Public Opinion on the Saluda-Reedy Watershed: Knowledge, Attitudes and Behaviors

Report Prepared by:

Dr. Catherine Mobley, Ph.D.
Dr. James Witte, Ph.D.
Clemson University
Department of Sociology

This research project was funded by
The Saluda-Reedy Watershed Consortium
www.saludareedy.org

PROJECT GOALS

In January 2004, the Saluda-Reedy Watershed Consortium (SRWC) initiated a public opinion research effort to gauge the views of community stakeholders on watershed issues. This research endeavor, conducted in Upstate South Carolina, contributes to the development of the socioeconomic dimension of SRWC's integrated watershed management plan. Rather than being evaluative in nature, the results serve as a baseline for measuring the success of future watershed education efforts. The most important data from the study are the insights about possible ways for communicating information to Upstate residents about watershed issues. The information collected about the various subgroups can assist project personnel in targeting educational efforts by sociodemographic characteristics and geographic location (i.e., residents of upstream vs. downstream communities). Additionally, the insights on views of municipal officials and environmental professionals provide a starting point for integrated decision making about watershed issues.

The main goal of this project was to obtain information about stakeholders' knowledge, attitudes, and behaviors as they relate to watershed health. Some more specific objectives were to:

- Determine the overall level of concern about watershed health;
- Ascertain stakeholder knowledge of watershed concepts and issues;
- Gain an accurate understanding of individual behaviors and actions that are relevant to water quality;
- Learn more about residents' level of participation in outdoor recreation activities;
- Identify openings and barriers to participation in water quality improvement efforts;
- Ascertain the willingness of the public to become involved in efforts to improve water quality and to pay for improved water quality; and
- Identify how the views of decision makers and environmental professionals on watershed issues may differ from the views of the general public.

METHODOLOGY

This research effort consisted of a telephone survey of local citizens and four web surveys, one each for local citizens, municipal officials, environmental professionals, and developers. The main survey instrument for local citizens was developed with input from the SRWC partners. A copy of the final survey instrument can be found in Appendix A. Survey questions were organized into the following categories (1) environmental concern and perceptions of change in water quality; (2) environmental knowledge about watershed basics and the causes and impacts of pollution; (3) participation in recreational activities; (4) participation in environmentally positive and negative behaviors; and (5) willingness to get involved in efforts to improve water quality and willingness to pay to improve water quality.

The web survey for the general public duplicated the telephone survey and included additional specialized questions. The web surveys of municipal officials, environmental professionals, and developers included key questions from the citizen survey (for comparisons across respondent groups). Additional questions were developed to capitalize on the visual

capabilities of the web and the ability to tailor these questions to the respondent group being surveyed.

Telephone survey

The survey was conducted using Computer Assisted Telephone Interviewing (CATI) methods. Approval for conducting research with human subjects was obtained through Clemson University's Institutional Review Board. All interviews were conducted from the CATI lab, located in the Department of Sociology at Clemson University.

Respondents were selected using a random list of phone numbers purchased from Scientific Telephone Sampling, a national vendor of telephone samples. The majority of calls were made during evening hours, weekdays between 5 and 9 p.m. Limited daytime and weekend calling was also conducted so as not to exclude potential respondents who are regularly not home during the early evening hours. Only residents 18 years of age and older were interviewed.

The sample was selected so that the number of random numbers for each zip code mirrored the proportion of the adult population in that zip code relative to the adult population of the watershed area as a whole (339,726). The telephone survey was pre-tested in March 2004 and actual data collection took place from May through July 2004. A total of 855 watershed residents was surveyed, for a margin of error of plus or minus 3.4%with a 95%confidence level. The interviews lasted an average of fifteen minutes.

The response rate for the survey was 29%. This response rate, which was calculated using standard methods used by the American Association of Public Opinion Researchers, is typical for telephone surveys of this length. (See Table B-1 for further information about the calculation of the response rate).

Web Surveys

The web surveys were developed and implemented using the OnQ survey software developed at Clemson University. OnQ is a flexible and powerful software system, where survey branching is transparent to the respondent and questionnaire content is not limited to text (http://camss.clemson.edu).

The web surveys were developed in August and September 2004 and "went live" in October 2004. They remained online through May 2005. A variety of organizations agreed to create a link to the survey from their home websites. Host agencies included the City of Greenville, the Municipal Association of South Carolina, the S.C. Water Resource Center, the City of Spartanburg, Pinnacle Consulting Group, and the Strom Thurmond Institute at Clemson University. A link was also placed on the SRWC homepage. The surveys were also publicized through several listservs (e.g., Sustainable Universities Initiative) and through an SRWC workshop ("Dealing with Dirt").

A number of attempts were made to encourage participation from developers. Unfortunately, survey participation from developers was minimal--fewer than 10 individuals completed the entire survey-- so results for this survey are not reported here. However, we do include suggestions for reaching developers in the future.

DATA ANALYSIS

To provide an overview of research results, frequencies were conducted for all questions on the telephone survey (see Appendix C).

Frequencies for the main survey questions on the web surveys are also presented and discussed in this report (see Appendices J and K).

Pearson chi-square analyses were conducted for the telephone survey data to determine if a relationship existed between the main research variables and the main sociodemographic characteristics of sex, race, income, education, age, and residence (i.e., urban vs. rural). Weighted percentages and only those results that were statistically significant at the .05 level or below are discussed in this report.

Aside from determining if there was a relationship between the research variables, it was also important to determine whether the relationship was substantively important. Therefore, along with the chi-square results we have included a measure of association to calculate the strength of the relationship between the sociodemographic variables and dependent variables of interest. Cramer's V was used to test the strength of the relationships between nominal variables or between nominal and ordinal variables. Gamma was used as the measure of association in those cases when both variables were ordinal.

There are a variety of standards for interpreting measures of association. In this report, a value of .10 or less indicates a weak relationship between variables, a value between .10 and .30 designates a moderate relationship between variables. A Cramer V or gamma of greater than .30 indicates a strong relationship between the variables in question. This report will highlight those relationships with measures of association of .10 or above (and where the chi-square p-value is less than .05). A summary of the chi-square analyses of the telephone survey is presented in Table B-2. Appendix D through Appendix I provide cross-tabulation results for the relationships between all of the major research variables and the six main demographic variables.

Each survey included several open-ended questions. Results from some of these questions are provided in the respective sections of the report.

SAMPLE CHARACTERISTICS

Telephone Survey

Table B-3 provides a comparison between the telephone survey sample and the watershed population. When compared to the general population, the SRWC telephone survey sample was disproportionately female (61.3% of the sample vs. 52.3% of the actual watershed population) and better educated than the general population (with 27.7% of the sample earning a bachelor's degree or higher vs. 16.3% of the general population). The sample also consisted of wealthier respondents, with 36.6% of the sample earning $60,000 or more (as compared to 25% of the watershed population). With respect to race, 85.1% of the sample was white as compared to 78.1% of the watershed population. There were also some differences in age profiles, with the survey comprised of a greater proportion of 45-54 year olds than found in the watershed population (23.8% vs. 17.9%, respectively) and a lower proportion of 18-24 year olds (7.0% of the phone survey vs. 12.6% of the watershed population).

Research has shown that some of these segments of the population (e.g., higher-educated females) are more likely to participate in surveys. We adjusted for these demographic differences by using standard

statistical weighting procedures. The resulting weighted data matched Census data for the watershed quite closely (Table B-3. While there was a change in distribution of the population on some survey items, the distribution of responses on the research variables of interest changed very little as a result of the weighting procedure. The results reported and discussed in this report are the weighted numbers.

Zip code information was collected from respondents to allow for comparisons between rural and urban residents. The rural-urban distinction was defined by using the Department of Health and Human Service zip code list for the provision of rural ambulance services. Each case was then coded as being a "rural" or "urban" residence. When viewing a map of the watershed, this rural-urban split paralleled an upstream-downstream split in the data. Thus, the discussions on residential differences tend to focus on "upstream-downstream" differences since they have such important implications for watersheds.

Web Survey – General Public

The web survey of the general public covered the same topics as the telephone survey. One hundred individuals participated in all or a part of the general public, web survey. Table J-1 presents a comparison between the weighted telephone sample and the web sample of local residents. When compared to the telephone survey sample, web survey respondents were disproportionately white (87.5% vs. 80.0% for the phone survey), more highly educated (e.g., 44.9% of web respondents indicating they had earned a Ph.D. as compared to just 4.9% of telephone survey respondents), earned higher incomes (67.3% indicating they earned $60,000 or higher as compared to 25% of the phone survey), and more likely to be between the ages of 35-64 (58.4% vs. 30.3%). Web survey respondents were more likely than telephone respondents to be homeowners (90% indicating they owned their home as compared to 77.2% of the telephone sample). Also, as presented in Table J-2, telephone survey respondents were more likely to be longer-term residents of the Upstate. Nearly three-fourths of the telephone sample indicated they had first moved to the area more than 20 years ago, as compared to just 41.3% of web survey respondents. Twenty-eight percent of web survey respondents first moved to the area five years ago or less (as compared to just 6.3% of telephone survey respondents).

Obviously, given these characteristics the general public, web survey sample is not a random sample and one cannot generalize from this sample to the general public as one would with a more traditional, random sample. One cannot make statistically valid point estimates from this sample even to this subset of the general public. Instead, one should think of this sample as representative of a particular subset of the general public: those most interested in learning about and discussing issues related to the Saluda-Reedy watershed. Just as with a focus group, from the data collected with this web survey we are able to learn how members of this subset of the general public view issues related to the watershed. These insights are important since from an integrated watershed management perspective this is exactly the subset of the general public that needs to be addressed, if change is to be effected.

