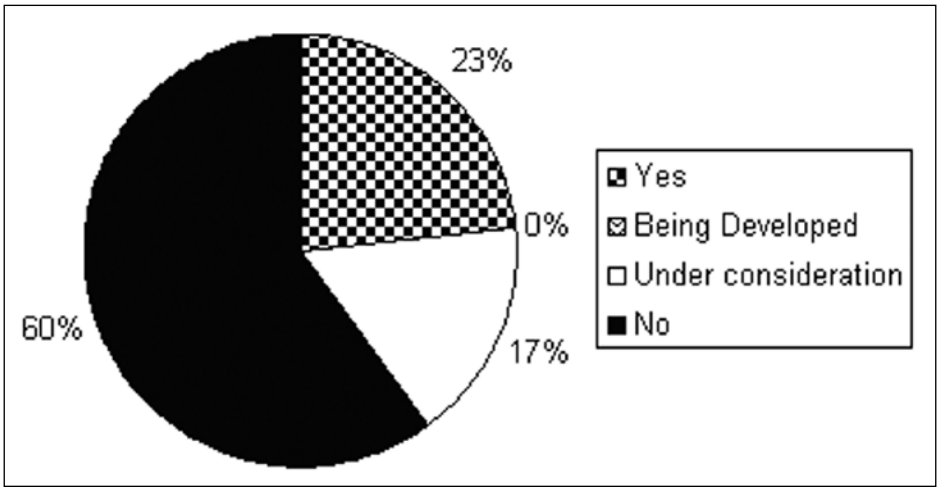
Three questions were posed to jurisdictions concerning measuring the performance of their roadside litter prevention programs. Specifically, respondents were asked whether they conducted roadside litter studies, behavioral, or attitude surveys concerning roadside litter, or whether they conducted any other research or studies to evaluate their litter prevention programs. The responses indicate that 39% of respondents ($N = 38$) have never conducted a roadside litter survey, 53% of respondents ($N = 36$) have never conducted an attitudes or behavioral study, and 60% have not and are not planning on conducting any other evaluation study for their roadside litter program (see Figure 12).



(*a*)



(*b*)



(*c*)

FIGURE 12 Measuring performance: (*a*) Frequency of roadside litter surveys; (*b*) Frequency of behavior and/or attitudes surveys; (*c*) Conducted other measures of effectiveness. *Note:* Totals may not add up to 100% due to rounding errors.

CHAPTER FOUR

CASE STUDIES

CASE STUDY CRITERIA AND DEVELOPMENT

The case studies presented in this section of the synthesis were selected from the state or provincial DOTs that responded to the nationwide survey administered in connection with this synthesis project. The Principal Investigator visited the websites for each of the respondents and based on this review, the literature review, and the survey results identified Florida, Georgia, Texas, and Washington State as DOTs with diverse yet exemplary roadside litter prevention programs.

CASE STUDY 1: FLORIDA

Background

In 1988, the Florida legislature enacted the Solid Waste Management Act that provided for a comprehensive solution to Florida's solid waste problems by involving state and local government entities and the private sector. Section 55 of the Solid Waste Act provided that there must be a coordinated effort to a cleaner environment through sustained programs of litter prevention. As part of a 1993 rewrite of the 1988 Solid Waste Management Act, the legislature established a goal of reducing litter by 50% from January 1, 1994, through January 1, 1997.

The legislature directed Keep Florida Beautiful, Inc. (KFB) to assist with the implementation of the Florida Solid Waste Management Act. To help reduce litter and marine debris, the legislature established KFB as a working public-private partnership and designated KFB as the organization to coordinate Florida's efforts to reduce litter and marine debris. KFB, the state affiliate of Keep America Beautiful, Inc., works with affiliate organizations at the local level to encourage individuals, organizations, and businesses to prevent littering and to clean up their communities.

KFB is directed by the legislature to coordinate Florida's litter prevention programs, including coordination of Florida's statewide media education campaign and grassroots community-based efforts. The organization serves as the umbrella for volunteer-based community programs that primarily are carried out through Florida's local KAB systems. KFB serves as a statewide conduit for private and public sector funding concerning litter and related solid waste management issues. KFB offers organizational infrastructure for local grassroots community-based volunteer programs. KFB also acts as the conduit and manages the Department of Environmental Protection appropriation for the Approved Community-Based Program Grant.

Creation of KFB occurred within the context of a vigorous debate over the passage of a bottle bill and a legislative directive to the Department of Environmental Protection to recommend items in the litter stream that could be subject to a litter tax. KFB was created and charged with accomplishing litter reduction without the passage of a bottle bill or a litter tax, but its creation implied a substantial long-term funding commitment by the private sector.

Curiously, in 1993 when the 50% litter reduction target was set, the legislature provided KFB with only 25% of the recommended funding for a statewide litter prevention program. KFB's request for funding, aimed at achieving the legislature's litter reduction goal, was $2 million for a mass media campaign, $1 million for grants to affiliates, $500,000 for KFB, and $500,000 to purchase trash cans. The legislature provided no funding to KFB for the litter prevention program in 1995, 1996, and 1997. Although many leading business, civic, government, and environmental organizations had agreed to participate in the program, KFB recognized that, in the absence of adequate funding for the statewide campaign, progress toward the legislature's litter reduction goal was not likely.

Target Audiences

The Florida litter prevention program did not appear to target any specific groups or entities. Instead, the local KFB affiliates were expected to develop programs that were appropriate for their specific situation.

Strategies

Florida's litter program involves a concentrated effort to reduce litter, marine debris, and illegal dumping. For 2001, the program's focus includes grassroots public education programs and public-private partnerships coordinated by Florida's local KAB affiliates, state agencies, businesses,

associations, civic organizations, and local government. These grassroots programs are working to build individual responsibility within local communities that work to reduce habitual and thoughtless littering and illegal dumping.

To build the community-based grassroots effort, grants are provided to counties by the Department of Environmental Protection. KFB assists in the review of these grants, which contain programs identified in the KFB Operating Plan. Counties are encouraged by the legislature to form public-private partnerships at the community level.

One of the major efforts of KFB throughout the 1990s was to build up the number of local KAB affiliates (such as Keep Tallahassee–Leon Beautiful, Keep North Miami Beautiful, and so on). During the first 2 implementing years, approximately 10 community litter programs were established. Today, more than 40 community programs implement their litter prevention education programs under the KFB umbrella. Each local community program is certified by the national KAB program.

KFB and the local systems are the nucleus for the state's implementation of its litter prevention and recycling education programs at the community level. For example, programs include the statewide annual Great Florida Cleanup, neighborhood cleanups, administration of local adopt-a-shore programs, and implementation of comprehensive environmental education programs in local school systems, to name a few.

In particular, KFB is working with Florida's Front Porch Communities initiative (which helps communities revitalize distressed neighborhoods) with grants, technical support, and other assistance by conducting cleanups, supporting litter prevention activities, and expanding the participation of local private businesses in Front Porch programs.

KFB uses mass media campaigns to create awareness about litter prevention.

The Solid Waste Management Act provides that the DOT must place signs discouraging litter at all off-ramps on the Interstate highway system. The Florida DOT has determined that litter law signs may be installed on the Interstate where excessive littering occurs (Florida Department of Transportation 2004). The official road signs are shown in Figure 13. In 2005, Florida raised the minimum fine for littering from $50 to $100.

Florida has been a pioneer in attempting to identify the tourist and economic impacts of litter (although not limiting the research to roadside litter). In the 1997 Florida Litter Study, the state conducted a survey of local businesses to determine the economic impacts of litter. Data were collected through 200 perception surveys completed by in-person interviews of 20 businesses in 10 major Florida cities. The businesses surveyed were from seven categories (food and drink, manufacturing, entertainment, retail, service, residential, and businesses with drive-up windows). The average amount spent per business to clean up litter on an annual basis was estimated to be $2,434.73. The most frequently littered items were cigarette wrappers, cigarette butts, drink containers, fast food wrappers, and auto parts. Most businesses reported that people put litter into their dumpsters, onto their property, or in their parking lots. In the instance of placing litter in private dumpsters, the placement of any unwanted material on private property without owner consent is considered illegal dumping under Florida law. While this action does not bring about all of the impacts of littering on the ground, the business owner incurs the cost of disposal, which in the case of hazardous materials or garbage that is not accepted at the landfill, can be significant. Finally, 98% of the businesses surveyed thought that the presence of litter lowers property values and has a negative effect on business.

FIGURE 13 Florida litter prevention road sign. (*Source:* Florida Department of Transportation website 2009).

Evaluations

The state of Florida adopted a 50% litter reduction goal, and the goal was not achieved. Unfortunately, the KFB plan recognizes that although adequate revenues existed in the Solid Waste Management Trust Fund, only partial funding was provided for the Statewide Anti-Litter Media Campaign for 1996–1997, and no funding was allocated in 1995–1996. Some funding was restored from 1997–2000, but it was eliminated once again in 2001.

