SUMMARY
2001 ROADSIDE LITTER CHARACTERIZATION STUDY

BACKGROUND

The goal of Keep Iowa Beautiful (KIB) is to reduce the volume of environmental littering in Iowa by 50% over the next three to five years by changing the behavior of residents and visitors to Iowa.

KIB also works to assist communities and organizations in cleanup and beautification projects, conduct studies that help to understand the reasons some people litter and show a lack of respect for land and property, provide anti-littering and beautification education programs, increase public awareness of the costs of littering and encourage regional groups and communities to become Keep Iowa Beautiful affiliates.

Keep Iowa Beautiful (KIB) developed a three-part statewide comprehensive program to collect "benchmark information" for litter assessment in 2001. Components of this program included an attitudinal survey prepared by the Iowa Department of Transportation, an analysis of the cost of litter control prepared by Franklin and Associates, and the 2001 Roadside Litter Characterization Study.

During the spring of 2001, **BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR**) was selected to perform the 2001 Roadside Litter Characterization Study which included development of an Internet based Geographic Information System (GIS) for KIB. The approved budget for this project included $80,000 for the roadside litter survey and $40,700 for the optional GIS/Internet site, for a total project cost of $120,700

A separate **Technical Summary** has been prepared that reviews the various technological innovations implemented to collect, store, retrieve and display the 2001 Roadside Litter Characteristic Study Data. The KIB Internet/GIS site is located at **www.internetgis.org/kib/default.asp** or via a link at **keepiowabeautiful.com**.

SUMMARY OF RESULTS

- 150 roadside sites were sampled. None of the roadside sites were part of the IDOT Adopt-A-Highway litter collection program. The median width of the sites was 22.4 feet and the median length 195.3 feet long.

- The study randomly selected sites based on population, urban versus rural classification, and daily traffic count. 116 of the sites were located in incorporated places and 35 were located on rural roadways. The selection process implemented controls to disperse sites throughout the State.

- Litter was collected if it was 1/2 inch square or larger, 22,585 pieces of litter were collected over 657,401 square feet of roadside survey area.

- The study identified namebrands within each category of litter. Staff calculated and counted litter pieces count, weight, and area (in square inches). The study identified beverage containers by material type and deposit designation.

- The top four categories by litter piece count included the following categories

  ➢ "Tobacco Related" (cigar and cigarette filters and butts and tobacco packaging) was 37% of the overall litter count (8,270 pieces). Cigar and Cigarette filters and butts represented over 95% of this category (7,639 pieces).

  ➢ "Other Plastic" (plastic pieces that were not bags and did not fit into any other category) was 15.3% of the overall litter by count.

  ➢ "Other Paper" (paper that did not fit into any other category, e.g. napkins, fast food packaging, etc.) was 12.8% of the overall litter by count.

  ➢ "Packaging" (over 90% of which was represented by the sub category "Candy and Snack Packaging") was 11.6% of the overall litter count.

- The subcategory "Fast Food Wrappers/Bags" represented 0.55% of the overall litter count.

- The category "Beverage Container" was further analyzed by deposit and non-deposit subcategories.

  ➢ 468 pieces of deposit designated beverage container litter was collected along Iowa roadsides; representing 2% percent of all litter collected and 44% percent of all beverage container related litter collected (1,040 total pieces). 572 pieces of non-deposit designated beverage container litter was collected along Iowa roadsides representing 2.5% of all litter collected and 54% of all beverage container related litter.

  ➢ 220 pieces of beer beverage container related litter was collected, of which 66% were identified as an Iowa deposit container. 206 pieces of soda beverage

container related litter items were collected, of which 50% were identified as an Iowa deposit container.

➢ 50% of the deposit litter was aluminum cans 44% percent were glass, and 5% was plastic.

- The leading namebrands for a selection of subcategories included Marlboro (Cigarette Filters and Butts), Snickers (Candy and Snack Packaging), Mountain Dew (Soda Containers), Bud Light (Beer Containers), McDonald's (Paper Cups), and Burger King (Plastic Cups).

- 44.8% of the litter collected during the study was located along high volume roadside segments, although the high volume sites represented 12% of the samples. Additionally, the high volume sites generated more litter per square foot of surveyed area than medium volume, low volume, and rural sites combined. Examples of non-interstate high volume roadsides include SE 14th Street in Des Moines and Spruce Hills Drive, west of Elmore Ave., in Davenport.

- Iowa has 284 miles of high volume roadsides (counting both sides of the road) and the average area of the high volume roadsides sampled was 5,733 square feet. If the average roadside is 31.5 feet wide, and the average number of litter pieces per site is 723, then an extrapolation could be calculated for the State showing almost 21,000 pieces of litter per mile on high volume roadsides.

ROADSIDE LITTER CHARACTERIZATION STUDY DESIGN

Litter characterization reports reviewed by **BARKER LEMAR** staff for the 2001 Roadside Litter Characterization Study included several studies completed in Nebraska, Florida and Oklahoma as well as reports and technical summaries from the Institute of Applied Research. For a complete listing of reports and technical summaries reviewed for this roadside litter report, please refer to Attachment A.

After reviewing previous litter studies, staff provided a summary of possible litter collection criteria to the KIB stakeholders including the pros and cons of each criterion.

1. Litter Collection Parameters

During the planning meetings, KIB stakeholders expressed an interest in collecting cigarette litter data. Stakeholders and staff thought cigarette related litter was "under-measured' by previous studies due to the litter size criteria of these studies. A recommendation was made, and accepted, that **BARKER LEMAR** Field Crews collect litter if it was 1/2 square inch or larger. The 1/2 square inch criterion included most cigarette filters, filter material, and butts.

Litter would only be collected if it lied within the boundaries of the delineated roadside site.

2. Selecting Primary Stratification Systems for the Study

KIB stakeholders continually asked two important questions while determining site selection criteria, these were:

- How are the site selection criteria going to influence KIB's ability to change littering behavior through education and marketing efforts?

- How well will the selection process represent the entire state?

KIB stakeholders identified key parameters affecting site selection, they were:

- The entire State of Iowa must be represented equally;

- The selection of roadside sites must attempt to minimize bias, and;

- The sites should be selected randomly.

Additional considerations in site selection involved access to data at a state level, preferably access to state level data in an electronic format.

As the site selection discussion progressed, two distinct systems to weigh site selection materialized.

3. Urban and Rural Stratification Systems

First, the KIB stakeholders asked that the state to be divided into rural and urban areas. The Stakeholders then determined that urban areas should be further divided into categories based on population.

Staff defined urban areas for this study as a roadside within the geographic boundary of incorporated places. For this study, rural place was defined as any place 2 miles from the border of any incorporated place.

The State of Iowa has 77% of the population living in incorporated places (urban sites) and 23% of the population living in unincorporated (rural) areas. Therefore, potential urban sites should total 116, and rural sites selected from rural areas should total 35.

BARKER LEMAR used 2000 US Census Bureau data to stratify urban areas according to population. Staff divided the total population of the IDOT classification by the total population. The resulting percentage was used to assign a specific number of urban roadside sites to that classification size (see Table 1).

While staff ordered cities in descending order, they assigned a number from 1 to 955 to the cities. A random number generator chose numbers within the City Classification. For example, the eight largest cities (numbered 1-8) identified as having populations over 50,001 received 39 random numbers (34% of 116 urban sites) numbered from 1-8. Table 1 provides a summary of city classification size and the number of roadside sites.

TABLE 1

IDOT CITY CLASSIFICATION SIZE	NUMBER OF CITIES IN IDOT CLASSIFICATION	ROADSIDE SITES / CATEGORY (151 TOTAL)	% OF TOTAL URBAN POP.
50,001 plus	8	39	34%
25,001 - 50,000	9	15	13%
10,001 - 25,000	13	11	10%
5,001 - 10,000	39	15	13%
1 - 5,000	886	36	31%
RURAL	NA	35	NA

4.   IDOT Average Daily Vehicle Count

The KIB stakeholders developed another tier of classifying urban sites. This stratification system involved selecting roadside litter collection sites based on IDOT average daily vehicle counts (traffic volume).

Year 2000 IDOT traffic volume data was used to develop three traffic volume classifications. Road segments are the geographical boundary for IDOT road volume data. A road segment is an undetermined length of road from one intersection to another intersection. Staff weighed each traffic volume classification by adding the total miles within each classification and dividing it by the total - see Table 2.

BARKER LEMAR staff used "Natural Breaks" ArcView's default classification method to determine the three daily vehicle traffic count classifications.

TABLE 2 - Traffic Volume and the Number of Roadside Sites

CARS PER DAY	KIB CLASSIFICATION	% OF IOWA ROADWAYS	# OF ROADSIDE SITES (116 TOTAL)
1- 9,070	Low Volume	67%	78
9,071 - 31,200	Medium Volume	21%	24
31,201 +	High Volume	12%	14

5.   Identify Roadside Litter Categories and Subcategories

KIB stakeholders provided input regarding some key litter classification categories, and subcategories. Specifically KIB stakeholders requested that beverage containers be identified by material type and then by their designation as a deposit or no-deposit container. Staff developed other categories from research performed on other statewide litter characterization studies and the experience of the **BARKER LEMAR** staff. The litter categories and subcategories are located in Attachment B.

METHODOLOGY - 2002 ROADSIDE LITTER CHARACTERIZATION STUDY

BARKER LEMAR staff began collecting roadside litter data on Wednesday, September 19, 2001 and completed the last site on November 12, 2001. Snow was not present during any of the litter collection events.

Field workers used a measuring wheel to measure length and width of the sites. Field crews were instructed to make sites 200 feet long if possible. Site width was not pre-determined, rather staff determined width in the field based on the location of barriers and natural geographical boundaries. Sites were not to exceed 40 feet in width. One site was not sampled due to a road closure and construction activities.

- The study area sampled 5.6 linear miles of Iowa roadways. The average site length was 195.3 feet and the average site width was 22.4 feet. The study sampled 669,364 square feet.

- 22,585 pieces of litter were collected.

Litter classification included a name brand identification phase, deposit designation phase, area estimation phase, litter count phase, and litter weight phases for the represented subcategories within each of the 150 roadside sites.

After staff classified the litter, statistical analysis were performed using the classification characteristics mentioned above as well as county population, county median age, and traffic volume.

Field staff sorted litter into several pre-approved categories and subcategories with a special emphasis on beverage containers and the deposit designation of the containers. Staff recorded weight (in grams), area (in square inches), and number of pieces for each subcategory.

Field staff also collected data regarding the proximity of schools and parks, stoplights, and fast food and convenience stores to the roadside survey area.

The following pictures provide examples of the type of litter subcategories and examples of litter from roadside sites.

Cigar/Cigarette Packaging

Lottery Related

*An Example of Litter from a
Low Volume Site*

*An Example of Litter from a
High Volume Site*

RESULTS - 2002 ROADSIDE LITTER CHARACTERIZATION STUDY

1.   Leading Categories by Count

The top five categories from the greatest number of pieces to the fewest are provided in Table 3. Total count from all litter collected totaled 22,585.   A complete list of all categories and subcategories ordered from heaviest to lightest is located at the KIB GIS based Internet site - www.internetgis.org/kib/default.asp.

Table 3

CATEGORY	PERCENT OF TOTAL	COUNT
Tobacco	36.6%	8,270
Other Plastic	15.3%	3,462
Other Paper	12.8%	2,883
Packaging	11.6%	2,628
Cup Related	5.3%	1,203
Beverage Container	4.6%	1,040

2.   Leading Categories by Weight

The top five categories from heaviest to lightest are provided in Table 4. A complete list of all categories and subcategories ordered from heaviest to lightest is located at the KIB GIS based Internet site. Total grams from all litter collected totaled 91,599 (313.14 pounds). The total grams were converted to pounds by dividing by 454.

Table 4

CATEGORY	PERCENT OF TOTAL	WEIGHT (POUNDS)	WEIGHT (GRAMS)
Construction Debris	18.65%	58.4	26,510.39
Tires	17.06%	53.4	24,256.70
Other Metal	15.41%	48.3	21,908.17
Beverage Container	12.87%	40.3	18,296.05
Other Plastic	5.84%	18.3	8,299.41
Miscellaneous	5.74%	18.0	8,153.53

5.   Leading Categories by Area

The top five categories from greatest area to least area are provided in Table 5. A complete list of all categories and subcategories ordered from heaviest to lightest is located at the KIB GIS based Internet site. Total square inches from all the litter collected totaled 142,165 square inches (636.10 square feet). The total square inches were converted to square feet by dividing by 144.

Table 5

CATEGORY	PERCENT OF TOTAL	AREA (SQUARE FOOT)	AREA (SQUARE INCHES)
Other Plastic	41.00%	95.4	13,735.70
Other Paper	19.00%	86.6	12,477.20
Candy and Snack Packaging	6.50%	85.8	12,355.10
Bags	5.40%	52.6	7,579.00
Beverage Container	5.00%	48.2	6,938.50

6.   Deposit and Non Deposit

BARKER LEMAR instructed staff to designate a beverage container as "Deposit" only if staff observed deposit language on the container. **BARKER LEMAR** thought this system would be the most objective method for determining the deposit designation. If field staff could not identify any deposit language on the container, they were to classify the beverage container litter as "Non-deposit".

- 468 pieces of deposit designated beverage container litter was collected along Iowa roadsides; representing 2.1% percent of all litter collected (22,585 total pieces) and 44.4% percent of all beverage container related litter collected (1,055 total pieces).

- 572 pieces of non-deposit designated beverage container litter was collected along Iowa roadsides representing 2.5% of all litter collected and 54.2% of all beverage container related litter.

- 220 pieces of beer beverage container related litter was collected, of which 66% were identified as an Iowa deposit container.

- 206 pieces of soda beverage container related litter items were collected, of which 50% were identified as an Iowa deposit container.

- 50% percent of the deposit litter (468 total pieces) was aluminum cans (234 total pieces), 44% percent was glass (206 total pieces), and 5.1% was plastic (24 total pieces).

7.   Namebrands

The following tables identify the top Namebrands listed from those with the greatest number of pieces to the fewest.

A complete report of all Namebrands for categories and subcategories is located in Attachment C. Tables 6 - 12 provide summaries of Namebrand data by individual subcategories.

Table 6 displays the total number of selected namebrands for Cigar/Cigarette Filters and Butts and the percent of these namebrands compared to the 22,585 littered items collected during the study. 5,548 filters and butts could not be identified by a namebrand.

Table 6

NAMEBRAND	PERCENT OF TOTAL	COUNT
Marlboro	6.27%	1,436
GPC	0.50%	116
Winston	0.29%	68
Salem	0.24%	55
Basic	0.22%	50
Camel	0.21%	48
Parliament	0.20%	47
Merit	0.19%	44
Pall Mall	0.11%	25
Old Gold Lights	0.10%	24
Newport	0.10%	23
Doral	0.10%	22
Virginia Slims	0.07%	15

NOTE: 5,801 (25.1%) cigarette filters and butts were identified as having no namebrand.

Table 7 displays the total number of selected namebrands for Candy/Snack Packaging

Table 7

NAMEBRAND	PERCENT OF TOTAL	COUNT
Snickers	0.26%	59
Tootsie Rolls	0.16%	33
Brach's Star Brites	0.08%	18
Twix	0.08%	18
Lifesaver Crème Saver	0.07%	17
Reeses	0.08%	17
Starburst	0.07%	16
Life Savers	0.06%	15
Nestle	0.06%	14
Slim Jim	0.06%	14
Trident	0.06%	14
Winterfresh	0.06%	13
Jolly Rancher	0.05%	12

Table 8 displays the total number of selected namebrands for Beverage Containers

Table 8

NAMEBRAND - BEER	PERCENT OF TOTAL	COUNT
Bud Light	0.19%	43
Busch Light	0.17%	39
Budweiser	0.12%	27
Miller Light	0.06%	14
Busch	0.05%	11
Ice House	0.02%	5
Natural Light	0.02%	5
Coors Light	0.02%	4

Table 8 continued

Old Milwaukee	0.01%	3
Pabst Blue Ribbon Light	0.01%	3
NAMEBRAND - SODA	**PERCENT OF TOTAL**	**COUNT**
Mountain Dew	0.26%	59
Pepsi	0.18%	41
Coke, Coca-Cola Classic	0.13%	30
Sprite	0.03%	7
Sunkist	0.02%	5
Diet Coke	0.02%	4
Dr. Pepper	0.02%	4
A&W Cream Soda	0.01%	2
Diet Pepsi	0.01%	2
7-UP	0.00%	1
NAMEBRAND – JUICE, MILK, SPORTS, TEA, VEGETABLE/ HEALTH, WATER	**PERCENT OF TOTAL**	**COUNT**
Sunny Delight Juice	0.02%	4
Blue Bunny Milk	0.02%	4
Anderson Erickson Milk	0.01%	3
Nestle Quik	0.01%	3

Table 9 displays the total number of selected namebrands for Paper Cups

Table 9

NAMEBRAND	PERCENT OF TOTAL	COUNT
McDonalds	0.24%	55
Burger King	0.12%	28
Taco Johns	0.05%	12
Wendy's	0.03%	8
Subway	0.03%	7
Hardee's and KFC (Pepsi)	0.03%	6

Table 10 displays the total number of selected namebrands for Plastic Cups

Table 10

NAMEBRAND	PERCENT OF TOTAL	COUNT
Burger King	0.04%	9
McDonalds	0.02%	5
Steak and Shake	0.02%	4
Casey's	0.01%	3
Kum & Go	0.01%	3

Table 11 displays the total number of selected namebrands for Fast Food Wrappers and Bags

Table 11

NAMEBRAND	PERCENT OF TOTAL	COUNT
McDonalds	0.08%	18
Subway	0.07%	16
Burger King	0.05%	12
Hardees	0.03%	7
Taco Bell	0.03%	7

Table 12 displays the total number of selected namebrands for Bags - Plastic Retail

Table 12

NAMEBRAND	PERCENT OF TOTAL	COUNT
Wal Mart	0.04%	8
Messerschmitt Ice Service	0.01%	3
Cub Foods	0.00%	1
Super Value	0.00%	1
Kum and Go	0.00%	1
Note: several namebrands were recorded with only one piece, those listed with one are for reference only, Barker Lemar recommends readers to the KIB Internet GIS site, or Attachment C for complete name brand reports. (www.internetgis.org/kib/default.asp)		

INTRODUCTION TO STATISTICS

Statistical methods provide a summary of conclusions that can be drawn from an experiment but also provide a reliable prediction of information that can be gained from a proposed experiment.

For this report **BARKER LEMAR** analyzed several independent variables, comparing traffic volume, median county age, and county population, to the total number of litter pieces, litter weight, and litter area within the litter research subcategories.

The searches for statistically significant relationships may assist KIB answer the questions, "Do the statistical correlations provide a framework from which we can develop systems to change littering behavior through education and marketing efforts?"

SUMMARY OF STATISTICAL RESULTS

Cigar/Cigarette Filters and Butts, Candy and Snack Packaging, and Beer and Soda Containers show a similar trend, which is: as traffic volume increases the variability between population, age and traffic volume decreases. This means that traffic volume is a primary independent variable that affects litter. However 40% to 60% of the variability is still not accounted for, other demographic or geographic variables are likely influencing the variability and are not accounted for in these results. Other variables might be median income, median education, pedestrian traffic, speed of vehicles, etc.

Using the Multiple Regression Package designed for KIB and simultaneously comparing the effect of county population, county median age and traffic volume, an R^2 near 0.6 can be calculated by adjusting traffic to high volume, including all county ages, and using only the counties medium or high populations. An R^2 means 60% of the variability can be explained with the selected variables. For field-tests an R^2 above 0.6 is thought to be a strong correlation considering all the possible outside influences (variables) not taken into consideration

CONCLUSIONS DRAWN FROM 2001 ROADSIDE LITTER CHARACTERIZATION RESULTS

The State of Iowa has approximately 112,619 miles of roadways, of which 142 miles are high volume roads segments, 1,631 miles are medium volume road segments, and 110,845 miles are low volume road segments. Note: all of the rural sites were low volume traffic sites. In this section, the site selection is considered random, unbiased, and therefore representative of the road segments and counties in Iowa.

1. Extrapolation of Traffic Volume Data and Litter Count

44.84% of the litter collected during the study was located along high volume roadside segments, although the high volume sites represented 12% of the samples.

Additionally, the high volume sites generated more litter per roadside mile than medium volume, low volume, and rural sites combined (see Table 13, Column C).

Staff calculated the high volume roadways in Iowa to contain approximately 6 million pieces of litter statewide, medium volume roadways were calculated to contain 23.6 million pieces of litter statewide and low volume roads (including rural roadways) were calculated to contain 192 million pieces of litter statewide.

TABLE 13 - Traffic Volume and Litter Count

	A	B	C	D	E
TRAFFIC VOLUME	**TOTAL PIECES**	**TOTAL LENGTH SURVEYED (MILES)[1]**	**PIECES / ROADSIDE MILE**	**TOTAL MILES IN THE STATE**	**TOTAL PIECES (ESTIMATED)[2]**
High	10,127	0.4828	20,974	284	5,956,616
Medium	6,317	0.8733	7,233	3,262	23,594,046
Low[3]	6,141	4.1860	1,467	110,845	162,609,615
TOTAL	22,585	5.5421	NA	114,391	192,160,277

2. Results of the 2002 Iowa Roadside Litter Characteristic Study Compared to Results of Roadside Litter Characteristic Studies and Related Work Performed by the Institute for Applied Research

- **Multiple and Single Correlation Coefficients**

  The Institute for Applied Research (Institute) provided linear regression coefficients for Average Daily Vehicle Traffic, accumulated litter rates and road type in Report S-8.16. In this report the Institute said "… for highways, roads, and freeways, the county population size and the average daily vehicle traffic have the highest simple correlation coefficients".

  The Institute also prepared the following remarks in the same report, "The average R squared coefficient from multiple regression for highways, roads and freeways is .373 indicating that only 37% of the variability if litter rates in those locales is associated with variability of the independent variables. The rest of the variability is probably associated with other unmeasured variables such as trappage, slope, heavy prior rainfall, maintenance frequency, vehicle speed, average age of drivers and pedestrians, etc."

  According to the Institute, adding independent variables increased the R squared coefficients increases the accuracy of the results.

  The 2001 Iowa Roadside Litter Characteristic Study generated R squared coefficients for specific subcategories using high volume road data, medium or high county population data and item count. Cigarette Filter and Butts generated an R squared coefficient of .41, Candy Wrappers and Snack Packaging generated an R squared coefficient of .34, and Beer and Soda Containers generated an R squared coefficient of .53.

  The 2001 Iowa study did not see R squared coefficients greater than .30 for subcategories using low volume road data, item count, and lower median county populations.

  If littering behavior is to be changed, a theory could be developed that litter is not necessarily age specific, rather traffic volume specific.

RECOMMENDATIONS (INFORMATION TO GUIDE POLICY)

1. A Fresh Litter Study

The 2001 Roadside Litter Characteristic Study measured only accumulated litter; because this is a baseline study, staff did not perform a "fresh litter study" which is the rate at which litter is re-charging. **BARKER LEMAR** recommends a 2002 fresh litter study on the high volume

roadways, the medium volume roadways, and a statistical sample of low volume roadways. A total of 24 medium volume sites and 14 high volume sites should be sampled, in addition to a random sample of 25% of the 112 low volume/rural sites (or 28 sites). A random sample of low volume/rural sites should provide an adequate measurement of fresh litter for these locations. 66 roadside litter sites would be re-sampled for fresh litter study in 2002. Researchers will collect litter from the same survey areas identify survey areas using the GIS program and field notes from the 2001 survey.

The 2002 study should begin in September and staff should complete the fieldwork by the end of October to coincide with the 2001 study. This study will use the same criteria and tools to measure litter size, area, and weight. The final report will calculate the amount of fresh litter deposited per year for categories, subcategories, and roadway type.

2.   Targeted Anti Litter Campaign

Targeting specific litter types and specific namebrands

A targeted litter reduction education and promotional system should involve the leading sub-category data and the leading name brand data.

Targeting Specific Road Segments and Geographic Areas

Educational and promotional campaigns should also consider focusing on road segments that met the "high traffic volume" criteria (greater than 31,201 vehicles per day).

If littering behavior is to be changed, a theory could be developed that litter is not necessarily age specific, rather traffic volume and population specific. Educational information might be concentrated in the areas of heaviest traffic volume within counties of medium to high populations.

Targeting Specific City Sizes

Based on field observations and objective data collected in the field, the amount of litter in rural areas, communities less than 5,000, and low volume road segments could be classified as very little to moderate. Staff had a few conversations with individuals, including mayors, of small towns (less than 5,000) when performing the litter characteristic fieldwork. A primary concern of these smaller communities was not litter, rather junk cars and other debris on private property and old buildings requiring demolition and disposal.

Medium sized communities of 5,001 - 10,000 also appeared to have very little to moderate levels of litter.

Larger communities (greater than 10,000) have mixes of low litter to heavily littered areas. A key predictor of the amount of litter was traffic volume and commercial development. Some high traffic volume road segments (including interstate sites and non-interstate sites) could be classified as moderately to heavily littered. Although some sites did not generate as much litter as a medium traffic road segment, the high traffic road segments appear to consistently generate more litter

3.   Modifying the KAB Litter Index

The KAB Litter Index may require adjustments if this tool is applied toward rural areas and incorporated areas less than 5,000 people. Staff scored small towns with a score of "1" consistently using the current KAB system. Staff recommends a review of the 1-4 scoring system for small urban areas making the scores more conservative.

BARKER LEMAR experimented with the Internet/GIS/Tablet PC technology to track and digitally record Litter Index routes and scores. This field test showed how a state might collect electronic Litter Index Data from local affiliates and send information, including routes, over the web to parent organizations creating a management tool that can compare data within states and among states.

4.   Targeting Specific Namebrand Demographics/Sales Data

Another interesting study might involve collecting sales data and calculate if the total number of name brand litter pieces identified in this litter study correlated with overall sales. If some of the leading littered name brands did not correlate with sales, then what other factors might influence their litter rate. Could it be the targeted demographic of the product, (e.g. are older or younger individuals littering)?

DIRECTIONS TO ENTER THE GIS/INTERNET SITE

BARKER LEMAR developed an Internet based GIS for KIB. The KIB Internet/GIS site is located at **www.internetgis.org/kib/default.asp** or via a link at **keepiowabeautiful.com**.

CONCLUDING REMARKS

BARKER LEMAR staff would like to thank the KIB Review Group that assisted with the development of the 2001 Roadside Litter Characterization Study.

- Keep Iowa Beautiful
- The Iowa Dept. of Natural Resources
- The Iowa Department of Transportation
- Carroll Co. Solid Waste Management Commission
- Iowa Recycling Association
- Story County Engineer's Office

- Iowa League of Cities
- Iowa Beverage Systems, Inc.
- Iowa Wholesale Beer Dist. Association
- Iowa Grocery Industry Association
- Casey's General Stores, Inc.
- Iowa Farm Bureau Federation
- Iowa Assoc. of Co. Conservation Boards

The authors would like to personally thank Field Staff for their enthusiasm and professionalism during the collection and classifying phases. The authors would also like to thank the IT staff that listened to ideas and then transformed those ideas into working databases, reports, Internet compatible programs, statistical programs, and various other technical pieces.

ATTACHMENT A

List of Litter Characterization Reports

List of Litter Characterization Reports Reviewed for the KIB 2001 Roadside Litter Characterization Reports

- *Nebraska Litter 1980. A Baseline Survey of Street, Roadside and Recreation Area Litter.*
- *Nebraska Litter 1982. A Baseline Survey for the NE Dept. of Env. Quality.*
- *Nebraska Litter 1985. A Survey of Litter Reduction Trends Since 1980.*
- *Nebraska Litter 1991. A Baseline Survey for the NE Dept. of Env. Quality.*
- *Nebraska Litter 1996.*
- *The Florida Litter Study*: 1994.
- *The Florida Litter Study: 1996*, Report #S97-1.
- *The Florida Litter Study: 1997*, Report #S97-14.
- *The Florida Litter Study. Interim Report.* January 13, 1999.
- *The 1998 Update: Oklahoma Visual Litter Survey and Analysis.*

Staff also reviewed the following reports and summaries from the Institute for Applied Research:

- *Problems with Full Scale Survey*, February 6, 1997.
- *Analysis of Variables Affecting Litter Rates*, Preliminary Draft January 1988.
- *Summary of Litter Research Findings*, S-1 rev 1995.
- *Litter Rate Ranking of States and Provinces Surveyed*, Report S-11.
- *Summary of Visible Litter Composition*, Rev 8/31/99.
- *Using Observations of Persons Littering To Target Advertising, Excerpt S-7.5 From PA99 Final Report.*
- *Summary of Litter Results from Institute Surveys*, Excerpt S-15.1; Rev 1998.
- *Summary of Litter Research Findings,* S-1 Rev 1995.
- *Summary of Visible Litter Composition*, Rev 8/31/99.
- *Summary of Problems Encountered in Litter Surveys,* Summary S-13; February 5, 1997. *Litter Control Program Options,* S-4.6, Rev 7/28/98.
- *The Pros and Cons of Various Methods of Litter Measurement*, Report S-9.4, Revised April, 1998.
- *Analysis of Variables Affecting Litter Rates.* S-8.16, Preliminary Draft Jan. 1988.

ATTACHMENT B

Litter Categories, Material Type, and Subcategories

Litter Categories, Material Type, and Subcategories

Category	Material Type	SubCategory	Deposit
Beverage Container	Aluminum/Glass/Plastic	Beer	Yes or No
Beverage Container	Aluminum/Glass/Plastic	Wine/liquor	Yes or No
Beverage Container	Aluminum/Glass/Plastic	Soda	Yes or No
Beverage Container	Aluminum/Glass/Plastic	Juice	
Beverage Container	Aluminum/Glass/Plastic	Milk	
Beverage Container	Aluminum/Glass/Plastic	Sports	
Beverage Container	Aluminum/Glass/Plastic	Tea	
Beverage Container	Aluminum/Glass/Plastic	Water	
Beverage Container	Aluminum/Glass/Plastic	Vegetable/health	
Beverage Container	Aluminum/Glass/Plastic	Broken plastic beverage container	
Beverage Container	Aluminum/Glass/Plastic	Broken metal beverage container	
Beverage Container	Aluminum/Glass/Plastic	Broken glass beverage container	
Cup Related		Plastic cups	
Cup Related		Polystyrene foam cups	
Cup Related		Paper	
Cup Related		Plastic lids	
Cup Related		Straws	
Bags		Plastic and paper bags	
Containers/Boxes		Corrugated cardboard boxes	
Containers Boxes		Paperboard boxes	
Containers/Boxes		Paper beverage casing	
Containers/Boxes		Polystyrene foam clam shell	
Containers/Boxes		Plastic clam shell	
Containers/Boxes		Jars/bottles/boxes	
Containers/Boxes		Cans	
Containers/Boxes		Aerosols/pump	
Containers/Boxes		Lids	
Packaging		Candy wrappers/snacks (paper/plastic)	
Packaging		Plastic	
Packaging		Paper	
Packaging		Plastic/paper/foil/combo	
Packaging		Foil	

Litter Categories, Material Type, and Subcategories - Continued

Category	Material Type	SubCategory	Deposit
Tobacco		Cigar/Cigarette filters/butts	
Tobacco		Packaging	
Tobacco		Dip/chew/snuff	
Fast Food Extras		Condiment packages	
Fast Food Extras		Utensils	
Fast Food Extras		Straw related packaging plastic/paper	
Fast Food Extras		Fast food wrappers/bags	
Organics		Miscellaneous	
Biohazardous/Medical		Miscellaneous	
Other Plastic		Bottle lid/cap	
Other Plastic		Plastic plate	
Other Plastic		Stretch/shrink style industrial film	
Other Plastic		Small pieces of undetermined source	
Other Plastic		Foamed Packaging	
Other Rubber not Tires		Miscellaneous	
Other Metal		Metal/Foil/Aluminum Pieces	
Other Paper		Towel/napkin	
Other Paper		Lottery	
Other Paper		Plate/tray	
Other Paper		Food wrap	
Other Paper		Small pieces of undetermined source	
Demolition/Construction Related		Miscellaneous	
Vehicle		Vehicle related not tires	
Tires		Inner tubes/retreads/rims/caps	
Textiles		Miscellaneous	
Miscellaneous		Miscellaneous	

ATTACHMENT C

Namebrand Report by Category and Subcategory