Web Survey – Municipal Officials

Twenty-two municipal officials participated in all or some of the survey. Again, this

sample size does not allow for generalizations to the broader population of municipal officials in the Saluda-Reedy watershed. However, the resulting data should be considered as comprising a "focus group" of municipal officials who are at least somewhat interested in water quality issues (gauged by the fact that they took the time to participate in this survey effort).

A majority of municipal officials who completed the survey were male (60%), white (90.9%), and highly educated (with 63.6% indicating they had earned post graduate degree). Seven of these municipal officials have been employed in the municipal sector for ten years or more. These participants hold a variety of job titles and include city council members, planning commissioners, planning directors, city engineers, and city administrators.

Web Survey – Environmental Professionals

Thirty-seven environmental professionals participated in the on-line version of the survey. Respondents to this web survey were predominantly male (80%) and nearly 70%were between the ages of 25 to 44. One-third of environmental professionals indicated they had earned a 4-year degree and an additional 52.4%indicated they had earned a post graduate degree.

Of the environmental professionals who completed the survey, over half have been professionally active in the Upstate for five or more years and nearly 20% have been engaged for ten or more years. The fields in which environmental professionals were employed were varied and included planning, transportation, stream ecology, wildlife biology, wetlands consultation, entomology, forestry, and parks and recreation.

MAIN FINDINGS

To facilitate the major goal of designing education and outreach efforts to the general public, much of the report focuses on the results from the telephone survey. However, data from the web surveys is provided throughout the report for comparison purposes and to illustrate the unique views of all four respondent groups on the main research variables of interest. Comparisons to watershed surveys conducted in other communities are made when appropriate. The final section of the report, "Implications and Recommendations" integrates the findings to allow for a more useful discussion of integrated watershed management.

Each section of the report begins with an overview of results from the telephone survey, providing information about overall frequencies for the main survey items (Appendix C) and subgroup differences for the main research variables (presented in Appendix D through Appendix I). Then, comparative data from the web surveys is presented (Appendix J). The section on "Special Analyses" discusses the results from the web survey questions that were tailored to either the general public, municipal officials, or environmental professionals (Appendix K).

Environmental Concern

Concern about watershed health was measured through the following question: "I'd like to know how concerned you are with pollution and environmental quality in your local streams and waterways: Would you say you are very concerned, somewhat concerned, not very concerned, or not at all concerned?" This question was included on the phone survey and all three web surveys

to allow for comparisons across respondent groups.

Respondents to the telephone survey expressed a high level of concern about water quality of local streams and rivers (Table C-1). Eighty-six percent of respondents are "very concerned" or "somewhat concerned" about watershed health. This level of concern is comparable to the extent of concern found in other watersheds (see Center for Watershed Protection, 1999).

Subgroup analyses of this question for the phone survey respondents reveal several patterns. Females were more concerned than males about water quality with 51.9%indicating they were "very concerned" as compared to 39.8% of males (Cramer's V=.137) (Table D-1). The youngest respondents (18-24 year olds) expressed the least concern about water quality. Only 15.1% of 18-24 year olds expressed they were "very concerned" as compared to between 48.8%and 54.7% of respondents in other age groups (gamma= -.206) (Table H-1). Respondents from rural, downstream communities were more likely than urban, upstream residents to indicate they were "very concerned" about water quality (Cramer's V=.106) (Table I-1). Significant chi-squares, but weaker measures of association were found for education and income. Individuals with lower levels of education and respondents earning less than $20,000 a year were most likely to indicate they were "very concerned" about water quality (Tables F-1 and G-1, respectively).

Respondents to all three web surveys indicated greater concern about water quality than phone survey respondents (Table J-3). Sixty-four percent of general public, web survey respondents, as compared to 46.2% of phone survey respondents, indicated they were "very concerned" about water quality. Nearly 64% of municipal officials and 75% of environmental professionals indicated they were "very concerned" about water quality.

Environmental Knowledge

Respondents' level of knowledge about watersheds was measured through a series of three questions: the definition of "watershed", knowledge about water runoff into local water bodies, and knowledge about practices used to manage water along rivers, streams, and lakes.

Definition of Watershed

The general public and municipal officials were asked the following multiple choice question: "Of the following, which best fits your definition of what a watershed is: Is it an area that retains water like a swamp or a marsh, all of the land area that drains into a specific river or lake, a reservoir that serves as a municipal water source, a small building where water is stored, or none of the things I've mentioned?"

When asked to choose the correct definition of the watershed, only 27.3% of telephone survey respondents selected the correct answer ("area that drains into specific river or lake") and over 13%indicated they did not know the correct definition or did not answer this question (Table C-8). Several major surveys on watershed issues document much higher levels of knowledge about the definition of a watershed. For example, in a survey of Chesapeake Bay watershed residents, nearly half (48%) of respondents chose the correct definition. In a 1997 Roper survey, 40% of respondents identified the correct definition of watershed (see McClafferty, 2002).

Thus, the watershed concept remains abstract and confusing for many local residents. For example, nearly half of the respondents (48.5%) chose "reservoir that serves as a municipal water source" as the correct definition of a watershed. This choice of the "reservoir" definition was not surprising given the connotation of "watershed" to Greenville residents. In upstream communities, the "Greenville watershed" is a generic, commonly-used term to refer to the reservoirs that are major sources of drinking water for Greenville residents. Despite this more localized, Upstate connotation, however, there were no significant differences between upstream and downstream residents in their ability to choose the correct definition of watershed (Table I-24).

Regarding subgroup differences in this basic knowledge about watersheds, males were more likely than females to choose the correct definition (Table D-24). The relationship between gender and knowledge was moderately strong (Cramer's V=.132). Regarding race, while Whites and minorities were equally likely to choose the correct definition, Whites were far more likely to choose the "reservoir" definition (50.9% vs. 39.6%) and minorities were more likely to choose the "small building" definition (19.4% vs. 7.4%) (Table E-24). This relationship was moderately strong (Cramer's V = .221).

Moderately strong relationships were also evident for education, income and age. Those with more education and individuals earning higher incomes were more likely to choose the correct definition (Cramer's V = .118 and 144, respectively; Tables F-24 and G-24 respectively). Differences between the various age groups in choosing the correct definition were minimal: the various age groups were fairly equally likely to choose the correct definition of watershed. However, individuals age 18-21 and 25-34 were least likely to choose the correct definition (Cramer's V=.162; Table H-24).

Respondents to the general public web survey were far more likely than the telephone survey respondents to choose the correct definition of watershed (Table J-4). More than three-quarters (77.3%) of web survey respondent chose the correct definition, as compared to 27.3% of the general public. Municipal officials were most knowledgeable on this measure, with 85% choosing the correct definition.

Knowledge of Local Water Bodies

An additional question was included on the telephone survey to determine respondents' knowledge about local bodies of water. Respondents were asked "To the best of your understanding, when rain falls where you live which body of water most directly absorbs the runoff?" Then, depending on the respondent's zip code, the respondent was provided with a list of 5-6 water bodies (i.e., creeks, streams, rivers or lakes): one that was the correct answer, several that were located in their zip code (but were not the closest water body), and at least one that was not located in the Saluda Reedy Watershed (see the telephone survey in Appendix A, pages A-5 through A-15, for a list of water bodies associated with each zip code).

When telephone survey respondents were asked to identify the water body most directly absorbing rain runoff from their homes, nearly 55% chose the incorrect answer and 15% indicated they "did not know." Only thirty percent of the sample identified the correct water body absorbing runoff from their homes. Upstream and downstream residents were equally likely to

choose the correct answer or to indicate "do not know." However, upstream residents were more likely than downstream residents to at least select a water body within their zip code, although the answer was incorrect (23.9% of upstream residents vs. 17.2% of downstream residents).

Knowledge of Protective Practices

A common goal of many watershed outreach programs is to educate residents about practices that can help to improve water quality or mitigate the impact of erosion. In this survey, respondents were asked to indicate their level of knowledge by responding to the following question about the effectiveness of three practices in managing land along rivers and lakes: "River banks and lake fronts are obvious places to think about water quality issues. In your opinion, how effective are the following measures in managing land along a river or lake?"

Overall, ninety percent of respondents correctly indicated that allowing natural vegetation to grow wild was "very effective" or "somewhat effective" at managing land along a river or lake (Table C-9). Also, nearly 89% recognized planting shrubs and bushes as a "very effective" or "somewhat effective practice." However, more than 80% of respondents incorrectly indicated that keeping vegetation mowed to the edge of the water was an effective way to manage land. Only 19% of respondents recognized this to be an ineffective practice. As indicated by the number of respondents to each question, the number of missing values for these questions was quite high. The percentage of respondents indicating they did not know about the effectiveness of these various measures (or, did not respond to the question) was quite high: 12% for allowing natural vegetation to grow wild, 15% for keeping vegetation mowed, and 11% for planting shrubs and bushes.

Regarding subgroup differences, there were moderately strong relationships between race, education and residence and ability to identify effective practices. Minorities were more likely than Whites to correctly indicate that planting bushes and shrubs was an effective practice (Cramer's V=.112) (Table E-27). As education increases, respondents are less likely to indicate that keeping the lawn mowed to the edge of the water was very effective (gamma=.184) (Table F-26). Urban, upstream residents were more likely than rural, downstream residents to identify "allowing natural vegetation to grow wild" as an effective practice (gamma=.153) (Table I-25).

In this section of the survey, respondents were also asked the following open-ended question: "In your opinion, are there any other effective measures that could be sued to manage land along a river or lake?" A majority of responses to this question pertained to litter control strategies (e.g., "litter patrols" and monitoring, greater fines for people who litter, and stricter law enforcement and laws against individuals and industries who litter). Other responses related to erosion control, the use of stream buffers, the control of chemicals (including fertilizers and pesticides), runoff controls, and the preservation of trees (although a few respondents suggested "deforestation" as a good strategy for managing land along rivers and streams).