The cost-benefit ratio average for Florida's KAB systems is approximately $1:$7.09, which means that for every dollar invested by local and state government, the local private sector cash, donations, and volunteer hours provide a match of $7.09.

The 2001 Florida roadside litter study determined that visible litter on the state's roadsides had dropped by more than 30% since 1997. For the period from 1995 to 2000 there was a net 15% decline. Although the goal required by the statute was not met, the data suggest that the litter programs were effective. In 2001, the state was faced with the decision of abandoning the current model/system or adopting an alternative model (e.g., Georgia, Pennsylvania, or Texas). In the end, given the substantial reductions in Florida roadside litter under the present system, and success in developing 40 local chapters of KAB, it was determined that the present system would be continued.

In 2002, it was recommended that the current litter goal be modified to establish litter reduction rates on a per capita basis, and that the visible litter survey be conducted every 3 years rather than annually (3-year increments are adequate to detect trends).

CASE STUDY 2: GEORGIA

The state of Georgia launched the "Litter. It Costs You" campaign in August 2006. An integrated and comprehensive approach to litter, the campaign encompasses education, eradication, and enforcement and leverages the resources of state agencies, city and county governments, and volunteer organizations to engage the public and effect change.

Background

The state created the Litter Abatement and Prevention Team to create a long-term, sustainable strategy for reducing litter through increasing public awareness, personal responsibility, and community involvement. The challenge before the team was to develop recommendations for more effective, coordinated, and innovative litter cleanup programs. The team clearly wanted to come up with ways to alter public opinion to prevent littering.

The Litter Abatement and Prevention Team is administratively attached to the Department of Community Affairs (DCA). It is made up of representatives from the following state agencies, associations, and organizations:

- Association County Commissioners of Georgia
- Department of Community Affairs
- Department of Economic Development
- Department of Natural Resources
- Department of Public Safety
- Department of Transportation
- Georgia Association of Code Enforcement Officers
- Georgia Beverage Association
- Georgia Chamber of Commerce
- Georgia Chapter of the National Solid Waste Management Association
- Georgia Municipal Association
- Georgia Police Chief Association
- Georgia Pulp and Paper Association
- Georgia Sheriffs Association
- Georgia State Patrol
- Georgia Tire Retailers Association
- Governor's Office of Highway Safety
- Hands On Georgia
- Keep Georgia Beautiful Executive Directors Association
- Metropolitan North Georgia Water Planning District
- Prosecuting Attorney's Council of Georgia

In 2006 the Georgia General Assembly passed the Comprehensive Litter Prevention and Abatement Act. The Act improves the ability of law enforcement to punish litter offenders, clarifies complicated statutes related to litter, and stresses personal responsibility as an overarching principle. The litter violations and penalties in Georgia are shown in Figure 14.

Initial steps in the Georgia campaign included conducting both a visible litter survey and attitudes research. Both of these efforts are intended to help Georgia with program development by identifying the types and locations of litter and by targeting audiences for litter education. This research will provide benchmark data that can be used in future years to evaluate the performance of the litter prevention campaign.

Target Audiences

A specific target audience is not mentioned in the Georgia material.

Strategies

The Georgia program has a well-developed set of strategies that reflects the multidisciplinary approach to litter prevention. The unapologetic litter prevention slogan is coupled with hard-hitting facts about the impacts of litter and includes various tools and materials that may be used by groups and individuals to educate others about litter prevention.

Georgia's youths are a primary target for litter prevention education, and the state has developed a litter prevention mascot: "Buster the Brown Thrasher." The mascot is prominent in all school-age promotional and educational material, including trivia, online games, and free downloads from the "Litter. It Costs You" website.

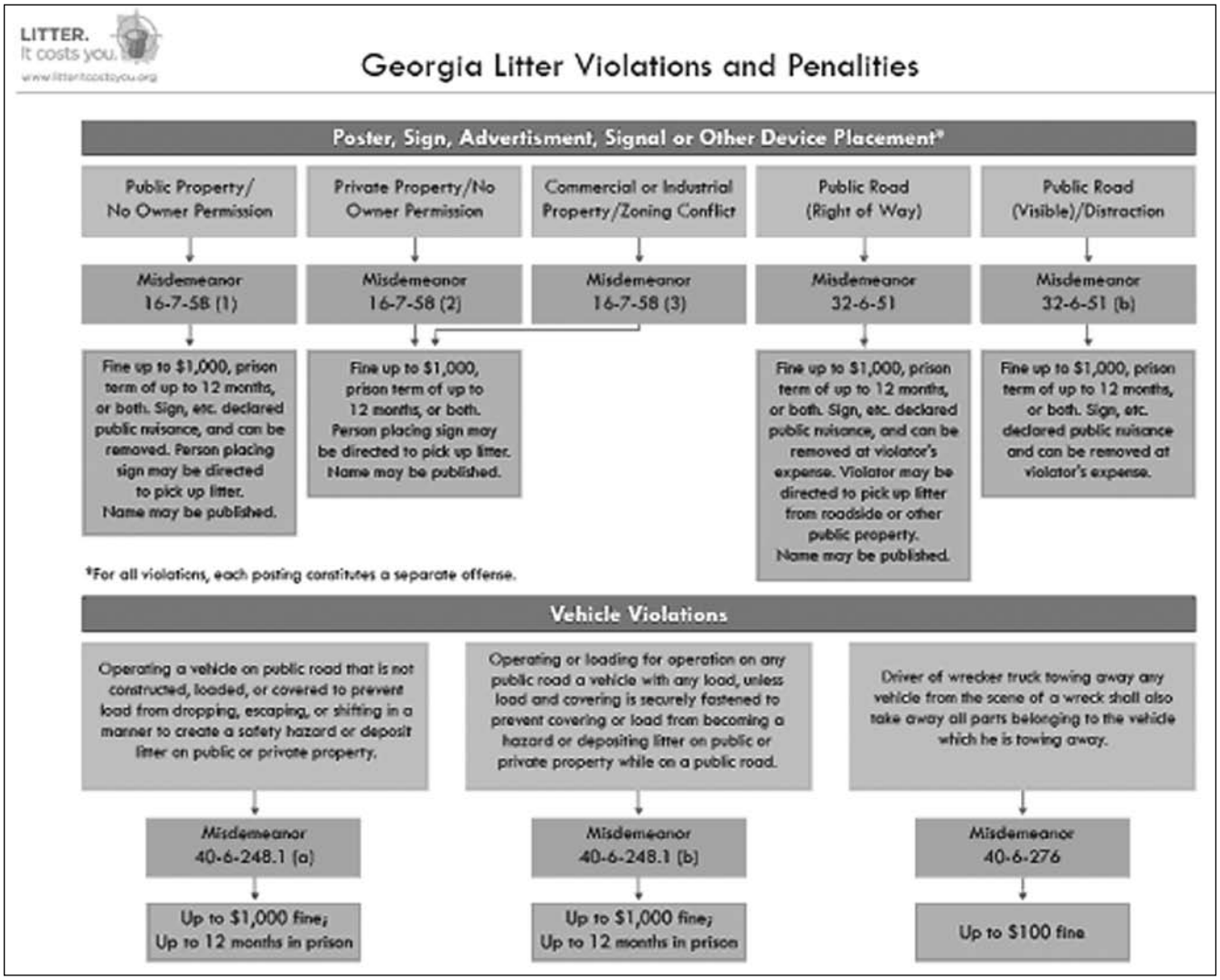


FIGURE 14 Violations and penalties for littering in Georgia (*Source:* http://www.litteritcostsyou.org).

Evaluation

The Georgia litter prevention program is in its infancy and evaluations have not yet been performed.

CASE STUDY 3: TEXAS

Background

Texas roadside litter prevention is spearheaded by the Texas DOT through the statewide "Don't Mess With Texas" (DMWT) advertising campaign. The highly successful campaign was created by a Texas-based advertising agency and launched in 1986 as a television advertisement featuring Stevie Ray Vaughan. The DMWT program has garnered national attention, including being inducted into the Madison Avenue Advertising Walk of Fame in 2006.

The DMWT program was introduced as a public education campaign, and the DMWT phrase is prominently shown on road signs on major highways, as well as in television, radio, and print advertisements. It is a complement to the AAH program (roadside litter collection). Interestingly, the AAH program was a Texas creation that has been adopted internationally.

Contributing to the immediate success of the DMWT program is a star-studded campaign trail that continues to this day. Texans such as Los Lonely Boys, The Fabulous Thunderbirds, Willie Nelson, and LeAnn Rimes publicly state they won't litter, and in doing so, serve as role models for others.

Funding for the DMWT program is assisted by the sale of official DMWT products, such as baseball hats and T-shirts.

FIGURE 15 Don't Mess With Texas advertisement (*Source:* http://www.dontmesswithtexas.org/view-ads-outdoor.php).