Web survey respondents and environmental professionals were more knowledgeable than phone survey respondents about the effectiveness of these practices (Tables J-5 through J-7). Municipal officials were more knowledgeable than the web public about the effectiveness of planting bushes and

shrubs. However, municipal officials were less knowledgeable than both general public samples about the effectiveness of allowing natural vegetation to grow wild.

Perceptions of Pollution

Environmental awareness and perception of pollution was measured by a series of three questions. First, respondents were asked to assess whether local streams and waterways were more polluted, less polluted or about the same as compared to 10 and 25 years ago. Second, respondents were asked whether they had observed various sources of pollution in local waterways. Respondents were then asked about the impact of various sources of pollution on water quality in the Upstate.

Perceptions of change over time

Overall, phone survey respondents were more likely to indicate that the quality of local waterways had degraded over time (Table C-2). While nearly 1/3 of respondents (30.8 %) agreed that water quality had remained the same over the past 10 years, higher proportions believed water quality had worsened over the past 10 years (55.2%) and 25 years (63.3%). Nearly 14% indicated local streams and waterways were less polluted now as compared to 10 years ago and nearly a quarter of respondents indicated water quality had improved over the past 25 years. It is important to note, however, that 20 of respondents indicated they did not know whether or how water quality had changed over the 25 year time period. This missing data could be the result of responses from younger respondents or from individuals who have not lived in the Upstate for such a long time period.

When asked about the change in water quality of specific local water bodies over the past 10 years, telephone respondents were most likely to indicate that Lake Greenwood (69.8%), the Saluda River (61.7%) and the Reedy River (61.4%) had become more polluted over time (Table C-3). When looking at the missing data for these respondents, a fairly high percentage of respondents did not respond to the question or indicated they did not know about the change in water quality of these specific water bodies (ranging from 18.7% (for the Reedy River) to 57.6% (for Lake Conestee)).

Regarding subgroup differences in perceptions of changes over time, significant relationships were observed for gender and age. Women were far more likely than men to feel that water quality had worsened over both 10 and 25 years (Cramer's V=.195 and .163, respectively) (Tables D-2 and D-3). Individuals age 25-34 felt water quality had degraded over the past 10 years, individuals age 65 and older felt water quality had improved, while 18-24 year olds were most likely to indicate it had remained the same (gamma=.-.101) (Table H-2).

Respondents to the telephone survey were more likely than all three web respondent groups to indicate that waterways were more polluted now than they were 10 or 25 years ago (Tables J-8 and J-9). Environmental professionals were twice as likely as municipal officials to indicate that waterways were about the same now as compared to 10 years ago, while municipal officials were most likely to feel waterways were less polluted over the same time period. Environmental professionals were most likely to believe local water bodies were less polluted now than they were 25 years ago.

Observation of pollution

Observation of pollution often impacts knowledge, attitudes, and behaviors. When individuals observe and are aware of various types of pollution, they may be more likely to change behaviors or to become involved in efforts to improve water quality. In the telephone survey, respondents were asked to indicate whether they had observed five specific types of pollution in local waterways. The most commonly observed types of pollution were trash and debris (observed by 65% of respondents) and mud or silt (observed by 61.8% of respondents), followed by algae problems (55.4%), foam or foul odors (41.7%) and toxic chemicals (20.9%) (Table C-5). The relatively low ranking of toxic chemicals may be because this source of pollution is not readily observable, nor is there a clear understanding among the general public of how these sources impact water quality.

There were no significant differences between men and women in observing each of the five types of pollution. However, there were significant racial differences in observation of pollution (although the strength of the relationships was weak). Caucasians were more likely than minorities to indicate they had observed trash and debris, mud or silt, or algae problems.

In terms of education, individuals with the highest level of educational attainment were most likely to observe mud or silt (gamma= -.137; Table F-6) and individuals with a high school degree were most likely to observe other types of pollution (gamma=-.156; Table F-9).

Individuals in the upper income brackets were more likely to observe trash and debris (gamma=-.203; Table G-4). Foam or foul odors were most often observed by individuals in the middle-income range of $40,000-$59,999 (gamma = -.129; Table G-5). Individuals in this income level and the $60,000-$79,999 income level were most likely to indicate they had observed mud or silt (gamma=-.140; Table G-6). Individuals in the $80,000 to 99,999 income bracket were most likely to indicate they had observed algae problems (gamma=-.119; Table G-8).

Age was moderately associated with observation of some forms of pollution. Individuals 65 and older were least likely to have observed foam or foul odors and mud or silt (Table H-6). Toxic chemicals were most often observed by individuals in the 55-64 year age group (40% of individuals in this age group indicated they had observed toxic chemicals, as compared to between 13.5% and 24.3% of individuals in the other age groups) (Table H-7). The relationship between age and observation of toxic chemicals and mud and silt were moderately strong (gammas = .148 and -.162, respectively).

Respondents living in rural, downstream communities were more likely than urban upstream residents to indicate they had observed mud/silt, algae problems, or other sources of pollution, although the strength of the relationships between observation of these sources and residence was weak (Cramer's V values were less then .10).

When respondents indicated they had observed other forms of pollution, they mentioned observing sewage/septic waste, fuel leaks, runoff (from boats, construction or yards) and bacteria. Others indicated they had observed specific chemicals in local waterways, including ammonia, industrial effluents, mercury, PCBs, and uranium.

Respondents to all three web surveys were more likely to have observed all six sources of pollution (Table J-10). However,

municipal officials were least likely to have observed foam and foul odor. And, municipal officials were keenly aware of algae problems as compared to any other group (90.9% of the municipal officials said they had observed algae problems as compared to 75.9% of environmental professionals, 68.2% of the public web sample, and 55.4% of the public phone sample). In fact, municipal officials indicated they had observed algae problems (90.9%) more often than they had observed trash or debris (86.7%).

Impact of Pollution

Respondents were asked how much impact thirteen different activities had on the quality of local waterways. For telephone respondents, littering was the source identified as having the greatest impact on water quality (Table C-6). Fifty-seven percent of respondents indicated littering had a "great" impact on water quality. The data also showed the following large percentages (in parenthesis) of respondents who indicated the other sources of pollution had a "great" impact on water quality: growth in the Upstate (51%), fertilizers and lawn chemicals (48.6%), fuel and oil leaks from trucks, buses and automobiles (48%), construction of new businesses and industry (43.9%), and waste from boats and boating (40.5%).

A relatively small number of respondents indicated that farm operations (20.8%) and golf courses (22.8%) had a "great impact" on water quality in the upstate. It should also be noted that more than 10% of respondents indicated "do not know" for both wastewater treatment facilities (14.9% indicating they didn't know) and farm operations (11.3% indicating "do not know").

These responses indicate that residents have a basic level of understanding about the various causes of water quality, although there seems to be little connection made between the various causes of pollution. For example, construction of homes and roads, two activities seemingly related to growth in the Upstate, did not cause as much concern among respondents as did growth in the Upstate. Less than one- of respondents felt that each of these two sources of pollution had a "great impact" on water quality.

Telephone respondents were also asked to assess the impact that business and industry had on the water quality of specific water bodies in the Upstate (Table C-4). For all water bodies listed (except the Chattooga River), nearly one-half of respondents indicated that business and industry had a "great effect" on water quality. However, as was the case with the assessment of changes in water quality over time for these bodies of water, the percentage of missing values for these questions was quite high, ranging from 20% (for the Saluda River) to 48% (for Lake Conestee).

There were some important subgroup differences in the assessment of impacts of the various sources of water pollution. Females were more likely than males to indicate that ten of the thirteen sources of pollution had a "great impact" on water quality in the Upstate (Tables D-10 through D-22). The two exceptions were farm operations and water runoff, for which no statistically significant differences in assessment of impacts were observed. The relationship between gender and assessment of the impact of these ten factors on water quality was moderately strong, as indicated by the Cramer V values of between .103 and .182.

Interestingly, the gaps in perception of impact were quite large for two activities for which males generally report higher participation rates (motor boating and playing golf). For example, 46.1% of females, as compared to 34.5% of males, felt that waste from boats and boating had a "great" impact on streams and lakes in the Upstate (Cramer's V=.137). More than two-thirds (67.7%) of women indicated golf courses and other playing fields had a "great" or "some" impact on water quality, as compared to 57.6% of men (Cramer's V=.128).

Regarding racial differences, minorities were more likely to indicate that all sources of pollution had a "great" impact on water quality in the Upstate. The relationships between race and assessment of impact were significant for six of the thirteen activities listed: construction of roads; construction of homes; fertilizers and lawn chemicals; exhaust from trucks, buses and automobiles; fuel and oil leaks; and golf courses. The relationships between race and assessment of impact were moderately strong, with Cramer V's ranging from .109 to .181 (Tables E-10 through E-22).

Regarding education, as education level increased, respondents were more likely to indicate that fertilizers and lawn chemicals and golf courses had a "great impact" on local streams and lakes. The relationship between education and assessment of impact of these two sources of pollution were moderately strong, with gammas of -.182 and -.141 respectively (Tables F-10 through F-22).

The only significant and moderately strong relationship between income and assessment of impact was observed for fuel and oil leaks (gamma=.113; Table G-15). Individuals in the upper income brackets were least likely to indicate this source had a "great impact" on water quality.

There were statistically significant differences between age groups in the assessment of the impact of all thirteen sources of pollution (Tables H-10 through H-22). However, the relationships between age and assessment of impact of these causes were weak, with the exception of the moderately strong relationships with fuel and oil leaks, wastewater treatment facilities, water runoff, waste from boats, and construction of new businesses and industry (gammas for these items ranged from .108 to .172). Individuals in the youngest age group (18-24) were most likely to indicate these sources of pollution had a "great impact" on streams and lakes (with the exception of water runoff: individuals in the 35-44 age group were most likely to indicate this source had a "great impact" on water quality).

Downstream and upstream residents had differing perceptions of the impact of the various sources of pollution. There were significant residential differences in the assessment of the impact of seven of the thirteen activities listed. Downstream residents were more likely to indicate growth in the Upstate, farm operations, and construction of new businesses and industry had a "great" impact on water quality (Cramer's V=.161, .129, and .126, respectively). However, downstream residents were also significantly more likely than upstream residents to indicate that construction of new businesses and industry had "no impact" on water quality.

Upstream residents were more likely than downstream residents to indicate that construction of roads (Cramer's V=.100), fuel and oil leaks (Cramer's V=.149), and water runoff (Cramer's V=.125) had a

"great" impact on water quality. To some degree, these differences in assessment of impact may reflect the more urban nature of upstream communities.

A rather different picture emerges when examining the proportion of upstream vs. downstream residents that indicated a particular source had "very little impact" or "no impact". A higher proportion of rural residents (18.9%) than urban residents (8.7%) were likely to indicate that water runoff into storm drains had "no impact" on water quality (Cramer's V = .125). Similarly, one-fifth (20.1%) of rural respondents indicated that waste from boats and boating had "no impact" on water quality as compared to 8.6% of upstream residents (Cramer's V=.169).

Telephone survey respondents were asked "what would you say is the single greatest source of pollution affecting streams and waterways in your region? The most common response to this open-ended question was littering (mentioned by 242 respondents). Other responses (and number of people mentioning the source) included: industry (n=160), construction (n=89), runoff (n=64), chemicals (n=43), motor vehicles (n=42) and population growth (n=34).

The data from the web surveys reveal some important differences in the assessments of the impact of pollution on water quality (Table J-11). A majority of respondents to each web survey felt that growth in the Upstate had a "great impact" on water quality, although the web, general public respondents were most likely to feel this way. Respondents' assessments of impact of other sources varied widely. For example, the general public, phone respondents were far less likely than other respondents to indicate that causes related to growth (growth in the Upstate, construction of roads, and construction of homes) had a "great" impact on water quality. However, these phone survey respondents were more like environmental professionals in their assessment of the impact of fertilizers and lawn chemicals and farm operations.

Environmental professionals were far less likely than the other respondent groups to indicate that several sources had a "great impact" on water quality (exhaust from trucks, buses and automobiles, wastewater treatment facilities, waste from boats and boating, and littering). On the other hand, environmental professionals were more likely than the other respondent groups to indicate that water runoff and construction of new businesses and industry had a "great" impact on water quality. Municipal officials were least likely to believe that construction of new business and industry had a "great" impact on water quality.

Sources of Information about the Environment

Respondents were asked to provide information about their major sources of information on water quality by responding to the following question: "Which has the biggest impact on your views on water pollution: your personal observations, the opinions of your friends or family, newspaper and television coverage, governmental reports, or environmental groups?"

Personal observation was the primary source of information for the general public, mentioned by 47.9% of the telephone sample (Table C-7). Just over one-fourth (26.3%) of respondents chose the media as their main source of information. Using more personalized sources of information contradicts research in other areas of the

country which indicates that individuals get most of their information from the news media (Center for Watershed Protection, 1999). Another 10% of respondents mentioned environmental groups as having the biggest impact on their views on water pollution. Friends and family and government reports were mentioned by the fewest number of respondents as the main source of information on water quality (4.3% and 2.3%, respectively). When respondents indicated they used a combination of information sources, the most common combination was personal observation and the media (n=43).

There were several significant subgroup differences for this question. While there were no statistically significant differences between men and women in main sources of information on water quality, there were distinct racial differences. Whites were significantly more likely than minorities to rely on personal observations, mentioned by 50.4% of whites as compared to 37.9% of minorities (Table E-23). Also, although environmental groups were a main source of information for only 9% of respondents overall, minorities were almost three times more likely than whites to indicate that environmental groups had the biggest impact on their views of water quality: 18.3% of minorities indicated they used such groups as their main source of information, as compared to 6.5% of Whites. The relationship between race and source of information was moderately strong, with a Cramer's V of .192.

Regarding income differences, personal observation was mentioned least by individuals earning $80,000-$99,999, while individuals in the $60,000-$79,999 were least likely to mention newspaper and television as their primary source of information on water quality (Cramer's V= -.130; Table G-23). Interestingly, individuals in the lowest income bracket (earning less than $20,000) were most likely to indicate environmental groups as their main source of information (17% of those in this income category as compared to no one in the highest income bracket of $100,000 or more).

While respondents were relatively equally likely to rely on personal observation across age groups, a higher proportion of younger people, as compared to those 65 and older, rely on personal observation. Individuals age 18-24 were also significantly more likely to rely on the opinions of friends and family (10.4% vs. between 1.5% and 4.4% of individuals in the other age categories). When compared to individuals in other age groups, individuals 65 and older were the least likely to rely on personal observation and the most likely to rely on newspaper and television and environmental groups. This relationship between age and source of information was moderately strong (Cramer's V = .116; Table H-23).

Upstream and downstream residents were relatively equally likely to indicate personal observations as their main source of information. However, upstream residents were significantly more likely than downstream residents to mention newspapers and television (27.9% vs. 18.2%, respectively) and downstream residents were more likely to indicate they relied on environmental groups for such information (15.9% vs. 7.5%, respectively). The relationship between residence and source of information was moderately strong (gamma=.127; Table I-23).

When comparing telephone survey respondents with general public, web survey respondents, the latter were twice as likely to use environmental groups (18.2% vs.

8.9%) and government reports (14.3% vs. 2.3%) as a main source of information (Table J-12). However, like the telephone survey respondents, personal observation was mentioned most often by web survey respondents as having the greatest impact on views on water quality. Finally, only 1.3% of the web survey sample indicated the media as a main source of information, as compared to 26.3% of the phone survey respondents.

Environmental Behaviors

The general public surveys measured environmental behaviors by asking respondents (1) about their frequency of participation in outdoor recreational activities; (2) whether they engaged in several positive behaviors in the past year; and (3) how often they participated in potentially negative behaviors. For comparison purposes, municipal officials and environmental professionals were asked about their participation in recreational activities and whether they had donated to or joined a conservation organization.

Participation in Outdoor Recreation

Research has shown a relationship between participation in outdoor activities and beliefs about and behaviors toward the environment. Respondents were asked about their frequency of participation in six recreational activities. The results provide some insights into how connected watershed residents are to outdoor hobbies and how to target outreach activities.

As indicated in Table C-10, fishing, hiking, swimming, and motor boating were the four most popular recreational activities for respondents (with 50%, 47.8%, 40.9% and 35.8% of respondents indicating they participated in these activities "often" or "sometimes", respectively). The lowest participation rates were recorded for hunting/trapping and kayaking/canoeing (17.4% and 15.3% of respondents indicating they participated in these activities "often" or "sometimes", respectively). More than three-quarters of respondents indicated they had never participated in hunting or trapping and nearly 72% indicated they had never kayaked or canoed.

The results indicate a number of subgroup differences in levels of participation in the various recreational activities. For all six activities, a large gender gap was observed (Tables D-28 to D-33). Across the board, men indicated they participated in each of the six activities more often than women. The relationships between gender and participation were moderately strong, with Cramer's V's ranging from .185 (for motorboating) to .325 (for hunting/trapping).

Regarding race, whites were more likely than minorities to participate "often" or "sometimes" in all six recreational activities (Tables E-28 to E-33). The relationship between race and participation was moderately strong, with Cramer's V's ranging from .122 (for kayaking and canoeing) to .285 (for motorboating).

There was also a moderately strong relationship between education and participation in three activities (Tables F-28 to F-33). There was a positive relationship between education and kayaking, motorboating, and hiking: those with higher levels of education were more likely to indicate they participated in these three activities "often" or "sometimes" as compared to individuals with lower levels of education (with gammas of -.164, -.172, and -226, respectively).

Income was related to participation in all activities, with the exception of hunting/trapping (Tables G-28 to G-33). Individuals earning less than $20,000 were least likely to have ever participated in all five activities for which significant and moderate relationships were observed (with gammas ranging from -.104 (for fishing) and -.267 (for motorboating)). Kayaking and fishing was most popular for individuals in the middle income category of $60,000-$79,999. Individuals in the highest income bracket ($100,000 or more) were most likely to indicate they "often" participated in motorboating.

As indicated in Tables H-28 through H- 33, the relationships between age and recreational participation for all activities was significant (chi-square significance level $\leq$.001 for all six activities) and moderately strong, with gammas ranging from .169 (for kayaking) to .381 (for swimming). Individuals 65 and older were most likely to indicate they had never participated in each of the six activities. However, the individuals in this age group still participated more frequently than 55-64 year olds in fishing, motorboating and hiking. The youngest respondents (18-24 years old) were most likely to indicate they often participated in kayaking/canoeing, fishing, swimming, and hiking.

Downstream and upstream residents had relatively equal levels of participation in all six activities, with the exception of swimming: urban/upstream residents were more likely than rural/downstream residents to indicate they "often" or "sometimes" swam in rivers and lakes (Cramer's V = .112; Table I-30).

Table J-13 provides a comparison of participation rates for web survey respondents. The general public, web respondents were most likely to indicate they had participated "often" or "sometimes" in kayaking/canoeing, motorboating, and hiking. Environmental professionals were most likely to indicate they had participated in fishing, swimming, and hunting/trapping. Municipal official participation rates for all activities were between the rates for these two web respondent groups, with the exception of hunting and trapping (for which they indicated the lowest participation rates).

Participation in Positive Behaviors

A major goal of many watershed outreach efforts is to promote environmentally-friendly behaviors among watershed residents. Respondents were asked whether they or a household member had participated in each of nine specific behaviors in the previous three years. It should be noted that when reporting on their own actions, individuals may feel compelled to provide the most socially acceptable response, even for telephone surveys. Thus, engagement in positive behaviors may be over-reported by survey respondents.