The DMWT litter prevention program has a hard-hitting message, and a look and feel that appeals to a younger audience. The messages are presented using eye-catching advertisements (see Figure 15) and memorable phrases, such as "Your first car was ugly, but Texas doesn't have to be," and "It's take out. Not toss-out."

Target Audience

The DMWT program has used research to identify groups that are prone to littering so that targeted information and behavior-change campaigns can be developed. For example, the 1998 Litter Attitudes and Behaviors Study classified Texans into one of five categories:

1. Gross Litterers—People who have personally discarded significant litter in the past 3 months.

2. Micro Litterers—People who have personally discarded cigarette butts, food, candy wrappers, and other minor litter in the past 3 months.

3. Reformed Litterers—People who have personally discarded major or minor litter in the past 36 months.

4. Tolerant Litterers—People who have not personally discarded litter, but have been with people who have, and did not condemn the behavior.

5. Non-Litterers—People who never litter.

The Gross Litterer commits the most serious offense and is identified as a primary target for litter prevention education. Although gender is not a major predictor of littering behavior, the findings indicate that young males are more likely to be Gross Litterers (20% are Gross Litterers and 27% are Micro Litterers). Interestingly, young females are equally as likely as young males to be Micro Litterers. To that end, the 1998 survey data suggest that the top five predictors of littering behavior are being young, smoking, eating fast food at least twice a week, driving more than 50 miles a day, and going out to bars or other nighttime entertainment at least once a week. In a follow-up survey in 2002, DMWT conducted a Hispanic Attitudes and Behaviors Study to better understand and develop litter prevention programs for this segment of the population that tends to be litter-prone.

Strategies

The core of the DMWT program is an advertising campaign that uses roadside billboards, television, radio, and print mediums. The advertisements have been tailored to appeal to the target audiences identified through research and that use famous Texans as spokespersons (e.g., Lance Armstrong and Willie Nelson). DMWT has developed Spanish-language DMWT advertising to target the Hispanic audience.

A scholarship program for graduating high-school seniors complements the promotional and advertising components of the DMWT program.

The DMWT "Rock the Bag" outreach tour is a strategy used to motivate Texans to use a litterbag in their vehicles. In 2008, the tour will make 28 stops in 16 different cities. At the DMWT display area, visitors can play litter trivia games, watch famous DMWT television advertisements, receive free limited-edition litterbags, and win prizes. A giant inflatable "Rock the Bag" mascot prominently marks the DMWT area at special events.

In 2007, the DOT released the "Litter Force Team" as a strategy to teach elementary-age children about roadside litter. The Litter Force Team is a group of four superheroes created to excite and inspire younger children to become litter-savvy. The Litter Force's mission is to use their special powers to protect Texas roadsides from a gang of trash villains. The

villains represent the most common types of litter found on Texas highways as recorded by Texas DOT 2005 Visible Litter Study. Online games offer different education objectives.

Evaluation

The campaign is credited with reducing litter on Texas highways 52% between 1995 and 2001. A subsequent evaluation in 2005, demonstrates a further 33% drop in litter. However, this same research indicates one in two Texans still litters. Whatever the results of the DMWT program on visible litter and behaviors, it is clear that the broadcasted advertising campaign is being received—in 2005, 71% of Texans knew what "Don't Mess With Texas" meant, compared with 62% in 2001.

The DMWT program boasts other benefits in addition to the reduction in roadside litter, including renewed pride in the state by its citizens, free public service airtime valued at $8.9 million per year, and taxpayer savings on litter pickup costs in 2000 totaling $8.4 million.

CASE STUDY 4: WASHINGTON STATE

Washington State has developed a leading litter prevention program with the slogan "Litter and It Will Hurt!" The program is directed at littering on roadways and is spearheaded by the Department of Ecology with cooperation from the DOT and others. The campaign provides a hard-hitting message that littering is unacceptable and harmful, and is supported by impressive penalties that indicate littering will not be tolerated.

Background

In 1997, Washington State formed a Litter Task Force (1997) to examine the effectiveness of litter control in Washington and to make recommendations to significantly improve litter prevention and collection for the future. The 17-member task force was composed of representatives from litter-taxpaying industries and agencies that receive tax funds or are responsible for some part of the litter control and recycling effort.

The Litter Task Force determined that there should be a commitment to a standard of zero litter throughout the state of Washington, and it pledged to work cooperatively toward that goal. Recommendations that were made to support the zero litter initiative are as follows:

1. Ensure that the **Department of Ecology became responsible and accountable** for administering state agency allocations of litter tax funds, working cooperatively with other agencies (Corrections, Natural Resources, Parks, and Transportation) to develop programs and monitor progress and results.
2. Establish a **central function within the Department of Ecology to coordinate, integrate, and strengthen** litter prevention and pickup efforts statewide. This would include **regular information-sharing sessions with other involved agencies, local government grantees, and other interested stakeholders** on methods for and progress toward the zero-litter goal.
3. Set an **enhanced baseline for the Ecology Youth Corps** pickup program to maintain progress toward zero litter.
4. Establish a **local government funding program** for litter control activities by cities and counties.
5. In addition to Recommendation 4, create an **additional competitive source of capital and operating funds** for local or state agencies. Equipment purchases (e.g., trucks and tools) are to receive priority from this fund.
6. Continue to **support waste reduction and recycling efforts** as an effective tool for preventing litter and reaching the zero litter goal.
7. Establish a **"rainy day account"** as a **contingency** for litter tax fund expenditures from currently unappropriated funds.
8. Conduct a **statewide litter survey** targeted at litter composition, sources, demographics, and geographic trends; maintain an information base to guide prevention and pickup efforts.
9. Conduct a **statewide litter prevention campaign in partnership with local governments and taxpaying businesses** to raise awareness of litter issues and encourage prevention.
10. Increase emphasis on the **existing legal system** for littering and illegal dumping to **strengthen enforcement** and include a **strong enforcement message** in the statewide litter prevention campaign.
11. Encourage the legislature to ensure that the Department of Revenue works toward **100% compliance in litter tax collection**, including consideration of **minimum** and **maximum** levels of tax liability.
12. Make a statutory change to **allow corporate logos on AAH signs** to enhance the DOT's ability to attract corporate sponsors for highway cleanup.

In preparation for developing and releasing a statewide antilitter campaign, the Department of Ecology conducted a statewide litter survey that included field research and litter

sampling, focus groups with admitted and potential litterers, and a telephone survey of the general population regarding the litter problem. This study yielded invaluable information concerning the composition of litter, who is littering and who may litter, the magnitude of the litter problem, and other information necessary for developing a targeted marketing campaign.

Subsequent to the completion of the litter survey, the Department of Ecology presented the results of the study to various stakeholder groups and discussed appropriate prevention strategies. Development of antilitter slogans and messages to be delivered through various print, radio, and television media was given the highest priority. In late January 2001, Washington State retained a media and public relations firm to help it plan and begin implementation of a litter prevention campaign that would achieve the following:

- Focus on litter on roadways (interstate, state, and county roads).
- Reach a broad audience to raise and maintain awareness over time.
- Reach targeted audiences engaged in intentional littering with more specific messages.
- Raise awareness of the enforcement system and costs for violating litter laws.
- Develop a system to measure the effectiveness of the campaign, including a link to overall tracking of litter survey pickup results.
- Involve state agencies, local governments, and (litter) taxpaying businesses in both planning and implementing the campaign.

The development process used a SWOT (strengths, weaknesses, opportunities, and threats) analysis to assess internal and external influences on a proposed campaign, and examined the successes from other state antilitter campaigns.

A creative campaign sparked the most reaction by clearly conveying the message of "stiff fines and punishments" associated with littering. Litterers were surprised by the magnitude of Washington litter fines and were concerned about the possibility of getting caught, particularly when they were made aware of a toll-free phone number for reporting littering. In light of this finding, the campaign slogan, "Litter and It Will Hurt," was selected as the overarching theme for all communications. This slogan resonated the best with the focus group and had the greatest longevity for a sustained public education campaign.

Campaign strategies have been designed to support three separate objectives: (1) a short-term objective to create awareness that significant fines are associated with littering and that a toll-free number can be used to report littering; (2) a long-term objective to make litterers believe their littering will be noticed and they could be caught; and (3) a long-term objective to influence litterers to change their behaviors, including to dispose of litter properly, cover and secure pickup truck loads, and clean out the back of trucks before driving on roadways.

With the help of a team of consultants, the Department of Ecology has developed a prevention strategy to reduce intentional littering on roadways. It is designed to reach a broad audience to raise and maintain awareness, and to reach targeted audiences contributing to a majority of the problem. It relies heavily on the partnership and involvement of state agencies, local governments, and (litter) taxpaying businesses. It plans for media sponsorships and includes a system to measure campaign outcomes. It reinstitutes a toll-free number to communicate the message that littering is not accepted in Washington State and that people care enough about litter to report it. It includes a short-term plan to raise awareness, but it requires a long-term commitment for behavior change.