The results indicate that Upstate residents do participate in a number of environmentally-friendly behaviors (Table C-11). The participation rates were highest for planting a tree (64.9%) and reducing water usage (59.2%). A significant proportion of watershed residents also indicated they had reduced or eliminated pesticide use (51.7%) and fertilizer use (45.7%), two activities which are often the target of watershed education campaigns.

A relatively small proportion of residents indicated they reduced or eliminated the use of a household product out of concern for the environment (22.8%) or created a wildlife habitat (26.5%). The lowest

participation rates were recorded for those activities involving community organizations: just under 1/5 of respondents (19.3%) made a donation to an environmental organization, followed by participating in a lake or river cleanup (17.6%), followed by joining or volunteering for an environmental or conservation organization (7.3%). Participation rates for all nine activities were significantly lower than rates recorded in the Chesapeake Bay watershed survey (see Center for Watershed Protection, 2002).

Regarding subgroup differences, there were significant differences between men and women for only two activities: men were more likely than women to indicate they planted a tree or participated in a lake or river clean up in the past three years (Cramer's V = .107 and .113, respectively). (Tables D-34 through D-42).

Whites were more likely than minorities to indicate they had stopped using a household product out of concern for the environment (Cramer's V=.148), planted a tree (Cramer's V=.312), created a wildlife habitat (Cramer's V=.190) and reduced or eliminated pesticide use. The relationships between race and the first three activities mentioned above were moderately strong with Cramer's V's ranging from .148 (use of household products) to .312 (planting a tree) (Tables E-34 through E-42).

Statistically significant educational differences in participation were observed for all but three activities: reducing or eliminating pesticide use, reducing water usage and donating to an environmental group (Tables F-34 through F-42). The relationships between education and positive behaviors were moderately strong (with the exception of stopping the use of a household product), with gammas ranging from -.138 (planted a tree) to -.403 (for joining a conservation group). Individuals with a college degree or post-graduate degree were most likely to have participated in these six activities, with the exception of one activity: high school graduates and individuals with some college education were most likely to have reduced or eliminated fertilizer use (gamma=-.142).

Income differences were similar to the educational differences, with moderately strong relationships observed. The relationships were moderate (gamma=-.107 for fertilizer use) to very strong (gamma=-.387 for planting a tree) (Tables G-34 to G-42).

Participation in positive behaviors varied by age for all but one activity: joining or volunteering for a conservation organization (Tables H-34 to H-42). While the youngest respondents (18-24) had the lowest participation rates for reducing water usage, they had the highest participation rates for lake or river clean-up efforts (gamma=.181) and reducing or eliminating pesticide use (although the strength of the relationship was weak). Individuals age 45-54 were most likely to have created a wildlife habitat while individuals 18-24 were the least likely to indicate they had done this (gamma = -.127). Individuals age 35-44 and 55-64 were most likely to indicate they had donated to a conservation group in the past three years (gamma=-.157).

When compared to telephone survey respondents, the general public, web respondents were more than twice as likely to indicate they had stopped using a household product out of concern for water quality. Web survey respondents were also far more likely than phone survey respondents to indicate they had joined or donated to a conservation organization

(Table J-14). Environmental professionals were more likely than all three groups to have participated in these activities. Municipal officials were least likely of the three web samples to indicate they had donated to an environmental group.

Participation in Potentially Negative Behaviors

Despite indications of "environmentally-friendly" behaviors, some residents are doing things that could harm local rivers and streams (Table C-12). Nearly 1/3 (30.5%) of respondents indicated they "often" or "sometimes" used fertilizers on their lawns and nearly one-fourth (22.9%) of respondents reported leaving pet waste in their yards "often" or "sometimes."

On a more positive note, nearly all respondents indicated they never disposed of oil down storm drains (98.2%), dumped grass clippings down storm drains or in backyard creeks (97.9%) or stored fertilizers or pesticides in leaking containers (97.9%). These figures reflect national trends which indicate that between 1% and 5% of residents dump oil or water down storm drains (Center for Watershed Protection).

There were fewer subgroup differences in participation in negative behaviors than for participation in positive behaviors. However, there were some subgroup differences for some of these negative activities, with moderately strong measures of association. Males were more likely than females to indicate they "often" or "sometimes" fertilized their lawn (10.7% of males compared to 6.2% of females; Cramer's V=.105) and operated a vehicle with oil leak (11.9% of males indicating "often" or "sometime" as compared to 6.6% of female respondents; Cramer's V=.119). Females were more likely than males to indicate they "often" or "sometimes" left pet waste in the yard (25.1% of females compared to 20.4% of males indicating "often" or "sometimes"; Cramer's V=.129) (Table D-43 to D-48).

With one exception, no statistically significant racial differences were observed in respondents' participation in potentially negative activities. In the one exception, whites were more likely than minorities to indicate they had left pet waste in their yards (Cramer's V = .129; Table E-44). This difference may be a reflection of differences between racial groups in patterns of pet ownership.

The only action for which educational differences were observed was fertilizing lawns: those with highest level of educational attainment (post-graduate degree) were more likely to indicate they "often" or "sometimes" fertilized their lawns (gamma=-.161) (Table F-43). Similarly, respondents in the higher income categories were more likely than other respondents to have fertilized their lawns in the previous three years. The association between income and use of fertilizers was quite strong (gamma=-.294; Table G-43), possibly reflecting differences between income groups in home ownership.

Regarding age differences, individuals 65 and older were least likely to have ever left pet waste in their yards (87.7% as compared to between 60.9% and 73% of those in the other age categories indicating they "never" left pet waste in their yards) (gamma= .117). As with racial differences, this finding may be attributed to differences in pet ownership. Individuals age 25-34 and 35-44 were most likely to indicate they "often" or "sometimes" operated a motor vehicle with an oil leak (gamma=.218). The youngest respondents were most likely to indicate

they "often" or "sometimes" disposed of oil down storm drains (gamma=.333), although the percentage of 18-24 year olds doing so was very low (4.3%).

For all six activities, no statistically significant differences between upstream and downstream residents were observed. Upstream and downstream residents were equally likely to indicate they had, or had not, participated in each of the six activities.

There were some important differences between telephone survey respondents and web survey respondents in participation in negative behaviors (Table J-15). For all six activities, the telephone sample was more likely than the web sample to indicate they had "never" participated in the activity listed. This was especially the case for leaving pet waste in one's yard: nearly 70% of telephone respondents indicated they had not participated in this behavior in the past three years as compared to just 27.8% of the web respondents. Similar large differences in indicating "never" participating were found for operating a motor vehicle with a leak (81.3% of phone survey respondents vs. 60% of web-survey respondents), improper disposal of grass clippings (97.9% vs. 87.9% of web survey respondents) and improper storage of fertilizers and pesticides (97.9% of phone respondents vs. 91.4% of web survey respondents). That is, the behavior of the more environmentally-sensitive web respondents did not necessarily match their attitudes and level of concern (as measured by a number of other questions on the survey).

Likelihood of Future Involvement

General public respondents were asked to indicate how likely they would get involved in efforts to improve water quality if certain scenarios occurred. As was the case for participation in positive behaviors, caution should be used in interpreting these results for respondents may have overstated their likelihood of participation in efforts to improve water quality.

For phone survey respondents, the high level of concern about water quality is generally matched by a high level of willingness to get involved in efforts to improve water quality. For each of the questions related to likelihood of getting involved, the proportion of respondents who indicated they were "somewhat likely" or "very likely" to get involved exceeded 75 percent (Table C-13). Respondents would be most likely to get involved if they were personally affected: if they could either personally save money or if they were being directly impacted by water pollution. Providing information about water quality issues, either directly to respondents, or through the media, would have the least impact on citizens' likelihood of getting involved in efforts to improve water quality. This finding seems to somewhat confirm the earlier finding (Table C-7) that the media was not the main source of information on the environment.

When comparing these results to a survey in the Chesapeake Bay region, SRW residents are significantly more likely to indicate they would get involved in efforts to improve water quality on four measures asked in both studies: if it impacted them personally, if they knew how they were being directly affected by pollution, if they could save money in the long run, and if they had more information on the environment (McClafferty, 2002).

Concerning demographic differences in likelihood of getting involved, with the exception of two cases, there was a statistically significant relationship between

gender and likelihood of becoming more involved in efforts to improve water quality (Tables D-49 through D-54). Men were more likely than women to indicate they were "very likely" or "somewhat likely" to become involved for three scenarios. However, the strength of the relationship between gender and these involvement scenarios was very weak for all variables except for personally saving money in the long run (Cramer's V=.130).

There were also racial differences in respondents' likelihood of becoming involved in water quality issues (Tables E-49 through E-54). Minorities indicated a greater likelihood of becoming more involved if they or the government could personally save money in the long run (Cramer's V= .119 and .105, respectively). Also, minorities were more likely than whites to indicate they would likely get involved if the local media featured stories either on water pollution problems (Cramer's V=.145) or on positive actions taken by local residents to improve water quality (Cramer's V=.111).

Significant differences and moderately strong relationships were found between age groups in the percentages of willing to become involved in efforts to improve water quality (Tables H-49 through H-54). For five of the six scenarios, those aged 65 and older were least likely to indicate they would get involved in efforts to improve water quality for each of the six scenarios. Young people (age 18-24) were most likely to indicate they would "very likely" get involved if they could personally save money (gamma = .235), if the local government could save money (gamma = .218), or if they were directly impacted in some way by water pollution (gamma = .281 for a moderately strong relationship).

The baseline survey indicates that while downstream residents are more concerned about water quality, downstream and upstream are equally likely to indicate a willingness to become involved in efforts to improve water quality. No significant differences were observed between upstream and downstream residents in the likelihood of getting involved in efforts to improve water quality (Tables I-49 through I-54).

On most items, telephone survey and web survey respondents were quite similar in their willingness to become involved (Table J-16). Fifty percent of respondents in both groups indicated they would "very likely" become involved if they could personally save money. A still higher percentage of respondents (75% of the phone survey respondents and 70% of the web survey respondents) indicated they would "very likely" become involved if the water quality issues impacted them personally. The two groups would be relatively equally influenced by media stories on water quality. However, it is apparent that web survey respondents would be more influenced by additional information on the environment.

Willingness to pay

While many residents indicated they would likely become involved in efforts to improve water quality, it is also important to assess residents' willingness to pay for such improvements. Results for the telephone survey reveal that watershed residents are generally willing to pay for improvements to the watershed (Table C-14). Respondents were most willing to pay more on their monthly water bill to improve the overall quality of water (60.0% responded "yes"). A majority of the respondents indicated they would be willing to pay extra for each of the two additional items mentioned in the

survey: to ensure all persons enjoy the same quality of water (53.2%) and to pay for the cover of trash removal (51.7%).

Regarding race, Whites indicated they would be more willing than minorities to pay extra on their water bills to improve overall water quality and to pay more on soft drinks and snacks, although the strength of the relationship between race and willingness to pay was weak (Cramer's V's for each of these questions were less than .10).

For all three willingness to pay questions, individuals 18-24 years old were most willing to pay extra, while individuals over the age of 65 were least likely to indicate they would be willing to pay extra on their water bills or for snacks (Tables H-55 through H-57). It is significant to note that a higher proportion of young respondents (ages 18-24) as compared to respondents age 25 to 64 were more likely to say they would be willing to pay extra for snack foods (gamma=.264). Nearly three-fourths (72%) of individuals age 18-24 indicated they were willing to pay more on snack foods to cover the costs of trash removal, as compared to approximately one-half (from 50% to 53.7 %) of respondents in the other age groups. This contrasts with the image of young people being "rubbish rebels" who have low levels of environmental awareness and willingness to become involved in conservation efforts (CWP, 1999). The relationships between age and willingness to pay were moderately strong with gammas of .232 (to ensure all persons enjoyed the same quality of water), .198 (to improve the overall quality of water), and .264 (to pay extra on snack foods).

There were no significant gender, income, education or residence (upstream vs. downstream) differences in willingness to pay.

When compared to the phone survey respondents, web survey respondents were equally willing to pay extra on their water bills to improve the overall quality of water, but slightly more willing to pay extra to ensure all persons enjoy the same quality of water and to pay extra for snack foods. Interestingly, for all three willingness to pay questions, both municipal officials and environmental professionals vastly underestimated the public's willingness to pay extra to improve water quality (Table J-17). For example, over half of both the general public phone and web survey respondents were willing to pay extra for snack foods, yet only 18.2% of municipal officials thought they would be willing to do so.

Special Analyses

The web surveys of the general public, municipal officials and environmental professionals included several questions which incorporated visual images and open-ended questions. The results for these specialized questions are presented in the following section and appear in Appendix K.

General Public Web Survey

Perception of News Headlines

As described in an earlier section of this report, residents and decision makers in the Saluda-Reedy Watershed tend to rely on newspapers and television stories for information about water quality, although to a lesser extent than they rely on personal observation. When designing outreach efforts, simply providing information to local citizens does not mean they will

necessarily respond to a particular story about the environment or that the story will increase their concerns about the environment. The web survey sought to explore this issue by providing the general public with an opportunity to respond to media portrayals of environmental issues.

The general public web survey included a question that explored how the public reacts to different news scenarios. Respondents were presented with images of six headlines of news articles that had appeared in local newspapers. The headlines and brief article summaries appear in Table K-1.

This section of the survey began with a collage of the image of the headline and the following statement: "On the following pages, you will find a series of current local news articles that are related to water quality and watershed health. For each, you will be asked to rank the overall importance of each issue and to indicate your personal level of concern regarding each. After viewing an image of the headline, respondents were asked if they wanted to read the article. Whether or not they went on to read the articles, each respondent was then asked two questions. First, "How important is the issue addressed in this article to the environmental quality of your local streams and waterways?" And then, "How important is the issue addressed in this article to you personally?" The response categories were "very important", "somewhat important", "not at all important", and "do not know."

As indicated in Table K-2, the article for which the "overall importance" and "personal importance" was the greatest was the article about the Upstate's polluted rivers. Nearly 65 % of respondents indicated this was "very important" overall and 61.7% indicated the information in this article was "very important" to them personally. Moreover, more respondents (46%) reviewed this article more than any of the other articles and for the longest amount of time (a median of 50 seconds). Respondents were least likely to have read the article about saving the trout population (only 21.8% of respondents read this article) and the power plant article (only 28.1% read this article).

For all measures, the percentage of individuals who indicated an article was "very important" overall exceeded the percentage who felt the same article was "very important" to them personally. The one exception was the article on the Upstate's polluted rivers. This article was of relatively equal importance, both overall and personally.

Some readers may speculate that the order in which the articles appeared could have influenced whether or not respondents viewed the article behind the headline. While a "fatigue factor" may have seemed to set in after reading the first three articles (as indicated by the decreasing amount of time spent reading the first three articles), the greatest amount of time (median of 50 seconds) was spent reviewing the fourth article (on Upstate water pollution).

Municipal Officials Web Survey

Importance of Water Quality as Compared to Other Policy Issues

Municipal officials were asked to rank the importance of several policy issues, including water quality, by responding the following request: "Please indicate the importance of the following municipal government responsibilities on a scale of 1 to 5 with 1 as the least important and 5 the most important."

As indicated in Table K-3, protecting water quality ranked in the middle of the list, just ahead of public transportation and parks and recreation (with 16% of municipal officials providing a ranking of "5" for both of these activities) and tied with road and bridge repair (at 25% of respondents giving these issues a ranking of the "highest importance"). The traditional activities of local government (e.g., police and fire protection and public schools) are among those that are consistently judged to be the most important. These priorities stem from traditional priorities for local and state government in South Carolina. Therefore, it will take further education and effort to convince municipal officials of the relevance of other policy areas, such as improving and protecting water quality.

Description of Water Quality Problems

Municipal officials were asked to describe the top three problems impacting water quality in the Upstate. Their open-ended responses appear in Table K-4. Many of the problems listed by municipal officials are interrelated. Loss of green space, increase in impervious surfaces and poorly designed parking areas emerged as a predominant theme. Several policy issues were also raised, including DHEC enforcement policies and concerns about planning.

Perception of Land Use Photos

The municipal officials' web survey included photographs of different land use practices. Respondents viewed four separate pairs of photographs that depicted various options in land use, including the design of retail parking, the landscaping of retail parking lots, the recreational use of waterways, and the use of open space. After viewing each pair of photos, respondents were asked "What impact do you think the choice of one option rather than the other would have on water quality in the Upstate?" Response categories were "Great impact," "some impact," very little impact," "no impact"; and "do not know." The photos presented to respondents are in Table K-5.

As indicated in the results presented in Table K-5, some municipal officials thought the two photos for certain scenarios represented stark contrasts, and thus were more likely to believe the choice of one over the other option would have a "great" impact on water quality. On the other hand, the differences between the two photos were not apparent to other respondents, as indicated in the percentage of respondents who indicated that the choice of one option over another would not impact water quality.

The two sets of parking lot photos (design of retail parking and landscaping of retail parking lots) seemed to cause most concern: one-half of the respondents indicated a choice of one design over the other would have a "great" impact and over 57.1% indicated the choice of landscaping options for retail parking lots would have a "great impact" on water quality in the Upstate. This seems to mirror the concerns described in the open -ended responses (Table K-4), when municipal officials listed various parking-related issues as a major concern. However, when "great impact" and "some impact" responses were combined, the photos on recreational use of waterways and the use open space seemed to generate the most concern, as indicated by the percentage of respondents who said that the choice of one option over the other would have "some" or a "great" impact on water quality.

Influences on Views on Water Quality

Municipal officials were asked to what extent various sources of information influenced their views on water quality (Table K-6). Respondents indicated they would be most (and equally) influenced by articles in professional journals and by citizen comments: just over 57% of respondents indicated that these two sources influence them to a "great extent." Fifty percent of respondents indicated that conversations with other municipal officials greatly influence their views on water quality. Municipal officials' views on water quality would be least influenced by news articles: only 14.3% said such sources of information influence their views to a great extent.

Use of Conservation Practices in Municipalities

The use of conservation-related practices was measured by a series of three questions on the: (1) current use of conservation related practices; (2) factors that would encourage municipal officials' use of conservation-related practices; and (3) factors that would prevent municipal officials from using such practices.

Current Use of Conservation Practices

Municipal officials were asked to what extent six practices were used in their municipality (Table K-7). The most commonly-used practices were community recycling programs (86.7% indicating this was used "often" in their municipality), sponsoring clean-up days (50% indicating "often"), and street cleaning (50% indicating "often"). The more proactive measure of acquiring stream buffers was used least often (2.14% indicating they "never" used this practice). Interestingly, over half of the respondents (57.1%) indicated they "did not know" whether their municipality had reduced fertilizer use in parks.

Factors Encouraging the Use of Resources to Improve Water Quality

Municipal officials were asked the following question: "How likely are the following to encourage you to invest your municipal resources in protecting water quality? Would you say it would be: very likely, somewhat likely, somewhat unlikely, not at all likely, or do not know?"

Observing practices used in other municipalities would be most likely to encourage officials to invest resources in protecting water quality (Table K-8). Extending this theme of peer influence, the second most important factor was "conversations with officials from other municipalities," with 46.2% of respondents say this would "very likely" influence them to invest municipal resources in improving water quality.