Target Audiences

The two major audiences for the campaign are litterers and nonlitterers. Target audiences for littering include the two segments creating the majority of intentional litter on roadways: (1) motorists or passengers who toss cigarette butts, alcoholic beverage containers, food wrappers, and other beverage containers out the window; and (2) those who drive pickup trucks and are not properly covering or securing their loads, and not cleaning out the back of their pickup trucks before driving on roadways. Campaign messages also will be aimed at those in the general public who are nonlitterers traveling on Washington State roadways.

Strategies

To create awareness, activities will focus on major promotional channels used to spread the word that significant fines are associated with littering and that a toll-free number is available to report littering. Channels include roadway signage, advertising, publicity, special events, messaging on such materials as litterbags and posters, and reminders on state agency materials.

To alter beliefs that littering is not noticed and that people do not care, additional strategies will need to be implemented, including letters to litterers (based on hotline calls); law enforcement officials asking people during designated litter awareness periods if they have a litterbag and reminding citizens that it is against the law to litter; ongoing publicity featuring stories of people who get caught littering; and window decals, signs, and bumper stickers providing frequent reminders on the road.

Evaluation

A baseline and follow-up surveys of Washington State residents was conducted to measure (1) awareness of the stiff

fines associated with littering and (2) awareness of the toll-free number to report littering. In addition, a repetition of the 1999 litter survey in 2004 was used to measure changes in targeted categories of roadway litter.

Several additional important measures have been implemented, including quantifiable reporting on the following: reach and frequency data from media, sponsorship and in-kind contributions, press coverage, and participation levels of other state agencies and local governments. Several of these measures can be combined with other campaign data (i.e., number of signs and calls to the hotline) to create overall numbers of campaign "impressions" with target audiences.

The success of the Washington "Litter and It Will Hurt" campaign can be seen in a comparison of the 1999 and 2004 Roadside Litter Surveys. Highlights include the following:

- The estimated amount of litter on Washington State roadways decreased from 8,322 tons in 1999 to 6,315 tons in 2004.
- The estimated amount of litter on interchanges in Washington State decreased from 617 tons in 1999 to 443 tons in 2004.
- There is a statistical significant downward trend in overall litter generation on county roads and on interchanges.
- Individual components of litter showed statistically significant decreases between 1999 and 2004.
  - *All beverage containers combined* decreased significantly on both interchanges and all roadways combined.
  - *Glass beverage containers* decreased on both interchanges and all roadways combined.
  - Construction and demolition debris on interchanges decreased significantly and showed a strong downward trend on all road types.
  - The accumulation of *tires/auto rubber products* exhibited a strong downward trend on all road types, except interchanges.
  - The decrease in accumulation of *fast food containers* on interchanges was statistically significant, and showed a strong downward trend on all road types.
  - *All alcoholic beverage containers combined and glass alcoholic beverage containers* showed a statistically significant decrease on all road types combined.
  - *Metal alcoholic beverage containers* showed a strong downward trend on all road types in winter, but not for the year as a whole.
- The number of alcoholic beverage containers, as measured in Bottle Equivalents (litter was quantified by weight not item count, so bottle equivalents is the total weight collected divided by an estimated weight of a single bottle), showed a statistically significant decrease in winter on all road types combined, and a strong downward trend on all roads year-round.
- The number of all beverage containers combined, as measured in Bottle Equivalents, exhibited a strong downward trend on all road types combined in winter, but not for the year as a whole.

SUMMARY OF LESSONS LEARNED

These four case studies highlight several specific program features and components that can be transferred to other states and that are especially promising to advance litter abatement. Overall, successful litter prevention programs use a multidisciplinary approach and apply a multitude of strategies that are based on solid research concerning the who, what, where, and why of roadside littering. It does not appear to be important which department leads or is administratively responsible for the campaign as long as a lead agency champions the cause of litter prevention.

The typical organizational structure for the litter prevention program is for a state agency or department to assume a lead role and to collaborate with other state departments, volunteer associations, private businesses, and so on. However, the Florida model positions the state KAB affiliate as the lead agency, which in turn relies heavily on local affiliates to develop and promote programs that are applicable and appropriate to the local condition.

In three of the four case studies, the advertising components of the litter prevention campaigns are well developed and are comparable to traditional private sector commercial advertising. The slogans that have been adopted in these jurisdictions are unapologetic, straightforward messages concerning the unacceptability of roadside littering. These slogans are the common thread through all of the litter prevention material.

CHAPTER FIVE

CONCLUSIONS

Roadside litter and litter collection are significant issues for road authorities in the United States and Canada. In addition to the staggering cost of roadside litter collection, litter itself has been linked to motor vehicle collisions, injuries to maintenance workers and wildlife, roadside bush fires, and the release of toxic substances into the environment. Unproven impacts of roadside litter include increased prevalence of animal–vehicle collisions resulting from food discarded at the roadside and loss of tourism owing to a littered environment.

One of the primary tenets in litter prevention is that litter begets litter. Research has shown repeatedly that keeping an area litter-free will greatly reduce the incidence of new litter. This suggests that prevention and collection efforts need to be maintained or bolstered.

The literature review conducted for this synthesis indicates that the effectiveness of individual litter prevention strategies is largely undetermined. The literature is replete with research on the effects of messaging, trash can design and placement, and penalties on litter reduction. However, the majority of these studies are not measures of success as it applies to *roadside* litter. It is uncertain whether the results from a cafeteria or a campground are directly transferable to a highway roadside. Still, some of programs that have been studied have been found to be effective. Specifically, facilities with Adopt-a-Highway (AAH) programs have 13% to 31% less litter than similar non-AAH facilities, and litter collection before roadside mowing is an effective method of reducing visible litter. Other measures such as passing container deposit laws and establishing local Keep America Beautiful affiliates have documented successes but are perhaps outside of the mandate of the department of transportation (DOT).

FIGURE 16 Example of promotional material showing a littered environment (*Source:* Tennessee DOT).

FIGURE 17 Example of promotional material showing a clean roadside (*Source:* Utah DOT).

Research also purports that advertising and education material reflect a social norm that littering is not commonplace (i.e., visual messages would show a clean environment as opposed to a littered environment). Displaying a littered environment in advertisements and promotional material lessens the effect of the message, yet this is a common mistake made in roadside litter prevention efforts (see Figures 16 and 17 for littered and clean roadside environments, respectively).

The enforcement community has a promising opportunity with closed circuit television to monitor high litter roadsides and reduce litter. Privacy issues that arise would be similar to those already considered by speed cameras and red light cameras that have been deployed in some states.

The survey of state DOTs reveals that the cost of roadside litter collection and disposal is about $430 to $505 per centerline-mile. Furthermore, although a variety of education programs and encouragement strategies are available for roadside litter prevention, no distinct trends or patterns have emerged in the use of these strategies. The opposite is true for enforcement and litter collection for which the following trends are apparent:

- Penalties for roadside littering include monetary fines and community service for offenders.
- Enforcement is provided by police and state officials.
- In addition to state maintenance personnel (or contractors), AAH, prison work crews, and community service programs are widely used roadside litter collection strategies.

The surveyed agencies provided a variety of opinions on key elements for a successful antilitter program, including partnering with others, funding, and good communications. The case studies clearly support the need for a multistakeholder approach that uses solid research on the who, what, when, where, and why of roadside littering to select and implement multiple, targeted antilitter strategies. Furthermore, it seems less important who leads the multistakeholder effort as long as a lead agency champions the cause. Finally, the case studies strongly suggest that advertising campaigns (for education and encouragement) be comparable to traditional private sector commercial advertising. It is important that slogans and other advertising material be attention-grabbing and memorable, delivering a straightforward, unapologetic message concerning the unacceptability of roadside littering.

Roadside litter prevention efforts are hampered, however, because nationally the attempts to address the roadside litter problem are largely fragmented and underresearched. Existing efforts lack the synergy that might be created by a national coordination of roadside litter prevention efforts. The individual states are in various stages of program development, using different organizational structures and strategies. In some cases, the DOT is the lead agency; in others, the DOT is a supporting agency to other state departments. The successes of the various programs in reducing roadside litter have been documented only by some of the well-developed state programs.

This is not to say that roadside litter prevention efforts have not enjoyed some success. The findings from the Institute for Applied Research demonstrate a drop in overall litter rates over time, which may indicate that litter prevention programs in the United States are working. Furthermore, the shift from intentional to accidental litter is significant, and is a strong indicator that campaign efforts might now be better directed toward accidental litter prevention efforts. On that note, the litter prevention community has adopted the term "accidental litter" to describe litter that was not deliberately or knowingly deposited on a road. The term "accidental" may imply that this litter is random and not culpable. It may be an effective strategy to use the term "negligent litter" because willful acts, such as securing cargo, and being more diligent about the potential for litter may further reduce litter.