It also appears that responses to this question contradict the responses to the question about what influences officials' views on water quality (discussed above; see Table K-6). While 57.1% of respondents indicated that articles in professional journals would impact their general views on water quality (Table K-6), no municipal officials indicated such articles would influence them to actually devote resources to improving water quality (Table K-8). Also, while only 14.3% indicated that the media would influence their views on water quality to a "great extent", just over one-fifth of respondents indicated they would be "very likely" influenced by news stories and special features to invest municipal resources in improving water quality.

When asked an open-ended question about what additional factors influence their views on water quality, municipal officials mentioned field trips with local conservationists, personal observations of [the] lack of respect for waterways, and "30 years of adult observation."

Factors Discouraging the Use of Low-Impact Development Strategies

To gain insight into barriers to using low-impact development strategies, municipal officials were asked "To what extent do the following prevent you from promoting low-impact development in your municipality? To a great extent? To a limited extent? Not at all? Or, do not know?"

To some extent, municipal officials do not see policy or administrative factors as barriers. As indicated in Table K-9, the greatest barrier to incorporating positive practices is the lack of economic incentives to use such practices. Sixty-four percent indicated the structure of the master plan was not a barrier. Fifty-seven percent indicated the lack of formal zoning was not a barrier. Nearly 43% indicated that building codes and local land laws were not preventing them from promoting low-impact development. The municipal officials also indicate they don't see citizen opposition or the structure of the permitting process as barriers to low-impact development.

Suggestions for Improving Water Quality

Municipal officials were asked "In your opinion, what are the most cost-effective actions to protect water quality in your area. In other words, what measures do you think would yield the greatest benefits at the lowest costs?" Responses to this question are provided in Table K-10. Answers covered a variety of topics, including policy changes, collaborative efforts with other stakeholders, and basic watershed education.

Municipal officials were then asked "What types of data and resources do you need to promote low-impact development and water quality protection that you do not already have access to?" They offered a variety of responses, including the following:

- A toolkit to show developers alternative design approaches to maximize water-quality protection as well as save money on the developer's end.
- Examples of other local low-impact development plans from areas similar to our County and municipalities
- Real economic data on the loss of opportunity costs associated with water quality degradation and future use; and
- River benchmarking. How are we doing? Where are the difficulties? What are some best practices we can enact?

Environmental Professionals Web Survey

Training, Data and Equipment Needed

Environmental professionals were asked about their needs for environmental training, data, and equipment. The possible responses to the list of items were: "Have and use", "Have, but don't use", "Don't have, but need" and "Don't have, don't need."

As indicated in Tables K-11, K-12, and K-13, environmental professionals had a wide range of needs on one hand, but also currently have access to a wide variety of training and tools. The predominant theme,

when looking at these three tables, is that a significant proportion of respondents indicated they had no needs for the specific training, data or equipment listed in the survey. The predominant training need was for Environmental Site Assessments for Real Property Transfers, conducting environmental audits, and for RCRA and DOT training (needed by 33.3% 21.1%, and 21.1% of respondents, respectively).

The predominant data needs are for wildlife data (13.6% of respondents indicating they "don't have, but need" these data), historical ecosystem data (14.3%) and detailed local weather data (14.3%). Of relevance to the current project is the need for water quality and water quantity data. More than one-half of respondents indicated they "have, but don't use" (13.6%) or "don't have, don't need" (31.8%) water quantity data. Over sixty percent of respondents indicated they either "have, but don't use" (18.2%) or "don't have, don't need" (45.5%) water quantity data. Regarding needed equipment, water and soil testing equipment and hazardous waste handling equipment ranked at the top of their list of needs (although, only 10% of the sample indicated they needed each of these).

In the open-ended questions asking what additional training, equipment or data were needed, environmental professionals indicated they could benefit from additional training in conservation easements, hydrologic modeling, and web design. Additional equipment mentioned included GIS software, remote sensing equipment, and small stream discharge gauge systems.

When asked to indicate what additional data they would need, environmental professionals had a wide variety of requests that extended beyond the itemized survey list. Their requests included: detailed flow data from all hydroelectric impoundments, detailed morphometry for all lakes, economic impact of residential development and of parks and trails in South Carolina and the Upstate. historical data on benthic macroinvert-ebrates, long-term monitoring data on smaller streams, information about what the general public's interest, opinions and willingness to pay or willingness to change lifestyle to protect water resources, water quality data (especially temperature and dissolved oxygen monitoring), information on the political climate in different areas of state and/or counties and an Upstate environmental GIS warehouse.

Issues That Environmental Professionals Would Like to See Explored by Other Stakeholders

In the interest of gaining insights into environmental professionals' views on integrated watershed management, respondents were asked the following question: "What issues or questions related to watershed protection would you most like to see explored and addressed by policy makers, citizens and others?" Their open-ended responses to this question are provided in Table K-14. Their requests covered a variety of concerns including water quantity and quality and the need for alternative policy solutions (e.g., using watershed, rather than political boundaries, for managing water resources).

RECOMMENDATIONS

This section of the report integrates some of the main research findings from the telephone survey and the three web surveys. Watershed education has the potential to broaden residents' perceptions about how they can make a difference in their local community and to nurture a sense of dedication to place. The survey results offer

some initial guidance as to how such an education effort in the Saluda-Reedy watershed should proceed. The results also have implications for how SRWC communicates with citizens about watershed issues.

Overall concern about water quality

A predominant theme in the research data was the importance of the watershed to local residents and decision makers. There is a high level of concern about water quality on the part of the general public and the web survey respondents. Women and rural, downstream residents were especially concerned about water quality. This concern may stem from perceptions of how water quality has changed over time. A majority of telephone survey respondents feel that local waterways have worsened over the past 10 and 25 years. This high level of concern provides an important starting point for watershed education and for nurturing a dedication to place that is so important for these kinds of efforts.

Knowledge about watersheds

Knowledge about watersheds provides a basis for the development of a "watershed consciousness" among local residents. Survey results suggest that education about the basics of watershed principles would go a long way. While concern among Saluda-Reedy watershed residents was high and comparable to levels of concern in other watersheds, knowledge about watershed basics was quite low. The ability of watershed residents to identify the correct definition of "watershed" was far below the level of knowledge recorded in other areas of the country. Less than 30% of respondents for the Saluda-Reedy survey were able to choose the correct definition of watershed. This difficulty is compounded by the localized connotation of "watershed" in the Upstate. Clarification of the basics of watersheds will help residents to better understand how their practices impact watershed health, both upstream and downstream.

Given that so few could state where local runoff landed and could state that mowing to the edge was an ineffective practice, better education efforts regarding the workings of watersheds could improve appreciation for the complexity of the watershed and the interrelatedness of various causes of pollution. Efforts such as watershed signs may help to better inform residents about the boundaries of the watershed (and let them know that the watershed extends beyond the "watershed" reservoir located in Greenville County). Additional measures should also be taken to inform residents about the localized nature of watersheds, in terms of the extent and nature of local streams and waterway in their own neighborhoods and how these tributaries connect to the watershed as a whole. Such knowledge could lead to more concern and action on the part of local citizens.

Observation and Perceptions of Pollution

Respondents to all four surveys indicated they had observed pollution in the Upstate, although the types of pollution observed and the extent to which they were observed varied widely. While the differences in perceptions and assessments of impact are not surprising, the data provide further insight into the specifics of these differences.

For example, there were several differences between income groups in what types of pollution were observed. Higher income respondents were more likely to observe trash and debris and algae. Such

observation patterns may be influenced by heightened attention to a particular pollution source. For example, a higher percentage of municipal officials indicated they had observed algae than indicated they had observed litter. This may be the result of the media attention to the algae problems in the lower part of the watershed.

Observation of pollution is also related to where people live and work or travel on a day-to-day basis. Active efforts to take people out of their "comfort zone" and explore all areas in the watershed may broaden people's perceptions of the causes, consequences, and solutions to pollution in local waterways.

Successful integrated watershed management relies on the development of a common knowledge base and understanding about watershed challenges. The data reveal the depth of disparities in respondent perceptions in the changes in water quality over time and of the impacts of pollution. For example, municipal officials' assessments diverged from the general public in some cases (e.g., just over 41% of phone respondents felt car exhaust was a "great" problem as compared to 13% of municipal officials) and were similar in other instances (e.g., when assessing the impact of waste from boats). Thus, when citizens attempt to influence decision makers to take action about a particular issue, municipal officials may not see the relevance of such action.

At the same time, the general public was relatively equal to environmental professionals in their assessments of the impact of fertilizers and farm operations, yet they were vastly different in their assessments of the impact of home construction, waste from boats, and water run-off. If we assume environmental professionals are more accurate in their assessments, then the public may not understand why environmental professionals are not concerned about some issues (such as boating or littering), and are concerned about others (such as construction of new roads).

As indicated in the report, residents have a basic level of understanding about the various causes of poor water quality, although there seems to be little connection made between the various causes of pollution. For example, construction of homes and roads, two activities seemingly related to growth in the Upstate, did not cause as much concern among respondents as did growth in the Upstate. Local residents could benefit from additional information about the interrelatedness of the various causes of pollution. Survey results suggest that certain segments of the watershed population would benefit from more information about the impact of fertilizers on water quality.

Targeting Particular Subgroups

While there is a need to expand watershed awareness across all groups, survey results suggest that a more targeted education strategy may be appropriate for certain issues. That is, several response trends indicate a need for "segmented" outreach to specific sociodemographic groups. Of particular relevance are the sex, race, age and residential differences observed.

Regarding gender differences, women expressed greater concern about the environment and were more likely than men to feel that water quality had degraded over time and to perceive that a number of pollution sources had a "great" impact on water quality. However, men were far more likely than women to participate in outdoor

recreational activities and to indicate they would likely become involved in efforts to improve water quality, especially if they could save money personally. More research should be conducted to explore the basis of these differences in attitudes and behaviors.

The data suggested some important racial differences as well. Despite being equally concerned about water quality, minorities were more likely than whites to assess sources of pollution as having a "great" impact and were more willing than whites to indicate they would likely get involved in efforts to improve water quality for various reasons. This level of concern and willingness to get involved was higher than whites, despite minorities having lower rates of participation in outdoor activities.

As documented in the literature on environmental injustice, minorities and low-income populations often disproportionately bear the brunt of environmental degradation (Bullard, 2000). Efforts to promote watershed identity and stewardship need to include the unique views of minority groups. Such strategies would require going beyond the traditional conservation efforts of watershed education. Such endeavors could have a more urban focus, with a particular emphasis on how minority (and low-income) citizens can contribute to efforts to improve water quality.

SRWC's efforts to strengthen local grassroots groups would be of benefit to minority and low-income neighborhoods, for environmental justice efforts rely on "bottom-up" citizen input as a starting point. And, the data collected suggest that minorities (and low-income respondents) may respond to such "bottom-up" citizen-based approaches. Both minorities and low-income respondents were more likely than Whites or individuals from other income groups to indicate that they relied on environmental groups as their main source of information on water quality (although personal observation was still the main source of information for both groups).

SRWC should consider including minority and low-income groups in its effort to strengthen local non-profit conservation groups. One example of such a group is ReGenesis, a community-based environmental justice organization located in Spartanburg, SC. Recently featured in Upstate Forever's *Upstate Update* newsletter (June 2003), the group aims to empower local citizens to lobby for healthier environments and for an increase in green spaces in their neighborhoods.

The data also suggest that while low-income and minority respondents were most likely to rely on environmental groups for information, they were least likely to join or to donate to such groups. Strategies for increasing minority and low-income membership and active involvement in local groups should be promoted, including sliding scale membership fees, outdoor recreational activities, and neighborhood-based river clean-up days.

Outreach efforts can also be segmented to individuals in different age groups. In this research, there was a statistically significant relationship between age and all but nine of the dependent variables. Nearly 2/3 of these relationships (16 of 48) were moderately strong, with measures of association greater than .10. Of particular interest were the findings about the youngest respondents (18-24 year olds). Although young respondents expressed the lowest level of concern about the environment, they were more likely than individuals in other age groups to assess the various sources of

pollution as having a "great" impact on the environment. Additionally, they were the most highly engaged in recreational activities, most likely to indicate they would get involved in efforts to improve water quality and expressed a greater willingness to pay.

SRWC has recently initiated watershed education efforts with children in younger age groups. This endeavor makes sense given the research which documents the importance of reaching children at a young age to develop a sense of place and to socialize parents about the importance of conservation and recycling efforts. Survey results suggest that SRWC may want to consider reaching out to local high school and college students. Given that this is the generation that has received the greatest degree of environmental education, such efforts may have a positive impact on the local community and on water quality.

Considering the nature of watersheds, it is important to consider the differences in the data between downstream (rural) and upstream (urban) residents of the watershed. While rural residents were slightly more concerned about water quality, they were equally likely to have observed various sources of pollution. However, the two groups had different perceptions about the impact of various sources of pollution. Because downstream residents were more likely to believe that growth in the Upstate had a "great" impact on water quality, there may be the perception that upstream residents contribute more to degraded water quality than downstream residents. Both groups could benefit from education about how the various causes of pollution are interrelated.

Likelihood of Getting Involved in Efforts to Improve Water Quality

An encouraging sign is the fact that Saluda-Reedy watershed residents are quite willing to get involved in efforts to improve water quality, when compared to individuals in other areas of the country (McClafferty, 2002). Fifty percent of respondents indicated that they would be most likely to get involved if they could personally save money, but a still higher level (75%) if they were directly impacted in some way by pollution. So, it is not only the "pocketbook issues" that will impact local residents and prompt them to translate concern into action. And, minorities and young respondents were most likely to indicate they likely get involved in efforts to improve water quality.

Outreach Strategies

Personal observation was the primary source of information on water quality. To a lesser extent, some respondent used both media and personal observation. Thus, SRWC will need to rely on more than media stories to communicate the importance of the watershed and to educate local citizens how they can make a difference in protecting local waterways.

Given the importance of personal observation, the eyes of local residents need to be "trained" to "see" both the watershed (in terms of understanding its geographic boundaries) and the potentially harmful (and beneficial) influences on water quality. In other words, SRWC should consider how to make the best use of visual images in getting across what a watershed is and how residents can improve their relationship to local waterways. Watershed tours and maps could contribute to these kinds of efforts.

Certain subgroups indicated they would be influenced by the media. Minorities were more likely to mention the media as a source

of information on water quality, while rural residents were more likely than urban residents to indicate they obtain water quality information from environmental groups.

The local media can also be used to communicate to the public and to municipal officials. The survey experiment with the news headlines suggests that local citizens respond to certain kinds of media portrayals. There is evidence that some types of headlines will capture residents' attention to the point that they read an article, while other types of headlines do not. For example, only about half as many people bothered to read the article on saving the trout population and they read it for a fraction of the time as compared to those who read about the identification of the Upstate's polluted waters. Perhaps residents responded to this article because they felt it most related to their locality. If this is the case, then perhaps a "Top 10" (or "Top 5") list and description of the water quality of local waterways would resonate with residents. When presented with such a headline or article, potential readers may be prompted to ask themselves "Which waterways are featured here?" "Do I live near any waterways on the list?" "Do I swim or boat in any of these waterways?"). We recommend a more careful and systematic study of what themes would lead residents to respond to various types of watershed education efforts.

Caution should be used when using the media to influence municipal officials. On one hand, municipal officials who responded to this survey indicated the news media did not influence their views on water quality. However, a greater proportion indicated their decisions about the use of resources to protect water quality may be influenced by media portrayals.

The web sample of general public shows that an interested and knowledgeable segment of the public can be reached through on-line media. This segment of the population is more highly educated, earns higher incomes, and is more likely to participate in outdoor recreational activities. However, survey results show that these individuals are more likely to participate in those behaviors which harm watersheds. When designing education materials, SRWC can take advantage of the unique capabilities of the Web to allow for visual messages tailored to this segment of the population.

Visual images could also be used to influence municipal officials. In explaining the consequences of different land use options, it may be useful to show photos that, to the untrained eye, would seem to be quite similar in how they impact water quality. That is, efforts could be made to train the municipal officials to see with the eyes of the environmental professional.

Integrated Watershed Management

The survey results provide a starting point for the development of an integrated approach to improving water quality in the Saluda-Reedy watershed. The data provide information about differences and similarities in perceptions and behaviors of various stakeholders. For example, municipal officials and environmental professionals greatly underestimated the general public's willingness to pay extra on water bills to improve water quality. This willingness to pay should be communicated to municipal officials. Additionally, municipal officials should be aware that a significant proportion of respondents are willing to get involved in efforts to improve water quality if the local government could save money.

Also, over three-fourths of municipal officials indicated they do not use low-impact development practices because citizens do not ask that such practices be used. And, one-half of the municipal officials indicated that citizen opposition to such measures would not prevent them from using such measures. This seems to suggest that citizens could have a positive impact on policy makers' decisions to improve water quality, if these local residents would get involved in such efforts.

Suggestions for Future Survey Efforts

Future survey efforts should focus on obtaining more information from some key stakeholders, including municipal officials and developers. This research effort relied on a purposive snowball sample of these respondents. In the case of municipal officials, we were somewhat successful in this outreach endeavor. Future efforts to obtain data from key decision makers would benefit from broader publicity about the research effort. Such communication should come directly from SRWC to facilitate greater response rates.

Concerning our difficulty in reaching developers, research has documented a number of challenges in studying this group, including defining the population to be studied (e.g., real estate professionals, architects, construction workers, or site managers), focusing on the proper sector (e.g., public, private, or non-profit developers), gaining access to the study population, and potential biases in responses once developers are located (Heberle 2003). In future survey efforts in the Saluda-Reedy watershed, greater use should be made of personal and professional networks to reach this respondent group. Because development professionals have such an important role in improving water quality, their input into water quality improvement efforts should be actively solicited.

In conclusion, the survey results provide a starting point for designing and implementing watershed education efforts in the Saluda-Reedy watershed. Watershed residents expressed a high level of concern about the quality of local waterways. An effective education effort can help to translate this concern into positive action. The survey results will serve as a baseline for determining the ultimate success of such efforts.

References

Bullard, Robert. 2000. *Dumping in Dixie: Race, Class and Environmental Equality*. Boulder, CO: Westview Press.

Center for Watershed Protection. 1999. *A Survey of residential nutrient behavior in the Chesapeake Bay*. Ellicott City, MD: Center for Watershed Protection (Report available at: http://www.cwp.org/UNEP_all.PDF).

Heberle, Lauren. 2003. *In search of good data: Problems in gathering useful information about redevelopment projects or "Where have all the developers gone?"* Louisville, KY: Center for Environmental Policy and Management.

McClafferty, Julie. 2002. *A survey of Chesapeake Bay watershed residents: Knowledge, attitudes and behaviors towards Chesapeake Bay watershed quality issues.* Annapolis, MD: Chesapeake Bay Program.

Photo credits (for photos presented in Table K-4):

Design of retail parking: Upstate Forever
Landscaping of retail parking lots: Upstate Forever

Recreation use of waterways:
Jet ski: U.S. Fish and Wildlife Service/John and Karen Hollingsworth
Canoeing: Lynn Betts/USDA Natural Resource Conservation Service

Use of open space:
Golf course photo: Ted Covington/Pics4Learning.com
Wetlands: Lynn Betts/USDA Natural Resource Conservation Service