Overall, however, quality effectiveness evaluations concerning roadside litter are rare, and road authorities and government agencies may be hesitant to invest in litter programs that have not been proven effective. Only a few

roadside litter prevention programs produce evaluations. Moreover, currently documented evaluations typically use the frequency or density of visible roadside litter as the sole measure of success. Other performance measures could be considered, such as injuries to workers and volunteers, motor vehicle crashes, roadside fires, and so on. Standard data collection methods and templates will allow state and municipal road authorities to pool collected data and obtain a better understanding of causative factors in roadside litter and appropriate target audiences for education and enforcement programs.

One of the primary obstacles in developing effective litter prevention campaigns, and in attracting funding for these programs, is the lack of reliable data on the roadside litter problem. The state survey clearly demonstrates that state DOTs do not have a consistent metric for roadside litter collection (e.g., weight, volume, and so on). The costs and impacts of roadside litter need to be better documented and widely publicized. The cost of roadside litter and litter collection in the United States is staggering and likely would be surprising to the general public and decision makers.

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APPENDIX A
Survey Questionnaire

NCHRP Project 20-5
Synthesis Topic 39-07
Reducing Litter on the Roadsides

Despite the annual expenditure of millions of dollars on litter prevention and removal, roadside litter is omnipresent. Roadside litter impacts roadway aesthetics, economic development/tourism, public health and safety, and diverts Department of Transportation (DOT) funds from other activities such as maintenance, congestion mitigation, roadway reconstruction and rehabilitation, and safety improvements.

This National Cooperative Highway Research Program (NCHRP) synthesis project will document current practices employed by road authorities to reduce roadside litter. It is anticipated this synthesis will provide useful information for all agencies involved in roadside litter prevention and abatement.

The objective of this questionnaire is to gain a better understanding of the state-of-the-practice for designing, implementing, and measuring successful strategies in roadside litter reduction, to identify best practices, and to document gaps in existing knowledge and research needs. We would appreciate your participation in this survey.

This survey should be completed by the person(s) in your jurisdiction who is (are) most familiar with **roadside litter abatement**. All responses will be included in a final study report, including the names of the responding agencies, and the name of the primary respondent. However, personal contact information will not be shared with any one except the study team.

Please return the completed questionnaire by Friday, June 6, 2008, via e-mail, fax, or postal mail to:

Gerry Forbes
Intus Road Safety Engineering Inc.
2606 Bluffs Way
RR 2
Milton, ON L9T 2X6
CANADA

E-mail: gerry@intus.ca
Fax: 905-332-9777

If you have questions, please contact Gerry Forbes via e-mail (gerry@intus.ca) or telephone (905-332-9470).

Your participation is appreciated.

PART 1: CONTACT INFORMATION

1. Name: _____

2. Title: _____

3. Agency: _____

4. Address: _____

_____

5. Telephone: _____ 6. Fax: _____

7. E-mail: _____

PART 2: SCOPE OF THE PROBLEM

8. Please provide your jurisdiction's statistical data concerning roadside littering for the three years indicated below. (*Enter a number in each box or DK if you "don't know"*)

		Year		
		2007	2006	2005
a.	How many citations were issued for littering and illegal dumping on roadways and roadsides in your jurisdiction?			
b.	How many of the citations indicated above resulted in convictions?			
c.	How many centreline-miles of road are under your jurisdiction? Specify: □ miles □□ kilometers			
d.	How much litter was collected from the roadways and roadsides in your jurisdiction? Specify: □□ pounds □□ tons □ kilograms □□ tonnes □ cubic yards □ cubic metres			
e.	What is the DOT's annual expense for litter collection on roadways and roadsides in your jurisdiction?			
f.	What is the DOT's annual expense for disposal of litter that was collected on roadways and roadsides in your jurisdiction?			
g.	How many workers or volunteers have been injured while collecting roadside trash (e.g., struck by vehicle, cut by broken glass, etc.)?			

9. Who collects the litter from roadways and roadsides in your jurisdiction? (*Check <u>all</u> that apply*.)

□ DOT
□ State police
□ Private contractor
□ Other agencies under contract (i.e., Conservation Corps, Division of Forestry)
□ Volunteer groups
□ Prison work crews
□ Individuals conducting community service
□ Other → *Specify*: _____

10. Has your jurisdiction **completed** any studies to determine the impact of roadside litter on tourism, economic development, etc.? (*Check <u>one</u> only.*)

□ Yes → *Please attach studies to the completed survey.*
□ No, but at least one study is in progress
□ No, but we are planning to do a study
□ No, and there are no plans to conduct any studies at this time
□ Not sure/Do not know

PART 3: GENERAL

11. Which organizations and individuals (e.g., other government agencies/departments, trucking associations, beverage container manufacturers, volunteer groups, etc.) collaborate with the DOT on anti-littering efforts? (*Provide a list below.*)

_____
_____
_____
_____
_____
_____

12. Does the DOT have an anti-littering slogan? (*Check <u>one</u> only*.)

□ Yes → *Specify:* _____
□ No, but one is in development
□ No, but we are considering one
□ No, this is not something we are considering at this time
□ Not sure/Do not know

13. Does the DOT have an anti-littering website? (*Check <u>one</u> only*.)

□ Yes →*URL:* _____
□ No, but one is in development
□ No, but we are considering one
□ No, this is not something we are considering at this time
□ Not sure/Do not know

14. What are the sources of funding for your roadside anti-littering programs? (*Provide a list below.*)

_____
_____
_____
_____
_____
_____

15a. Are you a ***Keep America Beautiful*** affiliate, or a sponsor of ***Pitch-In Canada***? (*Check <u>one</u> only.*)

☐ Yes, Keep America Beautiful
☐ Yes, Pitch-In Canada
☐ No
☐ Not sure/Do not know

15b. Are you a member or affiliate of any other national anti-littering organization? (*Check <u>one</u> only.*)

☐ Yes → S*pecify:* _____
☐ No
☐ Not sure/Do not know

PART 4: LEGISLATION

16. What is your jurisdiction's definition of "***littering***"?

_____

_____

_____

17. In your jurisdiction, is littering a civil or criminal offence? (*Check <u>one</u> only.*)

☐ Civil offence only
☐ Criminal offence only
☐ Both civil and criminal offence
☐ Not sure/Do not know

18. In your jurisdiction, is littering a strict liability offence[1]? (*Check <u>one</u> only.*)

☐ Yes
☐ No, but we are in the process of adopting this legislation
☐ No, but we are considering this legislation
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

[1] Strict liability, also known as absolute liability, is liability without regard to fault or negligence. Strict liability as it applies to littering means that under the law the sole question is whether littering occurred – there is no relief from guilt/liability by arguing the littering was unintentional or the littering could not have been prevented by exercising reasonable care.

19. Does your jurisdiction have **presumptive evidentiary rules**, where the offender can be inferred from specific indications of ownership found in the litter (e.g., a piece of correspondence with a name and address), or where the owner of a vehicle is deemed to be the offender if litter is seen being discharged from an identified moving vehicle? (*Check <u>one</u> only.*)

□ Yes → *Specify:* _____
□ No, but we are in the process of adopting these rules
□ No, but these rules are under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

20a. In your jurisdiction, what are the penalties for roadside littering? (*Check <u>all</u> that apply.*)

□ Monetary fine
□ Imprisonment
□ Community service
□ Restitution or restitution costs
□ Other → *Specify*: _____
□ Demerit points on drivers license
□ Forfeiture of motor vehicle used in littering
□ Revoke or suspend vehicle registration until littering violation is resolved
□ Publish names of offenders

20b. Please provide details (e.g., amounts or times) for each applicable penalty cited in Question 20a.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

21. Does your jurisdiction have a special docket or environment court to facilitate the processing of littering citations? (*Check <u>one</u> only.*)

□ Yes
□ No, but one is being developed
□ No, but one is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

22. Does your jurisdiction have any of the following litter taxes? (*Check <u>one per row</u>.*)

		Yes	Being developed	Considering	No	Not sure/ do not know
a.	Beverage container deposit/refund legislation (i.e., "Bottle bill")					
b.	Tax on litter-generating industries *(Specify which ones):* _____					
c.	Tax on "hard-to-dispose-of" materials and products *(Specify which ones):* _____					
d.	Other *(Specify):* _____ _____					

23. Does your jurisdiction have any other legislation regarding littering and anti-littering that applies to roadside littering? (*Check <u>one</u> only*.)

☐ Yes → S*pecify:* _____
☐ No, but legislation is being developed
☐ No, but legislation is under consideration
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

PART 5: ENFORCEMENT

24. Who is responsible for enforcing the litter laws on your jurisdictions roads? (*Check <u>all</u> that apply*.)

☐ State/Provincial police
☐ Local police
☐ Designated State officials → *Specify:*_____
☐ Other →*Specify:*_____

25. On average, how often does your jurisdiction carry out enforcement campaigns that are specific to littering or illegal dumping at the roadside? (*Check <u>one</u> only*.)

☐ Never
☐ Less than once a year
☐ Once a year
☐ Twice a year
☐ Three times a year
☐ More than three times a year

26. Does your jurisdiction's litter law permit enforcement personnel to arrest offenders without a warrant? (*Check <u>one</u> only.)*

□ Yes → *Specify circumstances:* _____
□ No, but this is being developed
□ No, but this is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

27. Does your jurisdiction provide regular targeted enforcement for any of the following? **(***Check <u>all</u> that apply*.)

□ Specific vehicle types (e.g., waste haulers, pick-up trucks, etc.)
□ Specific litter "hot spots" (e.g., rest areas, routes to landfills, etc.)
□ Other →*Specify:*_____

28. Does your jurisdiction have a "litter hotline" where citizens can report roadside littering? (*Check <u>one</u> only*.)

□ Yes
□ No, but this is being developed
□ No, but this is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

29. Does your jurisdiction have a reward/incentive program to encourage citizens to report roadside littering? (*Check <u>one</u> only*.)

□ Yes → *Specify:* _____
□ No, but this is being developed
□ No, but this is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

PART 6: EDUCATION AND ENCOURAGEMENT ACTIVITIES

30. Does the DOT provide litter/trash receptacles on the roadsides? (*Check <u>one</u> only*.)

□ Yes →*Which locations* (*e.g., freeway off-ramps*)*?*_____
□ No, but this program is being developed
□ No, but this program is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

31. Does the DOT use a litter/trash receptacle that has been enhanced or embellished (e.g., painted a distinctive colour, or made in a distinctive shape)? (*Check <u>one</u> only*.)

☐ Yes → *Specify:* _____
☐ No, but one is being developed
☐ No, but one is under consideration
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

32. Is there a policy or law governing how often the receptacles are to be emptied? (*Check <u>one</u> only*.)

☐ Yes → *Specify:* _____
☐ No, but one is being developed
☐ No, but one is under consideration
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

33. Does the DOT use any of the following products to reduce roadside litter? (*Check <u>one per row</u>.*)

		Yes	No	Being developed	Considering	Not sure/ do not know
a.	State/Provincial litter bags					
b.	Pledge cards					
c.	Posters					
d.	Educational videos					
e.	Colouring books					
f.	Bumper stickers					
g.	Billboards					
h.	Lapel pins					
i.	Other promotional items → *Specify:* _____ _____					

34. Does the DOT employ any of the following mediums to advertise roadside litter laws and/or programs? (*Check <u>one per row</u>.*)

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Public service announcements on television					
b.	Public service announcements on radio					
c.	Newspaper and/or magazine advertisements					
d.	Advertisements on websites other than State/Provincial DOT					
e.	Billboards					
f.	Roadside signs concerning littering fines					
g.	Direct mail of flyers or brochures					
h.	Including litter law information on State/Provincial forms (i.e., motor vehicle registration or driver license renewals)					
i.	Other mediums → *Specify:* _____ _____					

35. To which groups does the DOT direct anti-littering educational and encouragement programs/ campaigns? *(Check <u>one per row</u>)*

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Elementary school children					
b.	High school students					
c.	College and/or University students					
d.	Trucking associations					
e.	Waste haulers					
f.	Others → *Specify:* _____ _____					

36. Does the DOT offer anti-littering scholarships or grants to individuals or groups? *(Check <u>one</u> only)*

□ Yes → *Please attach details to the completed survey*
□ No, but these are being developed
□ No, but these are under consideration
□ No, we are not considering these at this time
□ Not sure/Do not know

37. Does the DOT have an awards program or similar program to recognize significant contributions to roadside litter reduction? (*Check <u>one</u> only*.)

□ Yes → *Please attach details to the completed survey*
□ No, but this is being developed
□ No, but this is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

38. Does the DOT have "cover your load" or spill prevention measures in place for private vehicle owners? (*Check <u>one</u> only*.)

□ Yes → *Please attach details to the completed survey*
□ No, but these are being developed
□ No, but these are under consideration
□ No, we are considering these at this time
□ Not sure/Do not know

39. Do landfills and transfer stations have the ability to refuse loads that are not properly covered or secured? (*Check <u>one</u> only*.)

□ Yes
□ No, but this is being developed
□ No, but this is under consideration
□ No, this is not something we are considering at this time
□ Not sure/Do not know

40. Which of the following programs are employed in your jurisdiction for roadside litter collection? (*Check <u>one per row</u>*.)

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Adopt-a-Highway					
b.	Sponsor-a-Highway					
c.	Assign-a-Highway					
d.	Prison work crews					
e.	Youth offenders					
f.	Community service					
g.	Other → *Specify:* _____					

41. Does the DOT (or a contractor) routinely collect roadside litter prior to conducting roadside mowing? (*Check one only*.)

☐ Yes
☐ No, but this is being developed
☐ No, but this is under consideration
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

42. Based on your experience and/or local research, which anti-litter practices are most successful at reducing roadside litter?

43. In your opinion, what are the key elements of a successful roadside anti-littering program?

PART 7: PERFORMANCE MEASURES

44. How often does your jurisdiction conduct a roadside litter survey? (*Check <u>one</u> only*.)

☐ Twice per year or more frequently
☐ Once a year
☐ Once every two years
☐ Once every three years
☐ Less frequently than once every three years
☐ Never
☐ Not sure/do not know

45. How often does your jurisdiction conduct behaviours and/or attitudes surveys concerning roadside littering? (*Check <u>one</u> only*.)

☐ Once a year or more frequently
☐ Once every two years
☐ Once every three years
☐ Less frequently than once every three years
☐ Never
☐ Not sure/do not know

46. Other than through roadside litter surveys and/or attitudes surveys, has your jurisdiction ever measured the effectiveness of any of your anti-littering programs? (*Check one only*.)

☐ Yes → *Please attach details and results to the completed survey*
☐ No, but this is being developed
☐ No, but this is under consideration
☐ No, this is not something we are considering at this time
☐ Not sure/Do not know

END OF QUESTIONNAIRE

Please return the completed questionnaire by Friday, June 6, 2008 via e-mail, fax, or postal mail to:

Gerry Forbes
Intus Road Safety Engineering Inc.
RR 2
2606 Bluffs Way
Milton, ON L9T 2X6
CANADA

E-mail: gerry@intus.ca
Fax: 905-332-9777

Thank you for your participation!

APPENDIX B
Survey Responses

PART 1: CONTACT INFORMATION

Agencies that responded to the survey:

United States	Canada
Alaska Department of Transportation and Public Facilities	Manitoba Infrastructure and Transportation
Arkansas State Highway and Transportation	Newfoundland and Labrador Department of Transportation & Works
Arizona Department of Transportation	Ontario Ministry of Transportation
California Department of Transportation	Prince Edward Island Department of Transportation and Public Works
Connecticut Department of Transportation	Quebec Ministere des Transport
Delaware Department of Transportation	Saskatchewan Highways
Florida Department of Transportation	Yukon Territories Department of Highways and Public Works
Indiana Department of Transportation	
Iowa Department of Transportation	
Kansas Department of Transportation	
Kentucky Transportation Cabinet	
Louisiana Department of Transportation	
Maryland State Highway Administration	
Michigan Department of Transportation	
Minnesota Department of Transportation	
Mississippi Department of Transportation	
Missouri Department of Transportation	
Montana Department of Transportation	
Nevada Department of Transportation	
New Hampshire Department of Transportation	
New Mexico Department of Transportation	
Ohio Department of Transportation	
Oregon Department of Transportation	
Pennsylvania Department of Transportation	
Tennessee Department of Transportation	
Texas Department of Transportation	
Utah Department of Transportation	
Vermont Agency of Transportation	
Virginia Department of Transportation	
Washington State Department of Ecology	
Wisconsin Department of Transportation	
Wyoming Department of Transportation	

PART 2: SCOPE OF THE PROBLEM

8. Please provide your jurisdiction's statistical data concerning roadside littering for the three years indicated below.

		Year		
		2007	2006	2005
a.	How many citations were issued for littering and illegal dumping on roadways and roadsides in your jurisdiction? (*N* = 7 for 2007, *N* = 9 for 2006, *N* = 8 for 2005)	Range: 1 to 1,746 Avg: 418	Range: 0 to 9,655 Avg: 1,857	Range: 0 to 10,294 Avg: 2,067
b.	How many of the citations indicated above resulted in convictions? (*N* = 5 for 2007, *N* = 5 for 2006, *N* =5 for 2005)	Range: 1 to 1,519 Avg: 320	Range: 0 to 1,603 Avg: 338	Range: 0 to 1,097 Avg: 234
c.	How many centreline-miles of road are under your jurisdiction? (*N* = 34 for 2007, *N* = 29 for 2006, *N* = 29 for 2005)	Range: 1,366 to 148,216 Avg: 20,512	Range: 1,366 to 57,483 Avg: 14,012	Range: 1,366 to 57,867 Avg: 14,050
d.	How much litter was collected from the roadways and roadsides in your jurisdiction? (*N* = 18 for 2007, *N* = 16 for 2006, *N* = 16 for 2005)	Responses varied in reporting number of bags, pounds, cubic yards, etc.	Responses varied in reporting number of bags, pounds, cubic yards, etc.	Responses varied in reporting number of bags, pounds, cubic yards, etc.
e.	What is the DOT's annual expense for litter collection on roadways and roadsides in your jurisdiction? (*N* = 26 for 2007, *N* = 25 for 2006, *N* = 23 for 2005)	Range: $35,000 to $62,000,000 Avg: $6,048,841	Range: $30,000 to $55,000,000 Avg: $5,841,701	Range: $30,000 to $42,000,000 Avg: $5,143,111
f.	What is the DOT's annual expense for disposal of litter that was collected on roadways and roadsides in your jurisdiction? (*N* = 6 for 2007, *N* = 5 for 2006, *N* = 5 for 2005)	Range: $5,000 to $400,000 Avg: $159,695	Range: $5,000 to $400,000 Avg: $221,192	Range: $5,000 to $335,410 Avg: $215,922
g.	How many workers or volunteers have been injured while collecting roadside trash (e.g., struck by vehicle, cut by broken glass, etc.)? (*N* = 8 for 2007, *N* = 7 for 2006, *N* = 7 for 2005)	Range: 0 to 2	Range: 0 to 6	Range: 0 to 4

There is no standardized manner in which roadside litter is counted/measured. DOTs reported the quantity of litter collected by weight, volume, area, truckloads, and bags.

Numerous respondents indicated that the cost of litter disposal is not separated from the cost of litter collection, and was included in the cost reported in 8e. One of the respondents indicated that the expense for the disposal of litter is "waived". Another respondent provided a cost of $17/kilometre (*$27/mile*).

The majority of respondents did not report or did not know the number of injuries sustained by workers or volunteers collecting roadside trash.

9. Who collects the litter from roadways and roadsides in your jurisdiction?

	N = 39	
	Number of Responses	Percentage
DOT	35	90
State police	4	10
Private contractor	18	46
Other agencies under contract (i.e., Conservation Corps, Division of Forestry)	10	26
Volunteer groups	36	92
Prison work crews	25	64
Individuals conducting community service	23	59
Other	7	18

10. Has your jurisdiction **completed** any studies to determine the impact of roadside litter on tourism, economic development, etc.?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 35)
Yes	7	18	20
No, but at least one study is in progress	1	3	3
No, but we are planning to do a study	1	3	3
No, and there are no plans to conduct any studies at this time	26	67	74
Not sure/Do not know	4	10	—

PART 3: GENERAL

11. Which organizations and individuals (e.g., other government agencies/departments, trucking associations, beverage container manufacturers, volunteer groups, etc.) collaborate with the DOT on anti-littering efforts?

_____

_____

12. Does the DOT have an anti-littering slogan?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 37)
Yes	19	49	51
No, but one is in development	0	0	0
No, but we are considering one	3	8	8
No, this is not something we are considering at this time	16	41	43
Not sure/Do not know	2	5	—

AZ: Don't Trash AZ!
CA: Don't Trash California
DE: Keep Delaware Beautiful. Don't Be A Litterbug
KY: Adopt-A-Highway…Make It Yours
MN: Don't Waste Our State
Maryland: Keep Maryland Beautiful
MO: No More Trash!
MS: Pick It Up Mississippi, I'm Not Your Mama
NM: Toss No Mas and Don't Trash NM
OH: A Scenic View Depends on You
OR:
TN: Stop Litter: Tennessee's Had Enough
TX: Don't Mess With Texas
UT: Litter Hurts!
VA: Littering Is Illegal
VT: Green Up
WA: Litter And It Will Hurt
WY: Wyoming's View Is Up To You

PE: Keep The Island Clean! Put Litter In Its Place

13. Does the DOT have an anti-littering website?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 39)
Yes	23	59	59
No, but one is in development	0	0	0
No, but we are considering one	2	5	5
No, this is not something we are considering at this time	14	36	36
Not sure/Do not know	0	0	—

14. What are the sources of funding for your roadside anti-littering programs?

15a. Are you a ***Keep America Beautiful*** affiliate, or a sponsor of ***Pitch-In Canada***?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 34)
Yes, Keep America Beautiful	11	28	32
Yes, Pitch-In Canada	1	3	3
No	22	56	65
Not sure/Do not know	5	13	---

15b. Are you a member or affiliate of any other national anti-littering organization?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* =3 5)
Yes	14	36	40
No	21	54	60
Not sure/Do not know	4	10	—

The national anti-littering organization most often cited was International Adopt-A-Highway Several of the "Yes" responses were for participation in the "Keep <Insert State Name Here> Beautiful" affiliates of KAB.

PART 4: LEGISLATION

16. What is your jurisdiction's definition of "***littering***"?

17. In your jurisdiction, is littering a civil or criminal offence?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 31)
Civil offence only	13	33	42
Criminal offence only	6	15	19
Both civil and criminal offence	12	31	39
Not sure/Do not know	8	21	—

18. In your jurisdiction, is littering a strict liability offence?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 18)
Yes	12	31	67
No, but we are in the process of adopting this legislation	0	0	0
No, but we are considering this legislation	0	0	0
No, this is not something we are considering at this time	6	15	33
Not sure/Do not know	21	54	—

19. Does your jurisdiction have **presumptive evidentiary rules**, where the offender can be inferred from specific indications of ownership found in the litter (e.g., a piece of correspondence with a name and address), or where the owner of a vehicle is deemed to be the offender if litter is seen being discharged from an identified moving vehicle?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 22)
Yes	15	39	68
No, but we are in the process of adopting these rules	0	0	0
No, but these rules are under consideration	1	3	5
No, this is not something we are considering at this time	6	15	27
Not sure/Do not know	17	44	—

20a. In your jurisdiction, what are the penalties for roadside littering? (*Check all that apply*.)

	N = 37	
Penalty	No. of Responses	Percentage
Monetary fine	37	100
Imprisonment	10	27
Community service	17	46
Restitution or restitution costs	10	27
Demerit points on drivers license	5	14
Forfeiture of motor vehicle used in littering	1	3
Revoke or suspend vehicle registration until littering violation is resolved	4	11
Publish names of offenders	1	3
Other	1	3

20b. Please provide details (e.g., amounts or times) for each applicable penalty cited in Question 20a.

_____

_____

21. Does your jurisdiction have a special docket or environment court to facilitate the processing of littering citations? (*Check one only*.)

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 24)
Yes	6	15	25
No, but one is being developed	0	0	0
No, but one is under consideration	2	5	8
No, this is not something we are considering at this time	16	41	67
Not sure/Do not know	15	38	—

22. Does your jurisdiction have any of the following litter taxes? (*Check one per row*)

		Yes	Being developed	Considering	No	Not sure/ do not know
a.	Beverage container deposit/refund legislation (i.e., "Bottle bill") ($N = 37$)	12	0	1	21	3
b.	Tax on litter-generating industries ($N = 37$)	3	0	1	23	10
c.	Tax on "hard-to-dispose-of" materials and products ($N = 37$)	9	0	0	21	7
d.	Other ($N = 33$)	1				

Indiana indicates that there is an extra fee to dispose of tires.

23. Does your jurisdiction have any other legislation regarding littering and anti-littering that applies to roadside littering?

	$N = 39$	Percentage	
	Number of Responses	Of All ($N = 39$)	Excl. DK ($N = 25$)
Yes	12	31	48
No, but legislation is being developed	1	3	4
No, but legislation is under consideration	0	0	0
No, this is not something we are considering at this time	12	31	48
Not sure/Do not know	14	36	—

PART 5: ENFORCEMENT

24. Who is responsible for enforcing the litter laws on your jurisdictions roads?

	$N = 38$	
	Number of Responses	Percentage
State/Provincial police	36	95
Local police	30	79
Designated State officials	6	16
Other	2	5

The designated state officials that were specified in responses include Wardens from the Department of Natural Resources, Conservation Officers, and Environment and Fisheries Officers.
The Other enforcement included the Royal Canadian Mounted Police, the County Sheriff, and local law enforcement personnel.

25. On average, how often does your jurisdiction carry out enforcement campaigns that are specific to littering or illegal dumping at the roadside?

	$N = 37$	
	Number of Responses	Percentage
Never	24	65
Less than once a year	4	11
Once a year	4	11
Twice a year	3	8
Three times a year	1	3
More than three times a year	1	3

26. Does your jurisdiction's litter law permit enforcement personnel to arrest offenders without a warrant?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 18)
Yes	12	31	67
No, but this is being developed	0	0	0
No, but this is under consideration	0	0	0
No, this is not something we are considering at this time	6	15	33
Not sure/Do not know	21	54	—

27. Does your jurisdiction provide regular targeted enforcement for any of the following?

	N = 38	
	Number of Responses	Percentage
Specific vehicle types (e.g., waste haulers, pick-up trucks, etc.)	11	29
Specific litter "hot spots" (e.g., rest areas, routes to landfills, etc.)	9	24
Other	3	8

All three "Other" responses referred to litter "hot spots" and varied only in the group that identified the litter-prone areas (*i.e., Department of Fisheries, maintenance personnel working with the police, and local agencies*).

28. Does your jurisdiction have a "litter hotline" where citizens can report roadside littering?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 35)
Yes	16	41	46
No, but this is being developed	0	0	0
No, but this is under consideration	1	3	3
No, this is not something we are considering at this time	18	46	51
Not sure/Do not know	4	10	—

29. Does your jurisdiction have a reward/incentive program to encourage citizens to report roadside littering?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 34)
Yes	6	15	18
No, but this is being developed	0	0	0
No, but this is under consideration	2	5	6
No, this is not something we are considering at this time	26	67	76
Not sure/Do not know	5	13	—

PART 6: EDUCATION AND ENCOURAGEMENT ACTIVITIES

30. Does the DOT provide litter/trash receptacles on the roadsides?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 37)
Yes	28	72	76
No, but this program is being developed	0	0	0
No, but this program is under consideration	0	0	0
No, this is not something we are considering at this time	9	23	24
Not sure/Do not know	2	5	—

The receptacles are located at rest stops, freeway off-ramps, truck parking areas, welcome centers, waiting areas, car pool lots, ferry areas, waysides and pullouts, vista/scenic lookout areas, and picnic areas.

31. Does the DOT use a litter/trash receptacle that has been enhanced or embellished (e.g., painted a distinctive colour, or made in a distinctive shape)?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 37)
Yes	9	23	24
No, but one is being developed	1	3	3
No, but one is under consideration	0	0	0
No, this is not something we are considering at this time	27	69	73
Not sure/Do not know	2	5	—

The enhancements that were mentioned by respondents were:

- *Bear-proof containers*
- *Concrete with exposed aggregate surfaces to match the attractive setting and visitor buildings*
- *Contain the DOT Workers' memorial bear an image of the profiles featured in the memorial.*
- *Colored blue*
- *Blue bins with the international recycle symbol stickers in the mini-recycle centers located in waysides and rest areas*

32. Is there a policy or law governing how often the receptacles are to be emptied?

	N = 38	Percentage	
	Number of Responses	Of All (*N* = 38)	Excl. DK (*N* = 34)
Yes	11	29	32
No, but one is being developed	0	0	0
No, but one is under consideration	0	0	0
No, this is not something we are considering at this time	23	61	68
Not sure/Do not know	4	11	—

The schedule for emptying roadside trash receptacles included:

- *Emptied daily or at least daily.*
- *Maintenance requirements for "no overflowing trash receptacles" or "empty as often as necessary"*
- *Depending on the site from twice a week to four times a day.*

33. Does the DOT use any of the following products to reduce roadside litter?

		Yes	No	Being developed	Considering	Not sure/ do not know
a.	State/Provincial litter bags (*N* = 36)	17	16	0	2	1
b.	Pledge cards (*N* = 36)	7	28	0	1	0
c.	Posters (*N* = 37)	18	18	0	0	1
d.	Educational videos (*N* = 36)	11	22	0	1	2
e.	Coloring books (*N* = 36)	8	24	0	0	4
f.	Bumper stickers (*N* = 36)	11	22	0	0	3
g.	Billboards (*N* = 37)	12	24	0	1	0
h.	Lapel pins (*N* =36)	4	30	0	0	2
i.	Other promotional items	8				

Other promotional items mentioned were key chains, pens, pencils, rulers, clips, tattoos, notepads, and magnets.

34. Does the DOT employ any of the following mediums to advertise roadside litter laws and/or programs?

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Public service announcements on television (*N* = 38)	14	23	0	0	1
b.	Public service announcements on radio (*N* = 38)	16	21	0	0	1
c.	Newspaper and/or magazine advertisements (*N* = 35)	8	26	0	0	1
d.	Advertisements on websites other than State/Provincial DOT (*N* = 37)	10	25	0	0	2
e.	Billboards (*N* = 36)	11	24	0	1	0
f.	Roadside signs concerning littering fines (*N* = 38)	32	6	0	0	0
g.	Direct mail of flyers or brochures (*N* = 36)	6	27	1	0	2
h.	Including litter law information on State/Provincial forms (i.e., motor vehicle registration or driver license renewals) (*N* =36)	2	28	0	3	3
i.	Other mediums					

Other mediums state fair trash cans, dynamic message signs.

35. To which groups does the DOT direct anti-littering educational and encouragement programs/ campaigns?

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Elementary school children (*N* = 34)	14	18	0	1	1
b.	High school students (*N* = 33)	12	19	0	0	2
c.	College and/or University students (*N* = 33)	8	22	0	0	3
d.	Trucking associations (*N* = 34)	2	28	0	1	3
e.	Waste haulers (*N* = 35)	5	26	0	1	3
f.	Others					

36. Does the DOT offer anti-littering scholarships or grants to individuals or groups?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 36)
Yes	4	10	11
No, but these are being developed	0	0	0
No, but these are under consideration	0	0	0
No, we are not considering these at this time	32	82	89
Not sure/Do not know	3	8	—

37. Does the DOT have an awards program or similar program to recognize significant contributions to roadside litter reduction?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 35)
Yes	8	21	23
No, but this is being developed	1	3	3
No, but this is under consideration	0	0	0
No, this is not something we are considering at this time	26	67	74
Not sure/Do not know	4	10	—

38. Does the DOT have "cover your load" or spill prevention measures in place for private vehicle owners?

	N = 39	Percentage	
	Number of Responses	Of All (*N* =39)	Excl. DK (*N* = 33)
Yes	19	49	58
No, but these are being developed	1	3	3
No, but these are under consideration	2	5	6
No, we are considering these at this time	11	28	33
Not sure/Do not know	6	15	—

39. Do landfills and transfer stations have the ability to refuse loads that are not properly covered or secured?

	N = 39	Percentage	
	Number of Responses	Of All (*N* =39)	Excl. DK (*N* = 21)
Yes	16	41	76
No, but this is being developed	0	0	0
No, but this is under consideration	0	0	0
No, this is not something we are considering at this time	5	13	24
Not sure/Do not know	18	46	—

40. Which of the following programs are employed in your jurisdiction for roadside litter collection?

		Yes	No	Being developed	Considering	Not sure/ Do not know
a.	Adopt-a-Highway (*N* = 38)	34	4	0	0	0
b.	Sponsor-a-Highway (***N*** = 33)	13	18	2	0	0
c.	Assign-a-Highway (*N* = 31)	3	27	0	0	1
d.	Prison work crews (*N* = 36)	26	9	0	0	1
e.	Youth offenders (*N* = 34)	9	21	0	0	4
f.	Community service (*N* = 35)	23	10	0	0	2
g.	Other	3				

41. Does the DOT (or a contractor) routinely collect roadside litter prior to conducting roadside mowing?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 35)
Yes	26	67	74
No, but this is being developed	0	0	0
No, but this is under consideration	0	0	0
No, this is not something we are considering at this time	9	23	26
Not sure/Do not know	4	10	—

42. Based on your experience and/or local research, which anti-litter practices are most successful at reducing roadside litter?

_____

43. In your opinion, what are the key elements of a successful roadside anti-littering program?

_____

PART 7: PERFORMANCE MEASURES

44. How often does your jurisdiction conduct a roadside litter survey?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 38)
Twice per year or more frequently	4	10	11
Once a year	9	23	24
Once every two years	0	0	0
Once every three years	3	8	8
Less frequently than once every three years	6	15	16
Never	14	36	37
Not sure/do not know	1	3	—

45. How often does your jurisdiction conduct behaviors and/or attitudes surveys concerning roadside littering?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 36)
Once a year or more frequently	7	18	19
Once every two years	3	8	8
Once every three years	0	0	0
Less frequently than once every three years	8	21	22
Never	20	51	56
Not sure/do not know	3	8	—

46. Other than through roadside litter surveys and/or attitudes surveys, has your jurisdiction ever measured the effectiveness of any of your anti-littering programs?

	N = 39	Percentage	
	Number of Responses	Of All (*N* = 39)	Excl. DK (*N* = 30)
Yes	7	18	23
No, but this is being developed	0	0	0
No, but this is under consideration	5	13	17
No, this is not something we are considering at this time	18	46	60
Not sure/Do not know	9	23	—

Abbreviations used without definition in TRB Publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETY-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation