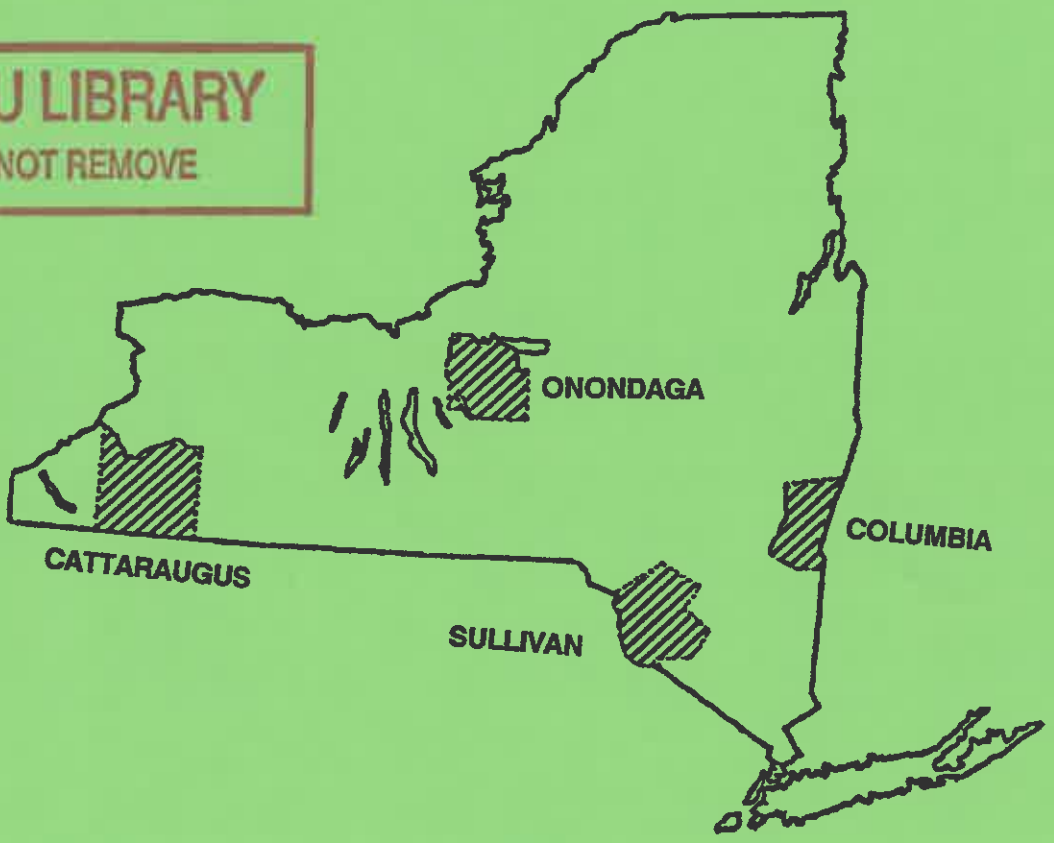
AN ASSESSMENT OF ATTITUDES AND BELIEFS ABOUT SEWAGE SLUDGE MANAGEMENT STRATEGIES IN NEW YORK

by

Larry M. Gigliotti

HDRU LIBRARY
DO NOT REMOVE



HDRU Series No. 91-10

December 1991

Human Dimensions Research Unit
Department of Natural Resources
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, N. Y.

HUMAN DIMENSIONS RESEARCH UNIT PUBLICATIONS SERIES

This publication is part of a series of reports resulting from investigations dealing with public issues in the management of wildlife, fish, and other natural resources. The Human Dimensions Research Unit (HDRU) in the Department of Natural Resources at Cornell University is a nationally-recognized leader in the study of the economic and social values of wildlife, fish, and other natural resources and the application of such information in management planning and policy. A list of HDRU publications may be obtained by writing to the Human Dimensions Research Unit, Department of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853.

AN ASSESSMENT OF ATTITUDES AND BELIEFS ABOUT SEWAGE SLUDGE MANAGEMENT STRATEGIES IN NEW YORK

by

Larry M. Gigliotti

December 1991

EXECUTIVE SUMMARY

The overall goal of this study was to provide information about people's values, understanding, interest, and concerns about sewage sludge management to guide the development of a plan for public education. Two major objectives of the surveys were to identify: (1) the public's orientation towards various sewage sludge management strategies, and (2) the public's desire for involvement in sewage sludge management issues. Surveys of two populations (general public and selected groups) in four New York State (NYS) counties (Cattaraugus, Columbia, Onondaga, and Sullivan) were implemented.

SUMMARY FINDINGS

- The four sample counties were relatively similar in attitudes and beliefs about sewage sludge management strategies.
- Although the selected groups tended to be more accepting of the various sludge management strategies than the general public, by and large both groups had relatively similar attitudes and beliefs.
- Overwhelmingly, both sample groups perceived that sludge management is becoming a significant problem in NYS.
- Significant numbers of people were on both sides (opposed/accepting) of any sludge management strategy. No sludge management strategy was strongly accepted by the public, although most people agreed with the decision to end ocean dumping of municipal sewage sludge.
- The public (general public and selected groups) had no clear preference for a sludge management strategy. Also, no clear consensus existed among the public about the negative and positive aspects of the possible sewage sludge management strategies.
- Overall, attitudes and beliefs about safety, nuisances, and potential benefits of sludge management were strongly related to the degree of opposition or acceptance of the various sludge management strategies.
- Individual's preferred sludge management strategy was strongly related to general beliefs about the overall safety, noxious characteristics, and potential benefits of the sewage sludge management strategies.

- Over three-fourths of the respondents believed that sewage sludge should be managed locally (within city and/or county boundaries). The general public sample was more likely to have a "local" attitude about management than the selected groups sample.

- Respondents with a "regional" (as opposed to a "local") attitude about sludge management were more likely to perceive benefits associated with sewage sludge and more likely to believe that safety and nuisances could be properly managed.

- Most people were not knowledgeable about sludge management regulations.

- Most people believed that utilizing the nutrients in municipal sewage sludge was a good idea; however, fewer people believed that it can be done safely or without nuisance problems.

- Few people believed that any single sewage sludge management strategy was ideal.

- Preference for a strategy was not a perfect predictor of acceptance (or rejection) of nearby application of that strategy. For example, almost half of the respondents who preferred incineration or landfills would be opposed to that sludge management strategy being near their place of residence (within their township).

- Preferences for sewage sludge management strategies were not strongly related to demographic characteristics or experiences with sludge-related issues.

- Respondents were very concerned about general environmental issues and about sewage sludge management issues.

- Respondents were most concerned about human health aspects of sludge management issues, followed by environmental aspects. Respondents gave human health and environmental quality about 70 points (out of 100 possible) to show how much consideration these aspects should be given in sludge management decisions, while economic and aesthetic considerations received the other 30 points.

- Most of the public felt that citizens should be involved in sewage sludge management issues.

- Individual's preferred sludge management strategy was not related to desired level of citizen involvement in sludge management issues.

- Individual's preferred level of citizen involvement in sludge management issues generally was not related to demographic characteristics or experiences.

- No sludge management entity emerged as being highly trusted to oversee the proper management of sewage sludge, although some form of citizen control would be most trusted by both the general public and the selected groups.

- University sources of information about sewage sludge management were rated as most credible followed by agency sources (NYS Dept. of Public Health, NYS Dept. of Agriculture and Markets, NYS Dept. of Environmental Conservation, and U.S. Environmental Protection Agency).

ACKNOWLEDGMENTS

I would like to express my appreciation to the many people who provided assistance with this study. The author expresses special appreciation to Daniel J. Decker for his guidance throughout this study and for his editorial assistance with this report. The author acknowledges with appreciation David Donovan for overall project direction; Carol Rundle, Tamara Russell and Lyn Donohue for assistance in data collection; Meg Ackerblade for assistance in data processing; and Margie Peech for assistance in manuscript processing. The author expresses appreciation to John Martin and J. David Deshler and all the members of the Program Development Committee for their assistance with this study and thoughtful comments on this report. Appreciation is also extended to all the New York residents who participated in this study by returning their completed questionnaires. This work was supported in part by the Department of Environmental Protection--City of New York through Contract No. 18676-150 between Stone and Webster Engineering Corporation and Cornell University.

TABLE OF CONTENTS

Page

INTRODUCTION 1

Background on Management of Sewage Sludge 1
Need for Public Involvement and Education 2
Purpose of this Study 3
Survey Objectives 4

METHODS 4

Sample Selection 4
Instrument Development 6
Survey Implementation and Nonresponse 7

RESULTS 7

General Findings 7

Response Rates 7
Nonresponse Bias 8
County Differences 10
Survey Differences (General Public vs. Selected Groups) 10

Public Orientation Toward Sludge Management Strategies 12
Public Involvement and Trust in Entities Responsible for Sludge Management 25

DISCUSSION 34

Nonresponse Bias 34
County Differences 36
Survey Differences (General Public vs. Selected Groups) 36
Public Orientation Toward Sludge Management Strategies 37
Public Involvement and Trust in Entities Responsible for Sludge Management 40

SUMMARY 42

LITERATURE CITED 43

APPENDIX A 46
APPENDIX B 50
APPENDIX C 59
APPENDIX D 62

LIST OF TABLES

Table		Page
1	Relationship of attitudes towards sewage sludge management boundaries with attitudes towards sludge management strategies and the use of nonlocal sludge	17
2	Preference ratings for sludge management strategies in New York, 1991	21
3	Actions the general public would likely take in sewage sludge management issues relating to the area (county) they live in	26
4	Preferred level of involvement for citizens in sludge management decisions	28
5	Trust in possible entities to oversee the proper management of sewage sludge in New York, 1991	31
6	Credibility of sources information concerning sewage sludge management in New York, 1991	32

LIST OF FIGURES

Figure		Page
1	New York counties selected in this study of attitudes and beliefs about sewage sludge management strategies	5
2	Comparison of general public and selected groups attitudes towards sludge management strategies	11
3	Comparison of general public and selected groups attitudes about the source of sludge	13
4	Comparison of general public and selected groups attitudes about municipal sludge management boundaries	14

AN ASSESSMENT OF ATTITUDES AND BELIEFS ABOUT SEWAGE SLUDGE MANAGEMENT STRATEGIES IN NEW YORK

INTRODUCTION

Background on Management of Sewage Sludge

Sewage sludge is a general term used to describe the major fraction of solids removed from wastewater (sewage) during treatment. The principal constituents of sewage sludge are: (1) solids present in untreated wastewater in a settleable form, (2) microorganisms produced during the wastewater-treatment process, and (3) a large amount of entrained water. Currently, many methods are being used for the management of this material in New York State (NYS). Included are: (1) ocean disposal, (2) incineration, (3) placement in landfills with other solid wastes, (4) application to agricultural land, and (5) use for lawn maintenance and other horticultural purposes. Application to forest lands is another possible sewage sludge management strategy, although it is not currently used in NYS.

In many areas of NYS, certain method(s) of sewage sludge management will cease to be feasible in the future and new approaches will have to be identified. Ocean dumping of municipal sewage sludge is mandated to end December 31, 1991, greatly affecting New York City and Nassau and Westchester Counties. Ocean disposal accounts for about 41% of the total dry weight disposal of municipal sludge in NYS (NYS Department of Environmental Conservation 1989). Also, the precipitous decline of available landfill capacity that has occurred in the state in recent years is causing many communities to reevaluate placement of sewage sludge in landfills as a disposal method. Landfilling currently accounts for about 26% of the total dry weight disposal of municipal sludge in NYS (NYS Department of Environmental Conservation 1989). The high capital and operating costs of incineration as well as negative air quality impacts make many municipalities reluctant to select this option. Incineration currently accounts for about 27% of the total dry weight disposal of municipal sludge in NYS

(NYS Department of Environmental Conservation 1989). Also, incineration by itself is not a true disposal method because the resulting ash must be disposed of, usually at a landfill. Increased use of beneficial-use (recycling) management alternatives is seen as one solution to the sludge problem and is strongly encouraged by the New York State Department of Environmental Conservation (DEC), Division of Solid Waste (NYS Department of Environmental Conservation 1989). Land application of stabilized sludge including sludge that has been composted currently account for only about 5% of the total dry weight disposal of municipal sludge in NYS (NYS Department of Environmental Conservation 1989).

Need for Public Involvement and Education

An important obstacle to the success of beneficial-use alternatives for sludge management is the rejection of such procedures by the public (Loehr et al. 1979). Public opposition usually develops from fears of health risks, environmental degradation, losses in property values, and nuisance problems such as odor or new transportation routes. Nonacceptance is often accompanied by disruptive tactics that prevent rational consideration of all alternatives and consequences (Gigliotti and Peyton 1986). Opposition can be particularly intense if a proposed facility provides little or no local benefit and a perception of inequality is present. Unfortunately, this situation is common with beneficial-use alternatives because suitable land for application is often geographically remote from the source of the municipal sewage sludge.

Because it is more difficult to manage an issue in a disruptive stage, attempts should be made to involve and inform publics in early stages of the decision-making process. Failure to involve the public may seriously misguide projects or lead to delays and increased costs if a project is halted by court or administrative action (Heberlein 1976). However, public

participation can take several forms and be motivated by a variety of reasons. Previous surveys suggest that in the case of sewage sludge disposal issues, the general public overwhelmingly believes that citizens should have meaningful input into strategy selection and siting decisions (Lagerstrom 1983, Gigliotti 1983). Past experience has shown that the "announce and defend" strategy traditionally used by public officials and their consultants is no longer acceptable to the public. However, public participation does not ensure that logical decisions will be made (Wengert 1971), especially if the public is not knowledgeable about an issue (e.g., about sludge management strategies). By cultivating the development of informed public opinion, it should be possible to avoid or at least reduce many of the problems in siting the necessary facilities that have been encountered in the past.

Purpose of this Study

Development of strategies for public education about sewage sludge will require an understanding of the public's beliefs and concerns and how they wish to be involved. Because attitude formation is complex and dynamic, knowledge of a person's verbalized attitude may be inadequate for predicting behavior. Therefore, any educational program intended to bring about change must be based more on the underlying beliefs and values that make up attitudes than the expressed opinions themselves. Surveys are especially useful in gathering information from the public on emerging issues, because at this early stage the public is not motivated to respond to other information-gathering techniques (Gigliotti and Peyton 1986).

The information gathered from the study will be used to guide public involvement and educational programs related to sewage sludge management in NYS by developing a plan for public education. Manfredo and Bright (1991) stress the importance of knowing the

experience and knowledge level of a group for which information is targeted. In their study, prior knowledge and perceived credibility of information source were strongly related to behavior change, while prior knowledge was influenced by direct experience and topic involvement.

Survey Objectives

The overall goal of this study was to provide necessary information about the initial values, understanding, interest, and concerns of potential target audiences regarding the development of public educational programs about sewage sludge management. The following research questions were identified to address this goal:

I. *What are the public's attitudes and beliefs about the various sludge management strategies? What is the relationship of values, beliefs and attitudes with preferences for sludge management strategies?*

II. *What types of public involvement do citizens want in sewage sludge management issues? What level of trust does the public have in possible sludge management entities? Which sources of information do the public find credible?*

METHODS

Sample Selection

Surveys of two populations in four NYS counties (Cattaraugus, Columbia, Onondaga, and Sullivan) were implemented (Figure 1). The counties were selected using specific criteria including: (1) geographic location, (2) population density (i.e., urban vs. rural), (3) population status (e.g., growing, static, decreasing), and (4) changing socio-economic characteristics (e.g., age or average income). These counties were selected to maximize differences within the sample populations and to represent certain characteristics of NYS residents (Appendix A).

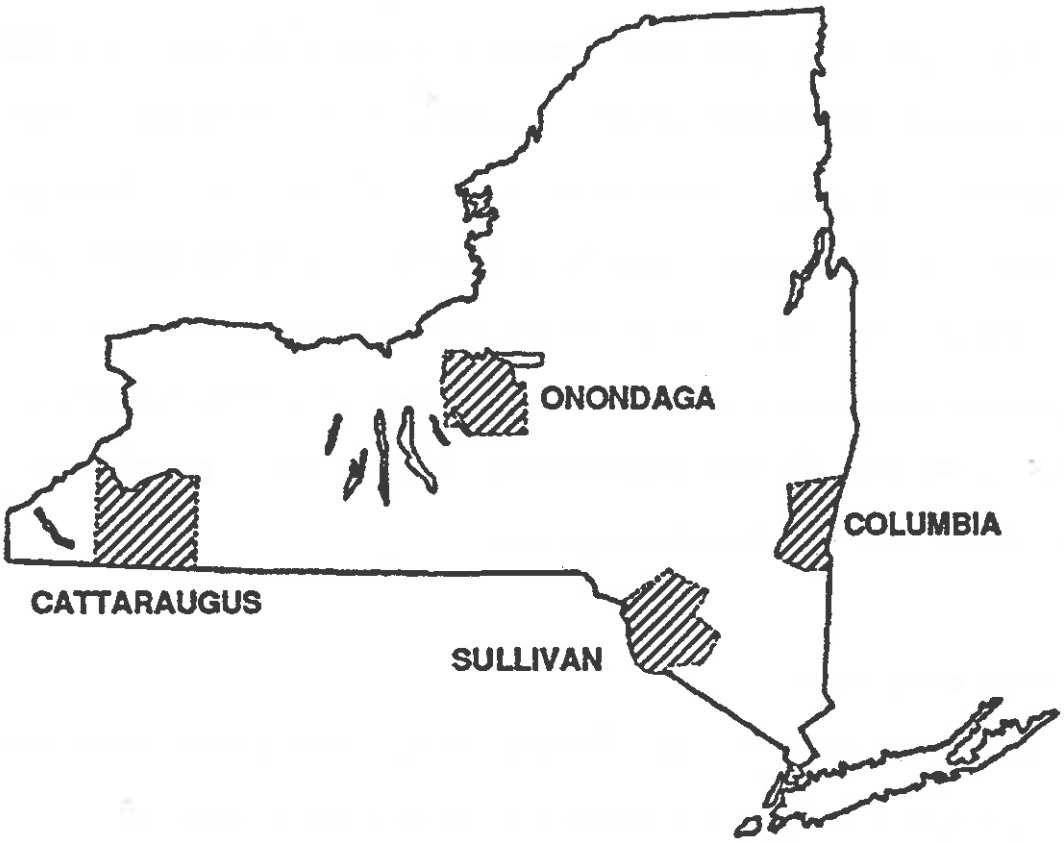


Figure 1. New York counties selected in this study of attitudes and beliefs about sewage sludge management strategies.

These counties were not selected because they have been targeted for disposal of sludge from another region of NYS or for pilot educational programs.

The two sample populations were identified as the "general public" and the "selected groups." The general public sample consisted of 300 citizens from each county. The citizens were identified at random by a private consulting firm (Survey Sampling, Inc.). The names were generated from telephone directories and NYS drivers license records.

The selected groups population, elected and appointed officials and civic leaders, was targeted because it was hypothesized that this population would be the first to become involved in any local sludge management issue and might therefore have different attitudes and beliefs. The selected groups population was comprised of all elected and appointed officials (e.g., county, municipal and township legislators; heads of departments of health, sanitation and water, and parks and recreation; and chairs of planning boards, Environmental Management Councils, and Conservation Advisory Councils), and local public opinion leaders (e.g., leaders of environmental and civic groups).

Instrument Development

Some factors theorized to affect behavior change include amount of past knowledge regarding a topic, direct experience related to the topic, personal involvement in the topic, role in social group, and perception of trust and credibility of information sources (Manfredo and Bright 1991). Behavior in a sludge management issue was hypothesized to be a function of several intervening variables including attitudes toward sludge management strategies, preference for a strategy, beliefs about the strategies, attitudes toward the source of the sludge, important values related to sludge management issues, perceived credibility of the managing entity, and desire for citizen involvement and personal involvement. The

construction of the survey instrument reflected these principles of communication and attitude theory (Appendix B).

Survey Implementation and Nonresponse

A 12-page, self-administrated, mail-back questionnaire was sent to 1,200 randomly selected residents in Cattaraugus, Columbia, Onondaga, and Sullivan counties (300 per county) and to 1,060 community leaders (selected groups sample) in the same four counties (304 from Cattaraugus, 153 from Columbia, 400 from Onondaga, and 203 from Sullivan) on 31 January 1991. Three mailings were sent to nonrespondents during February and March (Dillman 1978). A two-page questionnaire, which included key questions from the original questionnaire, was sent to 125 randomly selected nonrespondents from both the general public sample and the selected groups sample on 26 April and a follow-up was mailed on 14 May (Appendix C). Nonrespondents to these surveys were contacted by telephone during June 1991. Analysis of data from these surveys was conducted using the SPSSX statistical package (SPSS Inc. 1986). A significance level of $\alpha=0.05$ was used to determine significance. The chi-square statistic was used for contingency table analysis and the F-statistic was used for analysis of variance tests.

RESULTS

General Findings

Response Rates

Of the 1,200 questionnaires mailed to the general public sample, 213 were returned undeliverable, 16 were unusable and 405 were returned with codeable information, resulting in a 41% return rate (adjusted for undeliverables). Of the 1,060 questionnaires mailed to the

selected groups sample, 16 were returned undeliverable, 1 was unusable and 538 were returned with codeable information, resulting in a 52% return rate (adjusted for undeliverables).

Of the 125 randomly selected nonrespondents in the general public sample, 60 valid cases were obtained, 29 were unable to be contacted (deceased or moved with no known address), 17 were never reached and 19 refused to participate. Using the 29 that we were unable to contact (deceased or moved but not including those who never answered their phone) it can be estimated that 23% of all the nonrespondents were unreachable. This gives an adjusted return rate of 47%.

Of the 125 randomly selected nonrespondents in the selected groups sample, 92 valid cases were obtained, 15 were unable to be contacted (deceased or moved with no known address), 10 were never reached, and 8 refused to participate. Using the 15 that we were unable to contact (deceased or moved but not including those who never answered their phone) it can be estimated that 12% of all the nonrespondents were unreachable. This gives an adjusted return rate of 55%.

Nonresponse Bias

For the general public sample, nonrespondents and respondents were similar for most variables tested, specifically:

- Activity in environmental issues
- Concern about environmental issues in general
- Preferred level of involvement in sludge management issues
- Concern with how cities manage sewage sludge
- Attitude towards the ban on dumping sewage sludge in the ocean
- Rating of the sludge management problem for many large New York cities
- Rating of the sludge management problem for many small New York cities
- Rating of the sludge management problem for their county

Nonrespondents in the general public sample were less likely to have a preference for a sludge management strategy than respondents (18% vs. 9%) (X^2=28.286; df=6; p<.0001). Also, a higher percentage of nonrespondents than respondents preferred landfills (20% vs. 6%) and application to agricultural land for human food production (12% vs. 4%), while a higher percentage of respondents than nonrespondents preferred incineration (23% vs. 14%) and forest application (19% vs. 12%). Respondents had greater interest in learning more about sewage sludge management than nonrespondents (71% vs. 42%) (X^2=17.552; df=1; p<.0001). Nonrespondents were more opposed to the use of sewage sludge on nearby agricultural land than respondents (52% vs. 26%) (X^2=23.572; df=4; p<.0001).

For the selected groups sample, nonrespondents and respondents were similar for most variables tested, specifically:

- Concern about environmental issues in general
- Preferred level of involvement in sludge management issues
- Concern with how cities manage sewage sludge
- Rating of the sludge management problem for many large New York cities
- Rating of the sludge management problem for many small New York cities
- Rating of the sludge management problem for their county
- Interest in learning more about sludge management
- Preferred sludge management strategy

Nonrespondents in the selected groups sample reported a higher involvement in environmental issues than respondents (24% extremely involved and 38% quite involved vs. 11% extremely and 32% quite) (X^2=16.401; df=3; p=.0009). A higher percentage of nonrespondents strongly agreed with the ocean dumping ban than respondents (54% vs. 39%) (X^2=9.826; df=3; p=.0201). A slightly higher percent of nonrespondents were opposed to the use of sewage sludge on nearby agricultural land than respondents (35% vs. 23%) (X^2=9.918; df=4; p=.0418).

County Differences

Significant differences were found for the general public sample among the four counties for 7 of the 36 attitudes and beliefs measured. However, these differences among the counties were too small to conclude that important attitudinal differences existed among the counties, rather slight differences in the degree of agreement/disagreement with statements were noted.

Significant differences were found for the selected groups sample among the four counties for 15 of the 36 attitudes and beliefs measured. For 14 of the 15 significant variables the differences among the counties were very small. The statement, *Sludge management is becoming a significant problem in your county*, was the one variable for which large differences occurred among counties. This was likely a function of the different characteristics of the counties rather than a fundamental difference in attitudes. Onondaga County, which is the most urban of the four counties, had the highest agreement with this statement, Cattaraugus the lowest, and Sullivan and Columbia were midway between Onondaga and Cattaraugus in the amount of agreement with the statement.

In this report the data from the four sample counties (Cattaraugus, Columbia, Onondaga, and Sullivan) will be combined. County differences are too small to justify different educational messages or approaches to reach different counties.

Survey Differences (General Public vs. Selected Groups)

Of the 36 attitudes and beliefs measured, 28 were significantly different between the general public sample and the selected groups sample. In general, the selected groups sample tended to be more accepting of the various sludge management strategies than the general public sample (Figure 2). Also, the selected groups sample was slightly more

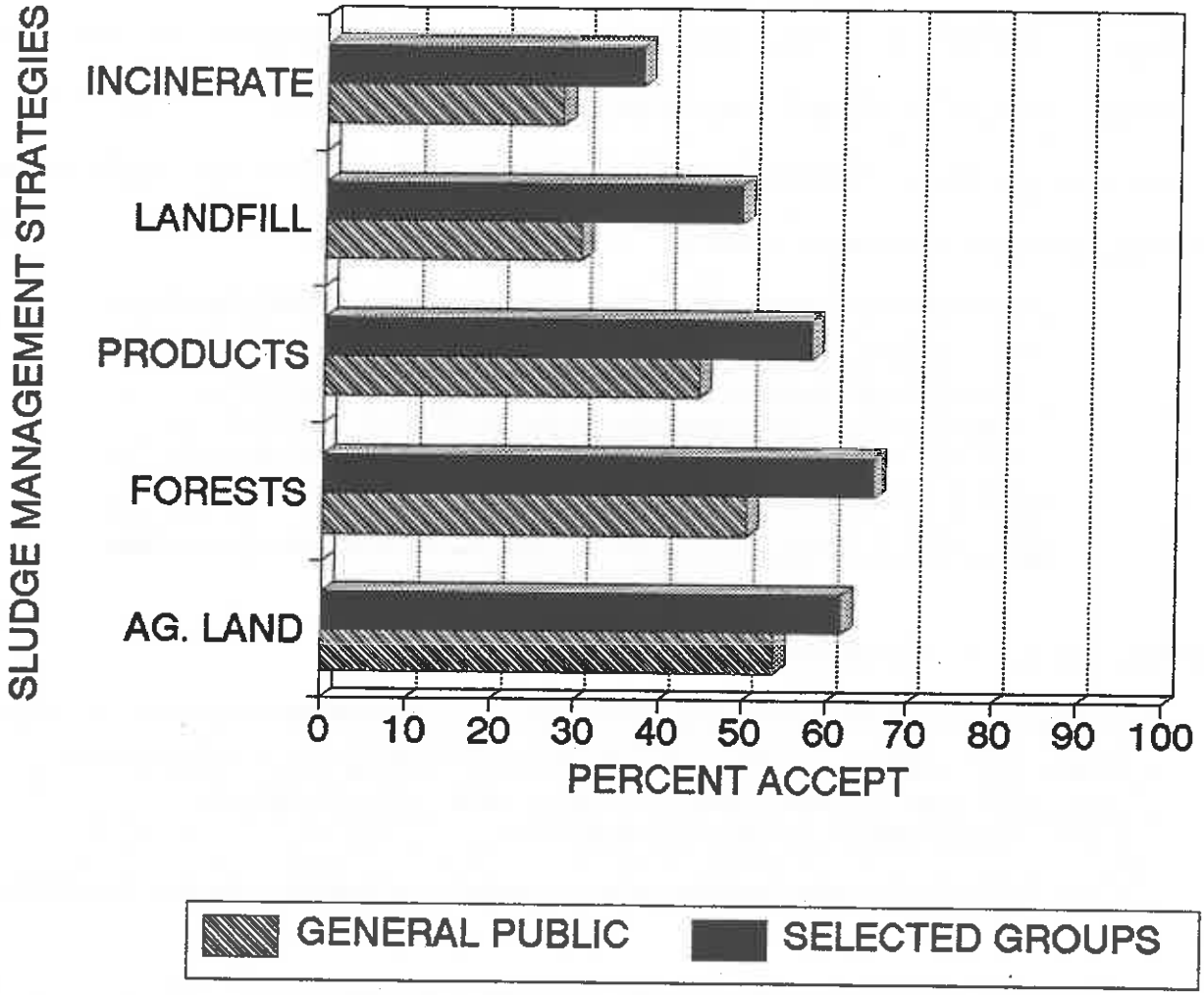


Figure 2. Comparison of general public and selected groups attitudes towards sludge management strategies.

accepting of sludge from other counties than the general public sample (Figure 3) and more selected groups respondents than general public respondents disagreed that sewage sludge should be managed within city boundaries (Figure 4). Many of the other attitude statements were related to opinions about the various sludge management strategies or sources of the sludge. For the belief questions, in general, the general public sample had more "*don't know*" responses than did the selected groups sample (Appendix D, Table D-1). Because of the large number of differences between the two samples, results will be reported separately for the two surveys unless otherwise stated.

The remainder of the findings are discussed in terms of two major objectives of the survey—the public's orientation toward various sewage sludge management strategies and the public's desire for involvement in sewage sludge management issues, including their trust in entities responsible for sewage sludge management.

Public Orientation Toward Sludge Management Strategies

What are the public's attitudes and beliefs about the various sludge management strategies? What is the relationship of values, beliefs and attitudes with preferences for sludge management strategies?

1) Does the public perceive that sludge management is becoming an important issue in NYS?

An issue must first be considered important enough that some action needs to be taken before the public likely will be receptive to educational messages. Three questions were designed to measure the importance of sludge management issues to the public—the

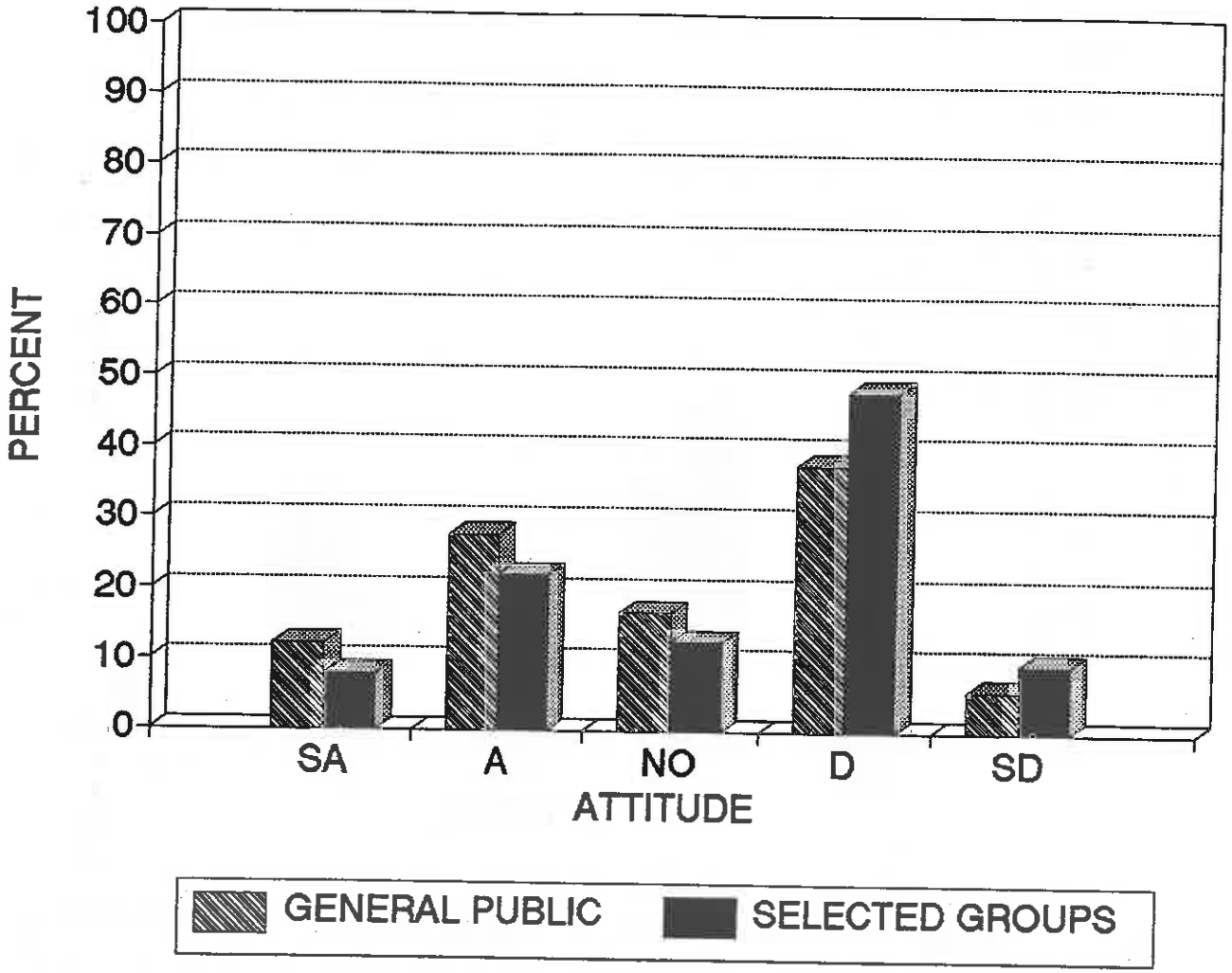


Figure 3. Comparison of general public and selected groups attitudes about the source of sludge. *"I would be opposed to any sewage sludge being brought into my county from another county even if there were benefits for my county."* (SA = Strongly Agree; A = Agree; NO = No Opinion; D = Disagree; SD = Strongly Disagree)

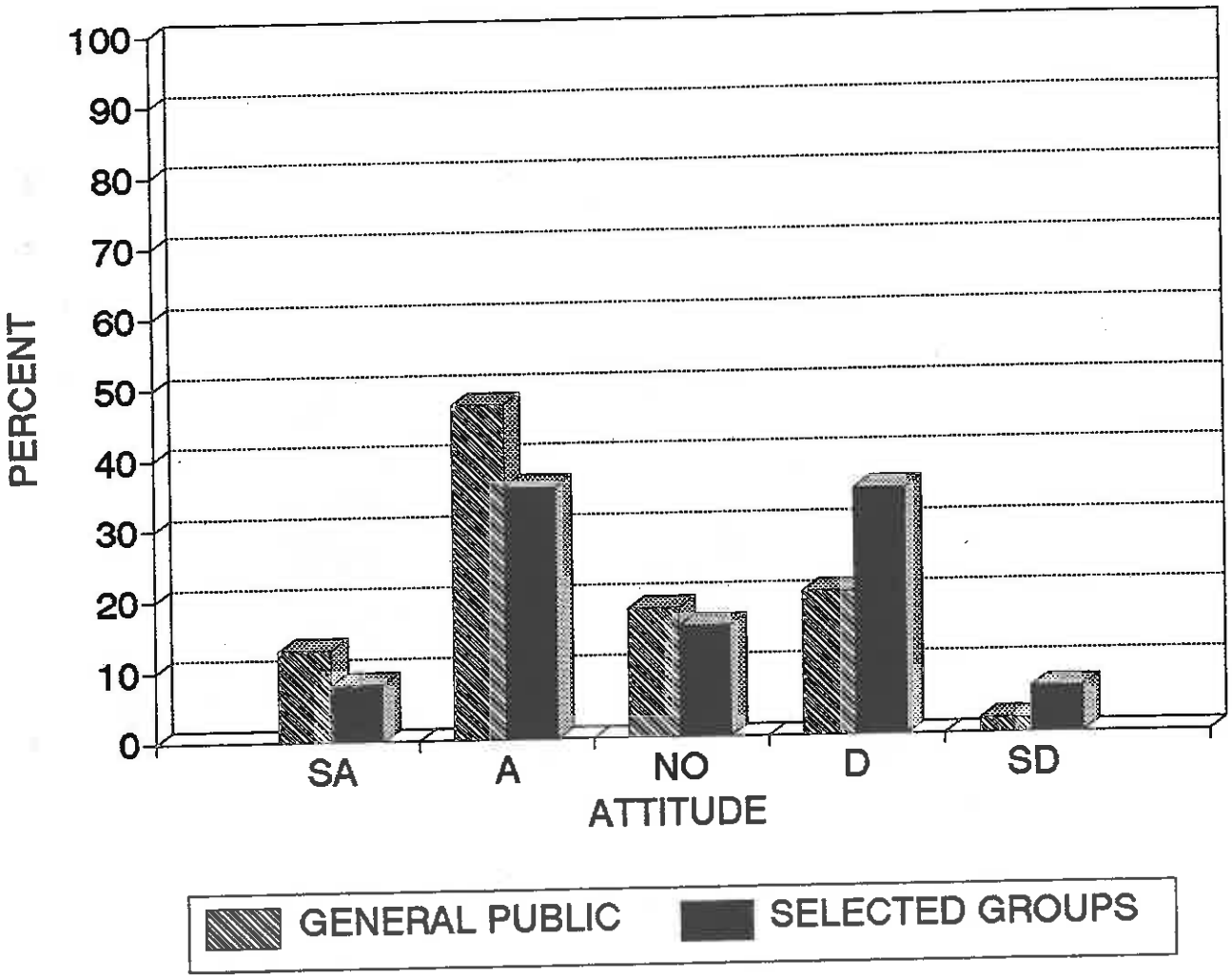


Figure 4. Comparison of general public and selected groups attitudes about municipal sludge management boundaries. *"Sewage sludge should be managed within municipal boundaries."* (SA = Strongly Agree; A = Agree; NO = No Opinion; D = Disagree; SD = Strongly Disagree)

perceived significance that sludge management is becoming a significant problem for many large cities in New York, for many small cities in New York, and locally in "your" county.

Overwhelmingly, both samples (general public and selected groups) agreed that sludge management is becoming a significant problem for large and small cities in NYS and in their own county (Appendix D, Table D-2). As mentioned earlier, the perceived importance of sludge management issues in their own county was the only large county difference. Respondents from Onondaga County, which is the most urban of the four counties, had the highest agreement that sludge management issues are becoming important in their county, followed by Sullivan, Columbia, and Cattaraugus.

2) How receptive is the public of the various sludge management strategies in NYS?

In general, the selected groups sample tended to be more accepting of the various sludge management strategies than the general public sample (Appendix D, Table D-3). However, for both groups there were significant numbers of people on both sides (opposed/accepting) of any sludge strategy issue, except for the ocean dumping issue; i.e., no sludge management strategy was strongly accepted by the public. Most people agreed with the decision to end ocean dumping of municipal sewage sludge by December 31, 1991.

3) What attitudes do citizens have about the source of the sludge and what is the relationship between these and attitudes about the various sludge management strategies?

A greater percentage of the general public sample than the selected groups sample felt that sewage sludge should be managed within municipal boundaries (59.9% vs. 43.1%) (Appendix D, Table D-4). Also, a greater percentage of the general public sample than the

selected groups sample felt that sewage sludge should be managed within county boundaries (59.9% vs. 43.1%) (Appendix D, Table D-4). Looking at the relationship between these two variables (municipal vs. county boundaries) and dropping those with no opinion, we find that a majority (53.9%) of the respondents agreed with both statements; i.e., sewage sludge should be managed within city and county boundaries; 16.3% disagreed with city boundaries but agreed that sewage sludge should be managed within county boundaries; 6.4% agreed with city boundaries but not county boundaries; and 23.5% disagreed with both.

Preliminary analyses showed that those in the above first three groups, those preferring local (city and/or county) sludge management boundaries, were relatively similar in their attitudes toward sludge management strategies and the source of sludge, but were different from those in the last group, those who are more regional in their sludge management attitudes. Therefore, the first three groups were combined and compared with the fourth group, referred to here as "local" vs. "regional" sludge management attitude. Overall, the group with the regional sludge management attitude was more accepting of all the sludge management strategies and was less concerned about the source of sludge (Table 1).

It is important to note that local vs. regional sludge management attitudes were not related to urban vs. rural residence (X^2=2.52; df=1; p=.1123) or whether the respondent's residence was connected to a municipal sewage system vs. a septic tank (X^2=1.86; df=1; p=.1724). However, respondents with political (elected or appointed) experience were more likely to have a regional sludge management attitude than nonpolitical respondents (29.8% vs. 14.7%) (X^2=22.20; df=1; p<.0001).

Table 1. Relationship of attitudes towards sewage sludge management boundaries with attitudes towards sludge management strategies and the use of nonlocal sludge.

I would be opposed to sewage sludge being applied to agricultural land near where I live (within my Township).

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=547)	27.2	14.8	58.0
Regional Management (n=167)	16.2	10.2	73.7
(X^2=13.48; df=2; p=.001)			

I would be opposed to sewage sludge being applied to forest land near where I live (within my Township).

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=549)	25.3	15.3	59.4
Regional Management (n=168)	15.5	7.7	76.8
(X^2=16.99; df=2; p=<.001)			

I would be opposed to sewage sludge products being applied to public areas such as parks, gardens, golf courses, etc.

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=550)	32.7	16.5	50.7
Regional Management (n=168)	17.3	8.9	73.8
(X^2=27.85; df=2; p=<.001)			

I would be opposed to a sewage sludge incineration plant being built near where I live (within my Township).

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=548)	46.2	21.4	32.5
Regional Management (n=168)	37.5	17.3	45.2
(X^2=9.14; df=2; p=.010)			

Table 1. (cont.)

I would be opposed to sewage sludge being placed in landfills near where I live (within my Township).

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=548)	42.7	17.2	40.1
Regional Management (n=169)	26.6	12.4	60.9
(X^2=22.78; df=2; p=.001)			

Counties should be allowed to transport their sewage sludge to any other county willing to accept it.

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=550)	58.7	9.1	32.2
Regional Management (n=169)	92.9	0.6	6.5
(X^2=68.36; df=2; p<.001)			

If managed and regulated properly, farmers should be allowed to use sewage sludge on their farms regardless of what area the sludge came from.

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=548)	47.6	12.2	40.1
Regional Management (n=168)	73.8	6.0	20.2
(X^2=35.46; df=2; p<.001)			

I would be opposed to any sewage sludge being brought into my county from another county even if there were benefits for my county.

Boundary Attitude	Strongly Agree and Agree	Percent No Opinion	Strongly Disagree and Disagree
Local Management (n=549)	43.9	12.6	43.5
Regional Management (n=168)	10.7	5.4	83.9
(X^2=84.97; df=2; p<.001)			

4) What is the relationship of attitudes and beliefs about the safety, nuisance problems and potential benefits of sludge management with acceptance of the various sewage sludge management strategies?

Respondents' (general public and selected groups) opinions of five sludge management strategies were recorded as either opposed or would accept. Most (33.4%) were not opposed to (would accept or were undecided) any of the five strategies; 24.0% were opposed to only one strategy, and 7.3% were opposed to all five strategies (Appendix D, Table D-5). Also, most (23.8%) would not accept (were opposed or undecided) any of the five strategies, 12.6% would accept only one strategy, while 15.8% would accept all five strategies (Appendix D, Table D-5). These two scales are used as measures of the degree of opposition or acceptance of sludge management strategies to evaluate the important attitudes and beliefs that contribute to sludge management strategy attitudes. Overall, attitudes and beliefs about safety, nuisances and potential benefits of sludge management were strongly related to the degree of opposition or acceptance of the various sludge management strategies (Appendix D, Table D-6).

5) What attitudes and beliefs are held about sludge management regulations?

The respondents (general public and selected groups) were about evenly divided in their belief that regulations for sewage sludge management adequately protect the public's health and environment; however, most were undecided (Appendix D, Table D-1). Generally, the public was largely unsure about their attitudes and beliefs about sludge management regulations.

6) Which sludge management strategy is preferred by the public?

The general public and the selected groups were similar in their first-choice preference for a sludge management strategy (X^2=10.68; df=5; p=.058). Incineration (23.9%), application to forest land (23.0%) and use as lawn and garden fertilizer or soil-conditioner (22.8%) were about equal, followed closely by application to agricultural land for production of animal feeds (17.3%). Only 9.5% preferred burying in landfills and 3.4% preferred application to agricultural land for production of human foods.

A preference score was calculated by assigning 4 points for the respondents' first choice strategy, 3 points for second choice, 2 for third and 1 for fourth. A similar profile of preferences for the sludge management strategies was obtained (Table 2). No significant differences were found between the general public sample and the selected groups sample for any of the preference ratings. Although incineration had the highest mean preference score, more people picked forest application (77.6%) than incineration (52.4%) (n=732 vs. 494) as one of their first four choices.

7) What beliefs about the sludge management strategies are held by the public and how are these beliefs related to preferences?

Respondents' (general public and selected groups) beliefs about the sludge management strategies were varied; i.e., there was no strong consensus among the public about which strategy had the least or greatest threat to environmental quality, the least or greatest threat to human health, the least or greatest adverse impact on nearby property values or which method was cheapest or most expensive (Appendix D, Table D-7). For example, 23.4% of the respondents thought that incineration would have the least threat to

Table 2. Preference ratings for sludge management strategies in New York, 1991.

Sludge Management Strategy	Mean Preference[a]	(Number)[b]
Incineration	2.78	(494)
Lawn and garden fertilizer or soil conditioner products	2.66	(699)
Application to agricultural land for production of animal feeds	2.65	(684)
Application to forest lands	2.57	(732)
Bury in landfills	2.22	(431)
Application to agricultural land for production of human food	1.82	(348)

Note: A space between the items indicates a significant difference between sets of items (95% C.I.), and the vertical bars are in front of the items that are not significantly different (95% C.I.).

[a]A four-point scale was used with 4=first choice, 3=second choice, 2=third choice, and 1=fourth choice.

[b]Number of respondents that rated the item as one of their top four choices (total number = 943). The general public and selected groups samples were combined because there were no significant differences in preference rating scores.

environmental quality and another 23.1% thought that incineration would have the greatest threat to environmental quality.

An overall impacts rating of sludge management strategy was calculated by scoring 1 point for each time the strategy was reported as the least threat to environmental quality, the least threat to human health, the least adverse impact on nearby property values and the cheapest method plus a negative 1 point was scored each time the strategy was reported as the greatest threat to environmental quality, the greatest threat to human health, the greatest adverse impact on nearby property values and the most expensive method. The first choice preference had a significantly more positive rating than the other strategies (Appendix D, Table D-8).

No single belief was a good predictor of respondents' first choice preference, although the strategy believed to have the least threat to environmental quality and the least threat to human health was more likely to be the first choice rather than the strategy believed to have the least adverse impact on nearby property values or the cheapest strategy (Appendix D, Table D-9). Most people believed that no single strategy was ideal (i.e., had the least threat to environmental quality, human health, adverse impact on nearby property values and was the cheapest method). When compromises were made, costs and impacts on property values were more likely sacrificed to gain benefits in environmental quality and human health.

Respondents who preferred one of the beneficial use strategies were generally more accepting of all the strategies; however, preference for a strategy was not a perfect predictor of acceptance (or rejection) of nearby application of that strategy (Appendix D, Table D-10). Almost half of the respondents who preferred incineration or landfills would be opposed to that sludge management strategy being near their place of residence (within their township). Preferred sludge management strategy was strongly related to general beliefs about the overall safety, noxious aspects and beneficial uses of the sludge management strategies (Appendix D, Table D-11). Respondents who believed that there were benefits associated with using sewage sludge and that the risks were manageable tended to prefer one of the "beneficial use" strategies, while those who preferred landfilling or incineration were less likely to believe that sewage sludge could be used beneficially and were more likely to believe that noxious or dangerous aspects were associated with the "beneficial use" strategies.

8) What demographic characteristics and experiences are related to sewage sludge management strategy preferences?

Preference for a sludge management strategy was not strongly related to demographic characteristics or experience(s). Sludge management strategy preference was not significantly related to urban-rural residence (X^2=2.64; df=5; p=.755), whether the residence was on a municipal sewage system or a septic system (X^2=5.13; df=5; p=.400), holding political office (X^2=5.57; df=5; p=.351), personal involvement in a local landfill, incineration, or waste treatment plant siting process (X^2=4.97; df=5; p=.419), visiting a sewage sludge treatment plant (X^2=3.78; df=5; p=.582), or knowledge of "your" city's sewage sludge management (X^2=7.09; df=5; p=.214).

Sex, income, age and interest in learning more about sewage sludge management were significantly related with first choice preference for a sludge management strategy (Appendix D, Tables D-12–D-15). More males than females preferred application to agricultural land while more females than males preferred application to forest lands and use of sludge as lawn and garden fertilizer products (Appendix D, Table D-12). Income was only slightly related to sludge management strategy preference, with those who preferred application to agricultural land for production of human food having the lowest income and those preferring forest application having the highest income (Appendix D, Table D-13). Those preferring landfills, incineration or application to agricultural land for production of human food had a higher mean age than those preferring application to agricultural land for production of animal feeds, lawn and garden fertilizer products or forest application (Appendix D, Table D-14). Those preferring application to agricultural land for production of animal feeds, lawn and garden fertilizer products or forest application were more interested in

learning more about sewage sludge management than those preferring landfills, incineration or application to agricultural land for production of human food (Appendix D, Table D-15).

9) What environmental values are held concerning sludge management? What values do citizens use to make sludge management decisions?

Most respondents (general public and selected groups) reported that they were concerned about general environmental issues and about sewage sludge management (Appendix D, Table D-16). Also, most people felt that wastes should be managed in the safest way possible, regardless of costs (Appendix D, Table D-16). These environmental attitudes were only slightly related to the number of strategies people would accept or reject (Appendix D, Table D-17). The respondents who agreed that wastes should be managed in the safest way regardless of costs would reject more (accept fewer) sludge management strategies. The respondents who reported that they were concerned about environmental issues would both accept and reject more sludge management strategies (i.e., they were more likely to have an opinion) than those not concerned about environmental issues. And, the respondents who were not concerned about sewage sludge management would reject more (accept fewer) sludge management strategies.

The respondents rated human health as the most important consideration in sludge management decisions, assigning it an average of 48.2 points out of 100. Environmental quality was rated slightly higher than economic costs (21.5 vs. 17.8 points) and aesthetics was given 12.8 points. Differences between the general public sample and the selected groups sample were very small and would not change the overall ranking (Appendix D, Table D-18). The selected groups sample gave slightly more importance to costs and less to aesthetics than the general public sample. The ordering of concerns (health, environmental

quality, cost, aesthetics) was about the same regardless of sludge management strategy preferred (Appendix D, Table D-19).

Public Involvement and Trust in Entities Responsible for Sludge Management

What types of public involvement do citizens want in sewage sludge management issues? What levels of trust do the public have in possible sludge management entities? Which sources of information do the public find credible?

1) What types of past involvement have the public had in sewage sludge management and what types of actions are they likely to take?

Only about 9% of the general public sample were ever personally involved in a local landfill, incineration or siting process for a waste-treatment plant compared to 31% of the selected groups sample (X^2=63.97; df=1, p<.001). About 31% of the general public and 55% of the selected groups sample had visited a sewage treatment plant (X^2=51.96; df=1, p<.001). About 31% of the general public sample and 65% of the selected groups sample reported that they knew how their city's (or the city nearest to them) sewage sludge was managed (X^2=100.05; df=1, p<.001). Also, the selected groups sample reported a higher level of activity in general environmental issues (Appendix D, Table D-20).

Most of the general public sample (71%) and the selected groups sample (78%) reported that they would be interested in learning more about sewage sludge management (X^2=5.30; df=1, p=.002). The general public sample was asked more specifically the type of active role they would likely take in sludge management issues relating to the area (county) they live in. Few people reported they would "very likely" take many high level actions, although most were very likely or moderately likely to "read materials on the subject" (84.4%), "talk about it with friends, relatives or neighbors" (84.4%), "sign a petition" (83.3%), or "attend meetings or public hearings" (64.1%) (Table 3).

Table 3. Actions the general public would likely take in sewage sludge management issues relating to the area (county) they live in.

ACTION (Percent:)	Very Likely	Moderately Likely	Not Likely
Read materials on the subject	45.4	39.0	15.6
Talk about it with friends, relatives or neighbors	42.1	42.3	15.6
Sign a petition	40.1	43.2	16.8
Attend meetings or public hearings	20.3	43.8	35.9
Contact officials or newspapers by letter, phone, or visit	12.6	33.3	54.1
Attend workshops	9.0	28.4	62.6
Donate money to a group working for or against an issue	8.5	40.1	51.5
Join an action group	7.4	27.6	65.0
Start a petition	5.6	22.2	72.2
Organize a meeting	2.4	12.0	85.6
Organize an action group	1.4	11.0	87.5

2) What level of citizen involvement does the public want in sewage sludge management issues?

Respondents were asked what level of involvement they felt citizens should have in deciding which sludge management strategy should be used in their area and in deciding related siting issues. Respondents were given four levels of involvement to choose from: (1) the planning and decision making should be left totally to the experts, (2) experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision, (3) experts should only do the early planning and provide the alternatives from which citizens can select, and (4) citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan. The

selected groups sample had a slightly higher preference for level 2 involvement (experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision) than the general public sample (Table 4). Within both the general public sample (X^2=1.96; df=3; p=.582) and the selected groups sample (X^2=2.26; df=3; p=.519) the respondents reported similar involvement preferences for both decisions regarding which sludge management strategy should be used and where sludge management facilities should be sited.

3) What is the relationship between desired type (level) of public involvement and attitudes towards sludge management issues?

Preferred sludge management strategy was not related to desired level of citizen involvement in sludge management strategy decisions (X^2=15.86; df=15; p=.391) or sludge strategy siting issues (X^2=8.91; df=15; p=.882). Those preferring citizen involvement levels 2 and 3 were slightly less opposed (and more accepting) of nearby application of the sludge management strategies (Appendix D, Table D-21). Concern about human health, economics, environmental quality or aesthetics of the area were not related to desired level of citizen involvement in sludge management decisions (Appendix D, Table D-22). Desired level of citizen involvement in sludge management decisions was not related to beliefs about the dangers of land application of sewage sludge (Appendix D, Table D-23). Desired level of citizen involvement in sludge management strategy decisions was not related to a "local" vs. "regional" sludge management attitude (X^2=6.03; df=3; p=.110), but there was a small relationship with desired level of citizen involvement in sludge management siting issues with a "local" vs. "regional" sludge management attitude (Appendix D, Table D-24). Preferred level of citizen involvement in sludge management decisions was not related to the belief that

Table 4. Preferred level of involvement for citizens in sludge management decisions.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

Preferred Level of Involvement[a]	General Public Sample (%) (n=394)	Selected Groups Sample (%) (n=532)
LEVEL 1	8.1	5.6
LEVEL 2	28.2	38.7
LEVEL 3	46.2	43.0
LEVEL 4	17.5	12.6

(X^2=13.68; df=3; p=.003)

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

Preferred Level of Involvement[a]	General Public Sample (%) (n=394)	Selected Groups Sample (%) (n=532)
LEVEL 1	6.1	3.9
LEVEL 2	26.4	37.6
LEVEL 3	50.0	44.4
LEVEL 4	17.5	14.1

(X^2=14.02; df=3; p=.003)

[a]Preferred level of involvement:

LEVEL 1 = The planning and the decision making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

sludge management is becoming a significant problem for many large cities in NYS, for many small cities in NYS, and locally in "your" county (Appendix D, Table D-25).

4) What is the relationship between desired type (level) of public involvement with demographic and experience characteristics?

Preferred level of citizen involvement in sludge management strategy decisions was not related to sex (X^2=1.32; df=3; p=.724), urban-rural residence (X^2=4.46; df=3; p=.216), political experience (X^2=5.74; df=3; p=.125), experience in environmental issues (F=0.67; df=3; p=.574), experience in waste-related siting issues (X^2=2.02; df=3; p=.569), and visiting a sewage treatment plant (X^2=2.02; df=3; p=.568). Involvement was only slightly (but not meaningfully) related to income (F=2.74; df=3; p=.043). Preferred level of citizen involvement in sludge strategy siting issues was not related to sex (X^2=4.18; df=3; p=.243), urban-rural residence (X^2=1.21; df=3; p=.752), political experience (X^2=4.54; df=3; p=.208), experience in environmental issues (F=1.85; df=3; p=.137), experience in waste-related siting issues (X^2=0.80; df=3; p=.849), knowledge of how their city's sewage sludge is managed (X^2=7.52; df=3; p=.057), or income (F=1.07; df=3; p=.362).

Residents' on a municipal sewage system preferred a slightly higher level of citizen involvement than those on a septic system (Appendix D, Table D-26). Those preferring citizen involvement level 1 (decisions left to the experts) were slightly older than those preferring the other citizen involvement levels (Appendix D, Table D-27). Those interested in learning more about sewage sludge management had a higher preference for level 3 and low preference for levels 1 and 2 compared to those not interested in learning more (Appendix D, Table D-28). Those who had visited a sewage treatment plant had a slightly higher preference for level 2 involvement than those who never visited a sewage treatment plant in facility siting issues

(Appendix D, Table D-29). Those who knew how their city's sewage is managed had a higher preference for level 2 involvement in sludge management strategy decisions than those who did not know, while those who did not know how their city's sewage is managed had a higher preference for total citizen involvement (level 4) in sludge management strategy decisions than those who did know (Appendix D, Table D-30).

5) What level of trust does the public have in possible sludge management entities? Which sources of information do the public find credible?

Respondents were asked to rate the amount of trust (from 0 equal to "no trust" to 7 equal to "very much trust") they had in possible sludge management entities to oversee the proper management of sewage sludge (i.e., making sure that the regulations and proper procedures were followed). The general public survey respondents reported slightly higher levels of trust for local citizen committees and DEC to manage sewage sludge (Table 5). The selected groups survey respondents reported nearly equal levels of trust for the various possible sludge managing entities (Table 5). The selected groups sample had slightly higher levels of trust in private consulting firms, plant supervisors, and private industry for sewage sludge management than did the general public (Appendix D, Table D-31). The general public had a slightly higher level of trust in the DEC than did the selected groups sample.

Respondents were asked to rate the credibility (from 1 equal to "low credibility" to 7 equal to "very high credibility") of possible information sources concerning sewage sludge management. The general public had higher mean credibility ratings of DEC, environmental organizations and sporting organizations than the selected groups sample (Table 6). The selected groups sample had higher mean credibility ratings of local government technical professionals, local planning boards, local government officials and private industries (Table 6).

Table 5. Trust in possible entities to oversee the proper management of sewage sludge in New York, 1991.

MANAGEMENT ENTITY	MEAN TRUST[a] BY GENERAL PUBLIC
| Local citizens	3.8
| DEC	3.8
| Plant supervisors	3.0
| | Private consultants	2.6
| Private industry	2.4

MANAGEMENT ENTITY	MEAN TRUST[a] BY SELECTED GROUPS
| Local citizens	3.8
| Plant supervisors	3.8
| | DEC	3.5
| Private consultants	3.4
| Private industry	3.2

[a]An eight-point scale was used with 0=No Trust to 7=Very Much Trust.

Note: A space between the items indicates a significant difference between sets of items (95% C.I.), and vertical bars are in front of the items that are not significantly different (95% C.I.).

Table 6. Credibility of sources of information concerning sewage sludge management in New York, 1991.

Information Sources	Mean Credibility[a] By General Public
University sources	5.3
NYS Dept. of Public Health	4.8
NYS Dept. of Ag. & Markets	4.7
NYS DEC	4.7[b]
U.S. EPA	4.6
Environmental organizations	4.6[b]
Sporting organizations	4.3[b]
Local environmental management councils	4.0
Local government technical professionals	3.9[b]
Local planning boards	3.3[b]
Local government officials	3.0[b]
Private industries	3.0[b]

Information Sources	Mean Credibility[a] By Selected Groups
University sources	5.2
NYS Dept. of Public Health	4.7
NYS Dept. of Ag. & Markets	4.6
U.S. EPA	4.5
NYS DEC	4.4[b]
Local government technical professionals	4.3[b]
Local environmental management councils	4.1
Sporting organizations	3.8[b]
Local planning boards	3.7[b]
Environmental organizations	3.7[b]
Local government officials	3.6[b]
Private industries	3.4[b]

[a]A seven-point scale was used with 1=Low Credibility to 7=Very High Credibility.

[b]General public sample and selected groups sample are significantly different.

Note: A space between the items indicates a significant difference between sets of items (95% C.I.), and vertical bars are in front of the items that are not significantly different (95% C.I.).

However, the overall mean rankings by the two groups were relatively similar. University sources were rated significantly higher by both groups than all other sources.

6) How is trust/credibility related to attitudes towards sludge management strategies?

Preferred sludge management strategy was not related to the level of trust in: DEC ($F=0.46$; $df=5$; $p=.810$), local municipal waste treatment plant supervisor ($F=0.19$; $df=5$; $p=.965$), private industry hired to manage sewage sludge ($F=0.64$; $df=5$; $p=.670$), and local citizen committee to oversee the management of sludge ($F=1.60$; $df=5$; $p=.157$). Preferred sludge management strategy was only slightly related to private consulting firms hired by local government ($F=2.38$; $df=5$; $p=.037$). Those preferring application to agricultural land for production of human food were slightly less trusting in private consulting firms than those preferring any of the other sludge management strategies.

7) How is trust/credibility related to preferred level of citizen involvement in sewage sludge management issues?

Preferred level of citizen involvement in sludge management strategy decisions was not related to level of trust in local municipal waste treatment plant supervisors ($F=2.50$; $df=3$; $p=.058$) and private industry hired to manage sewage sludge ($F=2.02$; $df=3$; $p=.110$). Preferred level of citizen involvement in sludge management siting issues was not related to level of trust in local municipal waste treatment plant supervisors ($F=2.20$; $df=3$; $p=.086$) and private industry hired to manage sewage sludge ($F=2.50$; $df=3$; $p=.059$). Preferred level of citizen involvement was related to the level of trust in the DEC, private consulting firms hired by local government and local citizen committees to oversee the management of sludge (Appendix D, Table D-32). Those preferring that citizens control the entire sludge

management process were less trusting of the DEC and private consulting firms hired by local government and much more trusting of local citizen committees to oversee the management of sewage sludge.

DISCUSSION

Nonresponse Bias

GENERAL PUBLIC: Nonresponse for the general public survey is not a major problem since nonrespondents and respondents were similar for most variables tested. Neither respondents nor nonrespondents had a strong preference for any single sludge management strategy, although there were significant differences between these two groups in their preferences for the sewage sludge management strategies. Nonrespondents were less likely to be able to state a preference for a particular sludge management strategy. This is consistent with much of the research which shows that nonrespondents tend to have a lower level of interest in the subject of the survey (Filion 1975, Kanuk and Berenson 1975, and Suchman 1962) and thus are less likely to have an opinion.

Surprisingly, nonrespondents were more opposed to the use of sewage sludge on nearby agricultural land than respondents. Results from a Michigan study would suggest that those opposed would be more stimulated to respond (Gigliotti 1983). This New York study did not focus on a single strategy and was therefore less threatening, whereas the Michigan study focused on a single sewage sludge management strategy (forest application) which probably stimulated those opposed to respond to the questionnaire in order to voice their opposition. In fact, a major conclusion of the Michigan study was that citizens must be involved in the selection of a sewage sludge management strategy; otherwise, some segment of the public would oppose any proposed strategy. With this in mind, the New York study

was designed to measure attitudes and beliefs from a neutral position, i.e., not focusing on any one strategy.

The general public nonrespondents were less interested than the respondents in learning more about sewage sludge management. This is more evidence that the topic of sewage sludge management was less important/interesting to the nonrespondents. Considering that most of the respondents indicated they would take few involvement actions concerning sewage sludge management issues and, since interest in learning more was related to the likelihood of getting involved in sewage sludge management issues, this suggests that education of the general public will be a difficult process. However, it is important to note that there was no significant difference between respondents and nonrespondents in preferred level of citizen involvement in sewage sludge management issues. Most preferred some important level of citizen involvement. This suggests that even the nonrespondents want to have the opportunity to be involved in sewage sludge management decisions and should not be dismissed as an uninterested group.

SELECTED GROUPS: Nonresponse for the selected groups survey is not a problem because nonrespondents and respondents also were similar for most variables tested. Surprisingly, nonrespondents reported a higher level of activity in environmental issues than did respondents. It is likely that for this group, nonresponse was more a function of time available to respond to the questionnaire than a fundamental difference in attitudes about sewage sludge management. The Michigan study also found that the chief reason for nonresponse by public officials was lack of time (Gigliotti 1983). Also, nonrespondents and respondents both had a high interest in learning more about sewage sludge management.

County Differences

Considering that the four counties (Cattaraugus, Columbia, Onondaga, and Sullivan) were selected based on differences across a number of characteristics, it is surprising that there were only a few statistically significant differences in attitudes and beliefs. This suggests that general educational materials about sewage sludge management would not have to be targeted at specific counties. One characteristic that could make a difference in reaction to a sewage sludge issue is a county's past experience with waste-related siting issues and the public involvement process (or lack thereof). In the Michigan study, mistrust, based on past experiences with the Michigan Department of Natural Resources (the sponsoring agency), was a key reason for rejection of a forest application study in one Michigan county (Lagerstrom 1983). Public involvement that is facilitated in the early phases of any sewage sludge management issue and an education program that treats all sludge management strategies fairly is essential to gaining and maintaining a high level of trust and credibility.

Survey Differences (General Public vs. Selected Groups)

In general, the selected groups respondents tended to be more accepting of all the sewage sludge management strategies. Perhaps these community opinion leaders, most (92%) of whom are or were public officials, realize that sewage sludge management is a problem that can only be solved by making decisions, not by opposing alternatives. However, despite this small difference, the two samples were similar in their preference for a sewage sludge management strategy. Thus, both the selected groups and the general public need similar educational messages. The important difference between the general public and the opinion leaders group may be their initial involvement activities and interest in sewage

sludge management. The opinion leaders will be more open to educational messages because their role as public officials and/or community opinion leaders will require them to have an understanding of any important issue facing their community. Also, they have more experience in such issues. Probably the most important message that this group needs is the importance of public involvement, since many may feel that it is their job to represent local interests. An educational/public involvement strategy may be to: first, educate the opinion leaders about sewage sludge strategies; second, stress the importance of public involvement; and third, engage these opinion leaders in efforts to educate and the involve the local citizenry. This will make sewage sludge management a local issue that is being solved by local citizens rather than an issue that was decided by "outsiders" or an unresponsive government.

The remainder of this discussion will focus on the relevancy of the study findings to public education. The discussion focuses on the two major objectives of the study—attitudes toward sewage sludge management strategies and public involvement.

Public Orientation Toward Sludge Management Strategies

Before the public will be receptive to further educational messages or public involvement actions there must be recognition that a problem exists (Zaltman and Duncan 1977). An overwhelming majority of the public (general public and selected groups) perceives that sludge management is becoming a significant problem throughout NYS. However, it must be remembered that this is a response to a general question about the importance of sewage sludge management. The public will still need specific information on

why it is a problem for them and how this issue affects them before they will be ready to take an active role in the issue. The results from this study suggest that this will be a message that most of the public will accept because, in general, they believe that sewage sludge management is becoming a significant problem.

An important finding of this study was that no single sludge management strategy was strongly rejected or supported with the exception that a significant majority agreed that ocean dumping should end. Perhaps this common ground can be used to stress the point that such decisions (e.g., banning ocean dumping) involve consequences that involve new decisions; i.e., if sludge is not dumped in the oceans it must be managed in a different way. This finding also illustrates why the public must be involved in the early phases of issues before any particular sewage sludge management strategy is selected, because a significant proportion of the public will be initially opposed to any of the possible sewage sludge management strategies.

This finding was different from a study of New York City residents that reported a preference for a land application (within City boundaries) strategy (Zimmerman et al. 1991). However, both studies found that attitudes and beliefs about the safety, nuisance problems and potential benefits of the sludge management strategies were strongly related to opposition or acceptance of the various strategies. Therefore, educational messages must compare the strategies on these parameters. General beliefs about which strategy was safest was the best predictor of preference for a strategy which in turn was the best predictor of acceptance or rejection of application of that strategy nearby. However, there was no agreement on which strategy was considered the safest. It appears that the current attitude structure about sewage sludge strategies could be easily changed by educational messages, since few people believed that any single strategy was ideal. Also, few characteristics were

related (none strongly related) to sludge management strategy preference. This suggests that the type of information the public needs first is a general comparison of the positive and negative aspects of all the strategies.

This study clearly indicates that the public has no strong beliefs or attitudes about sewage sludge management regulations. This is one area that educational messages need to stress, basically, what regulations exist, how these regulations contribute to the safety of the various strategies, and how these regulations are enforced. Reduction of perceived risk is essential to gaining public acceptance of that strategy as a possible alternative.

It appears that attitudes about sludge management boundaries and the source of the sludge can be partially changed by decreasing the risks people perceive associated with sewage sludge and increasing the perceived benefits of "recycling" sewage sludge. Although most agreed that recycling the nutrients in municipal sewage sludge was a good idea, fewer people believed that this was safe or possible. People who believed that sewage sludge could provide benefits and was safe to use were more likely to have a regional sludge management attitude (as opposed to a local sludge management attitude) and were more likely to accept nonlocal sewage sludge.

Another point of agreement between the two sample populations was that most were concerned about general environmental issues, about sewage sludge management and that wastes should be managed in the safest way possible, regardless of the costs. The New York City study also reported high levels of concern about environmental and sludge-related issues (Zimmerman et al. 1991). Also, human health was overwhelmingly the most important value that people want considered in sludge management decisions, with environmental quality rating second. A similar study of Michigan residents found almost exactly the same ranking of values (Gigliotti 1983). It could be pointed out that human health factors are

dependent upon environmental quality factors and therefore these two considerations far outweigh the economic costs or aesthetic concerns. If educational messages stress economic aspects of any strategy without first addressing the safety factor it will likely arouse suspicion—people may even assume that safety is being compromised to save money. Considering that opinion leaders and the general public were similar in their general environmental concerns and concerns about safety, these attributes could be stressed as common ground between the two groups to reduce suspicion and improve working relations between the two groups.

Public Involvement and Trust in Entities Responsible for Sludge Management

The general public has indicated that most of them would not be willing to become intensely involved in the issue of sludge management by actions such as attending meeting or workshops or starting petitions, etc.; but, most individuals indicated that they are interested in learning more. This suggests an educational strategy of producing written materials and working through various forms of the mass media to get the general public initially involved. Yet, the public clearly wants the opportunity for citizen involvement in deciding which sludge management strategy should be used and where sludge management facilities should be sited.

Few people believed "*the planning and the decision-making should be left totally to the experts*." These people tended to have more trust in management agencies and less trust in citizen groups. By explaining to this group that any public involvement process is guided by expert opinion and is restricted by regulations, this group would probably not be opposed to citizen involvement. By having a public involvement strategy that involves citizens from beginning to end (this does not mean that the same citizens must be involved from beginning

to end) will satisfy the majority of the citizens; namely, those who want "*experts to first obtain the views of the affected citizens and then proceed to do the planning and make the final decision*" and those who want "*experts to only do the early planning and provide the alternatives from which citizens can select.*" Finally, establishing a citizen committee to oversee the entire process will satisfy those who feel that "*citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.*" Thus, a public involvement strategy can be designed to address the public desire for involvement at all levels.

It might be surprising that the selected groups sample and the general public sample had similar desires for the level of public involvement. However, this study did not explore further specifically what respondents defined public involvement to mean. For example, a local public official might prefer a high degree of citizen control with the assumption that by being personally involved this is achieved since he or she represents local citizens. Thus, while citizens (non-public officials) and public officials may agree on the level of public involvement they may not necessarily agree on the meaning of public involvement. This study provides no answers to this question and only suggests that this caution be considered with any application of these findings and for future research.

One important finding was that preferred level of public involvement was not strongly related to preferences for a sludge management strategy or values, attitudes and beliefs about the sludge management strategies. Thus, at least in a nonpolarized situation, those desiring a high level of public involvement, and therefore more likely to be involved, do not hold different values, attitudes and beliefs from those less likely to be involved. This is rarely the case in polarized issues where those deeply involved often hold different values and

beliefs than those less involved. Care must always be taken to ensure that all parties are represented in the public participation process.

Information should be linked with a source perceived to be credible. No sludge management entity emerged as a highly trusted entity to oversee the proper management of sewage sludge, although some form of citizen control would be most trusted by both the general public and the selected groups. University sources of information about sewage sludge management were rated as most credible followed by agency sources (NYS Dept. of Public Health, NYS Dept. of Agriculture and Markets, NYS Dept. of Environmental Conservation, and U.S. Environmental Protection Agency), thus educational messages should use these sources when possible. The Michigan study reported that the public will likely seek information from news media (newspapers, radio, TV), even though they do not consider these sources to be accurate (Peyton and Gigliotti 1986). The Michigan study recommended including media reporters as participants in interactive educational and involvement activities to increase the use and accuracy of media channels of communication.

SUMMARY

Both groups surveyed (general public and selected groups) have high levels of concern about environmental issues in general and about sludge management issues specifically, believe that sludge management issues are becoming important, feel that citizens should have meaningful involvement in sludge management issues, are interested in learning more about sludge management and hold opinions about the various sludge management strategies. However, there was no consensus on the acceptability of any single sewage sludge management strategy with the exception that a clear majority agreed that ocean dumping should end.

Beliefs about the safety of the various sludge management strategies was strongly related to acceptance of that strategy as an alternative. In other words, people are very concerned about threats to human health and the environment from the various sludge management strategies but are not knowledgeable enough to evaluate the strategies. A significant percentage of the public would be opposed to any one of the possible sewage sludge management strategies. Therefore, an education program must provide information which compares all possible alternatives, especially with respect to health and environmental safety aspects, early in the decision-making process. Otherwise, the public would likely become polarized on the issue based on inaccurate or misleading information about the various strategies.

LITERATURE CITED

Dillman, D. A. 1978. Mail and telephone surveys: the total design method. John Wiley and Sons, New York. 325pp.

Filion, F. L. 1975. Estimating bias due to nonresponse in mail surveys. Public Opinion Quarterly 39:482-492.

Gigliotti, L. M. 1983. A public assessment of concerns and beliefs about forest application of sludge. M.S. Thesis, Michigan State University, East Lansing, MI. 252pp.

Gigliotti, L. M., and R. B. Peyton. 1986. Utility of a public acceptance survey for forest application planning: a case study. Pages 367-382 *in* D. W. Cole, C. L. Henry, and W. L. Nutter, eds. The forest alternative for treatment and utilization of municipal and industrial wastes. University of Washington Press, Seattle. 582pp.

Heberlein, T. A. 1976. Some observations on alternative mechanisms for public involvement: the hearing, public opinion poll, workshop and quasi-experiment. Natural Resources Journal 16:197-212.

Kanuk, L., and C. Berenson. 1975. Mail surveys and response rates: a literature review. Journal of Marketing Research 12:440-453.

Lagerstrom, T. R. 1983. Comparison of citizen reaction to a proposed sludge demonstration project in two Michigan counties. M.S. Thesis, Michigan State University, East Lansing, MI. 184pp.

Loehr, R. C., W. J. Jewell, J. D. Novak, W. W. Clarkson, and G. S. Friedman. 1979. Land application of wastes. Volume 1. Van Nostrand Reinhold Co., New York. 308pp.

Manfredo, M. J., and A. D. Bright. 1991. A model for assessing the effects of communication on recreationists. Journal of Leisure Research 23:1-20.

New York State Department of Environmental Conservation. 1989. Municipal sewage sludge management practices in New York State. N.Y. State Department of Environmental Conservation, Division of Solid Waste, Albany, NY. 43pp.

Peyton, R. B., and L. M. Gigliotti. 1986. Planning for the public dimension in forest sludge and wastewater application projects. Pages 341-348 *in* D. W. Cole, C. L. Henry and W. L. Nutter, eds. The forest alternative for treatment and utilization of municipal and industrial wastes. University of Washington Press, Seattle. 582pp.

SPSS, Inc. 1986. Statistical package for the social sciences user's guide. Second ed. SPSS Inc., Chicago. 988pp.

Suchman, E. A. 1962. An analysis of 'bias' in survey research. Public Opinion Quarterly 26:102-111.

Wengert, N. 1971. Public participation in water planning: a critique of theory, doctrine and practice. Water Resources Planning 7:26-32.

Zaltman, G., and R. Duncan. 1977. Strategies for planned change. John Wiley and Sons, New York. 404pp.

Zimmerman, R., R. J. Bord, N. A. Mathiowetz, and P. Slovic. 1991. Survey of public perceptions and environmental risk: New York City sludge management plan. City of New York, Department of Environmental Protection, Bureau of Wastewater Treatment. 51pp.

APPENDIX A

Background information on the four New York counties (Cattaraugus, Columbia, Onondaga, Sullivan) sampled in the assessment of attitudes and beliefs about sewage sludge management strategies.

The four New York counties (Cattaraugus, Columbia, Onondaga, Sullivan) selected for this study of attitudes and beliefs about sewage sludge management strategies represent a diversity of county characteristics. These four counties were classified on their degree of "ruralness" (or "urbanness") as follows (Eberts 1984):

Onondaga ----- Metropolitan / Partly Rural (Type 2)
Cattaraugus -- Rural / Considerable Urban Influence (Type 4)
Columbia ----- Rural / Moderate Urban Influence (Type 5)
Sullivan ----- Rural / Limited Urban Influence (Type 6)

Eberts (1984) provides the following description of these four counties:

ONONDAGA COUNTY

Located at the intersection of Interstate 81 and upstate New York's Thruway on the southwestern shore of Oneida Lake, Onondaga County is above average in size among upstate metropolitan counties. Its population of nearly 464,000 people is heavily urban, with 82.4 percent living in places of more than twenty-five hundred people. Syracuse is its largest city, with a 1980 population of just over 170,000 people.

Between 1970 and 1980 Onondaga County lost about 9,000 people, but actually gained a net of almost 20,000 adults between 21 and 65 years of age, and gained over 20,000 households. Moreover, between 1970 and 1980 the number of jobs held by people grew by about 20,700.

The manufacturing economic base is small and declining slightly, with 23 percent of the 1980 work force in manufacturing. In 1980, Onondaga County had 77 plants which employed a hundred or more persons, and 221 plants which employed twenty or more persons. Its agricultural base is larger than average in total products sold, and increasing slightly, with a 1980 adjusted value of over $50.2 million. The service sector is large, with over 76 percent of the 1980 work force engaged in service industries. This percentage is slightly larger than the average for upstate counties, and is growing slowly.

Onondaga County has several colleges within its borders, and about 36 percent of people over 25 years of age had some college background in 1980. This percentage is somewhat higher than the average for comparable upstate counties. The unemployment rate in 1980 was 6.9 percent, about average for upstate metropolitan counties. The county had an average poverty rate of 10 percent.

CATTARAUGUS

The second most western county in upstate New York's Southern Tier and on the Southern Tier Expressway, Cattaraugus County is above average in size among upstate New York rural counties. Its population of 85,000 people is heavily rural, with 65.6 percent living in places of less than twenty-five hundred people. Less than 15 percent of its work force commute outside the county for employment. Olean is its largest city, with a 1980 population of just over 18,200 people.

Between 1970 and 1980 Cattaraugus County gained about 4,000 people, including a net of 5,300 adults between 21 and 65 years of age, and gained

4,400 households. Moreover, between 1970 and 1980 the number of jobs held by its people grew by 5,000.

The manufacturing economic base is large though declining slightly, with 30 percent of the 1980 work force in manufacturing. In 1980, Cattaraugus County had 20 plants which employed a hundred or more persons, and 55 plants which employed twenty or more persons. Its agricultural base is larger than average in total products sold, even if declining slightly, with a 1980 adjusted value of over $52,2 million. Its service sector is large, with 64 percent of the 1980 work force engaged in service industries. This percentage is smaller than the average for other upstate rural counties, but is growing slowly.

The county has several colleges within its borders, but only about 24 percent of residents over 25 years of age had some college background in 1980. This percentage is somewhat lower than the average for other comparable upstate rural counties. The unemployment rate in 1980 was 8.6 percent, exactly average among upstate counties. Cattaraugus County had a high poverty rate (16%).

COLUMBIA

Located on the rural and hilly eastern banks of the Hudson River just south of Albany along the Taconic Parkway, Columbia County is below average in size among upstate rural counties. Its population of nearly 60,000 people is heavily rural, with 86.6 percent living in places of less than twenty-five hundred people. Almost one-quarter (23.5%) of its work force commute outside the county for employment. Hudson is its largest place, with a 1980 population of nearly 8,000 people.

Between 1970 and 1980 Columbia County gained 8,000 people, including a net of 5,900 adults between 21 and 65 years of age, and gained 5,000 households. Moreover, between 1970 and 1980 the number of jobs held by its people grew by 5,400.

The manufacturing economic base is small and declining, with only 20 percent of the 1980 work force in manufacturing. In 1980, Columbia County had 9 plants which employed a hundred or more persons, and 31 plants which employed twenty or more persons. Its agricultural base is larger than average in total products sold, although declining slightly, with a 1980 adjusted value of over $51.5 million. Its service sector is large, with over 74 percent of the 1980 work force engaged in service industries. This percentage is somewhat larger than the average for upstate rural counties, and growing.

Twenty-eight percent of people over 25 years of age had some college background in 1980. This percentage is average among comparable upstate rural counties. Columbia County had an unemployment rate in 1980 of 7.1 percent, below the average of other upstate counties. It had an average poverty rate of 14 percent.

SULLIVAN

Located in the heart of the Catskill resort area on upstate New York's Southern Tier Expressway, Sullivan County is slightly larger than the average rural county. Its population of 65,1000 people is heavily rural, with 83.7 percent living in places of less than twenty-five hundred people. Less than one-seventh (14.2%) of its work force commute outside the county for

employment. Monticello is its largest place, with a 1980 population of just over 6,300 people.

Between 1970 and 1980 Sullivan County gained about 12,600 people (one of the largest net increases among rural counties), including 8,300 adults between 21 and 65 years of age, and gained 6,100 households. Moreover, between 1970 and 1980 the number of jobs held by its people grew by 5,000.

The manufacturing economic base is very small although increasing slightly, with only 9 percent of the 1980 work force in manufacturing. In 1980, Sullivan County had only 1 plant which employed a hundred or more persons, and 9 plants which employed twenty or more persons. Its agricultural base is about average in total products sold, although declining, with a 1980 adjusted value of $44.8 million. Its service sector is very large, with 88 percent of the 1980 work force engaged in service industries. This percentage is well above the average for other upstate rural counties, although declining slowly.

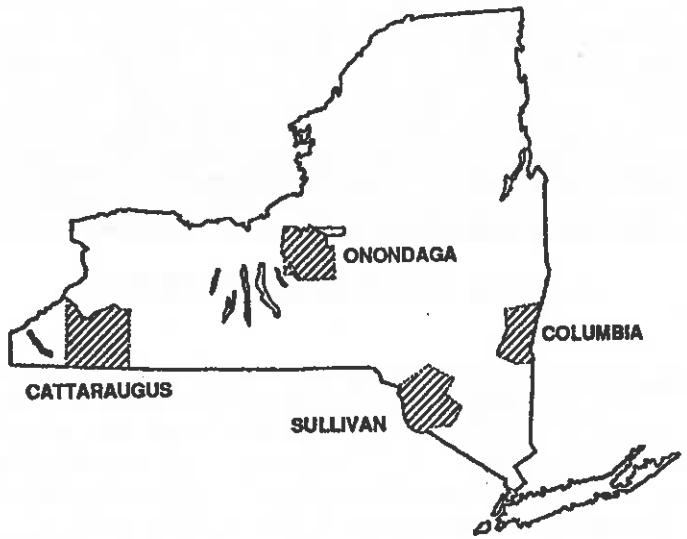
About 26 percent of residents over 25 years of age had some college background in 1980. This percentage is slightly lower than the average for comparable upstate rural counties. Sullivan County's unemployment rate in 1980 was 9 percent, about average for other comparable upstate counties. The county had a comparatively high poverty rate (17%).

APPENDIX B

Survey instrument used in this study of the general public's attitudes and beliefs about sewage sludge management strategies. (The survey instrument used with the selected groups sample was identical except question number 59 was excluded.)

WASTE MANAGEMENT IN NEW YORK

A SURVEY OF PUBLIC OPINIONS



Cornell University
Department of Natural Resources
Fernow Hall
Ithaca, NY 14853-3001

ABOUT THIS QUESTIONNAIRE

This survey is being conducted by a research team at Cornell University to guide the development of educational materials and public involvement activities related to municipal sewage sludge management technologies. We look forward to hearing your opinions.

DIRECTIONS FOR FILLING OUT THE QUESTIONNAIRE

* Please try to answer what you believe to be true for you. The best answer is the one which most closely reflects your own feelings and beliefs.
* It is important that the person to whom this questionnaire is addressed fills it out. This will ensure representativeness.
* We are interested in hearing from EVERYONE who receives this questionnaire, not just those with strong opinions about this topic.
* Do not write your name on the questionnaire.
* Your answers will be treated confidentially. The questionnaire has an identification number so that your name can be checked off our list when you return your questionnaire.
* To return this questionnaire, simply seal it (postage has been provided) and drop it in the nearest mailbox.

THANK YOU FOR YOUR COOPERATION!

MUNICIPAL SLUDGE MANAGEMENT IN NEW YORK

Sewage sludge is a general term used to describe the major fraction of those solids removed from wastewater (sewage) during treatment. The principal constituents of sewage sludge are: (1) those solids present in untreated wastewater in a settleable form, (2) microorganisms produced during the wastewater treatment process, and (3) a large amount of entrained water. Currently, a variety of methods are being used for the management of this material in New York State. Included are: (1) ocean disposal, (2) incineration, (3) placement in landfills with other solid wastes, (4) application to agricultural land, and (5) use for lawn maintenance and other landscaping purposes.

In many areas of New York State, it is becoming apparent that certain method(s) of sewage sludge management will cease to be feasible in the future and new approaches will have to be identified. At this point, there are no specific sludge management plans identified in your area that are related to this study. The purpose of this survey is to hear from New York State residents, such as yourself, to help in development of educational materials and guidelines that local governments can use in solving their sludge management problems.

SLUDGE MANAGEMENT SURVEY

The following series of questions is intended to obtain your opinions about sewage sludge management and related environmental concerns.

Please read each statement carefully and circle the response which best indicates how strongly you agree or disagree with each statement.

		STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
1.	Sludge management is becoming a significant problem for many large cities in New York.....	1	2	3	4	5
2.	Sludge management is becoming a significant problem for many small cities in New York.....	1	2	3	4	5
3.	Sludge management is becoming a significant problem in your county	1	2	3	4	5
4.	All sludge management technologies have some elements of human health risk.....	1	2	3	4	5
5.	Sewage sludge should be managed within municipal boundaries.....	1	2	3	4	5
6.	Governmental regulations for sewage sludge management are too strict.....	1	2	3	4	5
7.	It would be a waste not to recycle the nutrients in municipal sewage sludge.....	1	2	3	4	5
8.	I would be opposed to a sewage sludge incineration plant being built near where I live (within my Township).....	1	2	3	4	5
9.	All sewage sludge management technologies probably have unknown risks.....	1	2	3	4	5
10.	Application of sewage sludge to agricultural land can be done without odors.....	1	2	3	4	5
11.	I would be opposed to sewage sludge products being applied to public areas such as parks, gardens, golf courses, etc.....	1	2	3	4	5
12.	Sewage sludge should be managed within county boundaries.....	1	2	3	4	5
13.	Ocean dumping of municipal sewage sludge is mandated to end December 31, 1991. How do you feel about this decision?.....	1	2	3	4	5
14.	Society has a responsibility to manage its wastes in the safest possible way regardless of the costs.....	1	2	3	4	5

	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
15. Municipal sewage sludge is too dangerous to manage with techniques such as applying it to land as a fertilizer	1	2	3	4	5
16. I would be opposed to sewage sludge being placed in landfills near where I live (within my Township)	1	2	3	4	5
17. Governmental regulations for sewage sludge management adequately protect the public's health and environment	1	2	3	4	5
18. I would be opposed to sewage sludge being applied to agricultural land near where I live (within my Township)	1	2	3	4	5
19. Counties should be allowed to transport their sewage sludge to any other county willing to accept it	1	2	3	4	5
20. I would be opposed to sewage sludge being applied to forest land near where I live (within my Township)	1	2	3	4	5
21. If managed and regulated properly, farmers should be allowed to use sewage sludge on their farm lands regardless of what area the sludge came from	1	2	3	4	5
22. I would be opposed to any sewage sludge being brought into my county from another county even if there were benefits for my county	1	2	3	4	5
23. In general, I am very concerned about environmental issues, such as clean air and clean waterways	1	2	3	4	5
24. I am not concerned with how cities manage their sewage sludge	1	2	3	4	5

The following series of questions is intended to obtain your beliefs about sewage sludge management.

Please read each statement carefully and circle whether you agree or disagree with each statement or don't know.

	AGREE	DON'T KNOW	DISAGREE
25. Municipal sewage sludge composition and thus quality can vary greatly from one community to another	1	2	3
26. Sewage sludge can be beneficial to agricultural or forest soils thus improving plant growth	1	2	3
27. An application of sewage sludge to a forest site would spoil the aesthetics (beauty) of the area for several years	1	2	3
28. If properly managed, sewage sludge can be applied to land without causing water pollution	1	2	3
29. Odor problems will persist for a year or more after one application of sludge to land	1	2	3
30. Toxic chemical problems associated with the application of sewage sludge to land can be avoided with proper management techniques	1	2	3
31. It is the Department of Environmental Conservation's (DEC) responsibility to choose the sludge management technique for an area to make sure that human health and the environment are protected	1	2	3
32. Municipal sewage sludge can be managed within most city boundaries	1	2	3
33. Sludge management decisions are made at the county level but must meet DEC regulations for human health and environmental safety	1	2	3

	AGREE	DON'T KNOW	DISAGREE
34. DEC regulations meet or exceed EPA regulations for human health and environmental safety.....	1	2	3
35. DEC regulations forbid the use of sewage sludge on agricultural lands.....	1	2	3
36. Incineration is the only disposal method for sewage sludge which is safe to human health.....	1	2	3

37. Sludge management regulations of the New York State Department of Environmental Conservation (DEC) are (please circle one number which best reflects your opinion or check NO OPINION):

TOO LENIENT 1 2 3 4 5 6 7 TOO STRICT [___] NO OPINION

38. Please rate how you feel about the ability of DEC to enforce their sludge management regulations (please circle one number which best reflects your opinion or check NO OPINION).

TOO LENIENT 1 2 3 4 5 6 7 TOO STRICT [___] NO OPINION

39. How much trust do you have in the DEC's expertise (ability to perform proper tests and make proper decisions) to manage sewage sludge (please circle one number which best reflects your opinion or check NO OPINION)?

TOO LENIENT 1 2 3 4 5 6 7 TOO STRICT [___] NO OPINION

40. To show how much consideration you feel should be given to each category in making sludge-management decisions (such as how and where it will be managed), divide 100 points among the four categories below. The higher the number of points given to the category, the more importance you feel it should have compared to the other categories. Remember that the total is to equal 100.

____ HUMAN HEALTH
____ ECONOMICS (COSTS)
____ ENVIRONMENTAL QUALITY
____ AESTHETICS (BEAUTY) OF THE AREA

TOTAL = 100

Below are some possible methods of sewage sludge management. The same answer can be used more than once.

A. BURY IN LANDFILLS
B. INCINERATION (BURNING)
C. APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF HUMAN FOOD
D. APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF ANIMAL FEEDS
E. LAWN AND GARDEN FERTILIZER OR SOIL-CONDITIONER PRODUCTS
F. APPLICATION TO FOREST LAND
G. NO OPINION

From the methods listed above, fill in the letter of the one method which you believe will have...

41. ____ the least threat to environmental quality
42. ____ the greatest threat to environmental quality
43. ____ the least economic cost (cheapest method)
44. ____ the greatest economic cost (most expensive method)
45. ____ the least threat to human health
46. ____ the greatest threat to human health
47. ____ the least adverse impact on nearby property values
48. ____ the greatest adverse impact on nearby property values

Please rank these methods of sewage sludge management according to your overall preference (Fill in the appropriate letter).

A. BURY IN LANDFILLS
B. INCINERATION (BURNING)
C. APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF HUMAN FOOD
D. APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF ANIMAL FEEDS
E. LAWN AND GARDEN FERTILIZER OR SOIL-CONDITIONER PRODUCTS
F. APPLICATION TO FOREST LAND

49. ____ first choice

50. ____ second choice

51. ____ third choice

52. ____ fourth choice

53. Please check (✓) the one statement which best describes the level of involvement that you feel citizens should have in deciding which sludge management technologies should be used in their area.

[___] A. THE PLANNING AND THE DECISION-MAKING SHOULD BE LEFT TOTALLY TO THE EXPERTS

[___] B. EXPERTS SHOULD FIRST OBTAIN THE VIEWS OF THE AFFECTED CITIZENS AND THEN PROCEED TO DO THE PLANNING AND MAKE THE FINAL DECISION

[___] C. EXPERTS SHOULD ONLY DO THE EARLY PLANNING AND PROVIDE THE ALTERNATIVES FROM WHICH CITIZENS CAN SELECT

[___] D. CITIZENS SHOULD CONTROL THE ENTIRE PLANNING AND DECISION-MAKING PROCESS AND USE EXPERTS ONLY AS CONSULTANTS AND TO IMPLEMENT THEIR FINAL PLAN

54. Please check (✓) the one statement which best describes the level of involvement that you feel citizens should have in deciding siting issues involving sludge management technologies (e.g., where a landfill, land application, or incineration facility should be located) in their area.

[___] A. THE PLANNING AND THE DECISION-MAKING SHOULD BE LEFT TOTALLY TO THE EXPERTS

[___] B. EXPERTS SHOULD FIRST OBTAIN THE VIEWS OF THE AFFECTED CITIZENS AND THEN PROCEED TO DO THE PLANNING AND MAKE THE FINAL DECISION

[___] C. EXPERTS SHOULD ONLY DO THE EARLY PLANNING AND PROVIDE THE ALTERNATIVES FROM WHICH CITIZENS CAN SELECT

[___] D. CITIZENS SHOULD CONTROL THE ENTIRE PLANNING AND DECISION-MAKING PROCESS AND USE EXPERTS ONLY AS CONSULTANTS AND TO IMPLEMENT THEIR FINAL PLAN

55. How much trust do you have in the following to oversee the proper management of sewage sludge (i.e., making sure that the regulations and proper procedures are followed)? Please circle only one number for each response--leave blank any for which you have no opinion.

	NO TRUST						VERY MUCH TRUST
a. NYS Department of Environmental Conservation	0	1	2	3	4	5	6	7
b. Private consulting firms hired by local government	0	1	2	3	4	5	6	7
c. Local municipal waste treatment plant supervisor	0	1	2	3	4	5	6	7
d. Private industry hired to manage sewage sludge	0	1	2	3	4	5	6	7
e. Local citizen committee (elected) or appointed) to oversee the management of sludge	0	1	2	3	4	5	6	7

56. Have you ever personally become involved in a local landfill, incineration, or waste treatment plant siting process?

[ ] NO
[ ] YES -- If yes, were you satisfied with the outcome?
  [ ] NO
  [ ] YES

  -- If yes, were you satisfied with the process?
  [ ] NO
  [ ] YES

57. Have you ever visited a sewage sludge treatment plant?

[ ] NO
[ ] YES

58. Do you know how your city's (or the city nearest to you) sewage sludge is managed?

[ ] NO
[ ] YES

59. How likely would you be to take an active role in sludge management issues relating to the area (county) you live in?

	NOT LIKELY	MODERATELY LIKELY	VERY LIKELY
A. Read materials on the subject	1	2	3
B. Talk about it with friends, relatives or neighbors	1	2	3
C. Contact officials or newspapers by letter, phone, or visit	1	2	3
D. Attend meetings or public hearings	1	2	3
E. Attend workshops	1	2	3
F. Organize a meeting	1	2	3
G. Sign a petition	1	2	3
H. Start a petition	1	2	3
I. Donate money to a group working for or against an issue	1	2	3
J. Join an action group	1	2	3
K. Organize an action group	1	2	3
L. Other, specify: _____			

60. Are you interested in learning more about sewage sludge management?

[ ] NO
[ ] YES

INFORMATION SOURCES: Please indicate how credible you feel information concerning sludge management from the following sources would be by circling the appropriate number.

	LOW CREDIBILITY					VERY HIGH CREDIBILITY		NO OPINION
61. University Sources	1	2	3	4	5	6	7	0
62. NYS Dept. of Environmental Conservation (DEC)	1	2	3	4	5	6	7	0
63. NYS Dept. of Public Health	1	2	3	4	5	6	7	0
64. NYS Dept. of Ag. & Markets	1	2	3	4	5	6	7	0
65. Environmental Organizations (e.g., Audubon, Sierra Club,, etc.)	1	2	3	4	5	6	7	0
66. U.S. Environmental Protection Agency (EPA)	1	2	3	4	5	6	7	0
67. A Sporting Organization (e.g., Ducks Unlimited, Trout Unlimited, etc.)	1	2	3	4	5	6	7	0
68. Private Industries	1	2	3	4	5	6	7	0
69. Local Environmental Management Councils	1	2	3	4	5	6	7	0
70. Local Government Technical Professionals	1	2	3	4	5	6	7	0
71. Local Government Officials	1	2	3	4	5	6	7	0
72. Local Planning Boards	1	2	3	4	5	6	7	0
73. TV/Radio	1	2	3	4	5	6	7	0
74. Newspapers	1	2	3	4	5	6	7	0
75. Magazines	1	2	3	4	5	6	7	0
76. Scientific Journals	1	2	3	4	5	6	7	0

77. How active would you say you have been with respect to environmental issues of any kind, such as clean air or clean waterways (please check only one response)?

[ ] EXTREMELY [ ] QUITE [ ] SLIGHTLY [ ] NOT AT ALL

78. Please check (✓) any of the following organizations in which you are presently a member.

[___] A. AUDUBON
[___] B. SIERRA CLUB
[___] C. OTHER ENVIRONMENTAL ORGANIZATION, please specify: _____
_____

[___] D. LEAGUE OF WOMEN VOTERS
[___] E. GARDEN CLUB
[___] F. CONSERVATION CLUB, please specify: _____
_____

[___] G. A SPORT FISHING ORGANIZATION, please specify: ___
_____

[___] H. AN AGRICULTURAL ORGANIZATION, please specify: __
_____

[___] I. AN ORV CLUB (SNOWMOBILE, 4-WHEEL DRIVE, CYCLE, etc.), please specify: _____
_____

[___] J. A BOATING CLUB, please specify: _____
[___] K. LOCAL LANDOWNER ASSOCIATION
[___] L. COOPERATIVE EXTENSION
[___] M. PROFESSIONAL ORGANIZATIONS, please specify: ____
_____

[___] N. ANY OTHER ORGANIZATION THAT MAY BE INTERESTED IN NATURAL RESOURCE, ECONOMIC, OR DEVELOPMENT ISSUES, please specify: _____
_____

If you checked any of the above, to your knowledge did your organization ever have a sewage sludge disposal issue on its agenda?

[___] NO
[___] YES

If YES, please describe the situation: _____
_____
_____

PERSONAL INFORMATION

79. What is your sex?

[___] FEMALE
[___] MALE

80. What is your age? _____ YEARS

81. What is your primary occupation?

_____

82. What is your approximate gross family income from all sources before taxes in 1990? (This question is only used to determine if people with different incomes have different opinions.)

[___] a. LESS THAN $10,000
[___] b. $10,000 - $19,999
[___] c. $20,000 - $29,999
[___] d. $30,000 - $39,999
[___] e. $40,000 - $49,999
[___] f. $50,000 - $59,999
[___] g. $60,000 - $69,999
[___] h. $70,000 - $79,999
[___] i. $80,000 OR MORE

83. Do you live within a city or village limit?

[___] NO
[___] YES

84. Is your residence hooked up to a municipal sewage system (as opposed to a septic tank)?

[___] NO
[___] YES
[___] NOT SURE

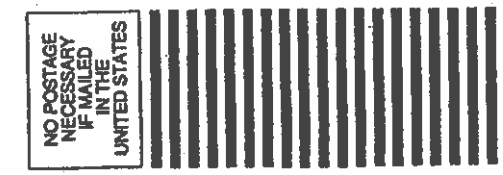
85. Do you currently or have you ever held any political office (elected or appointed) at any level of government?

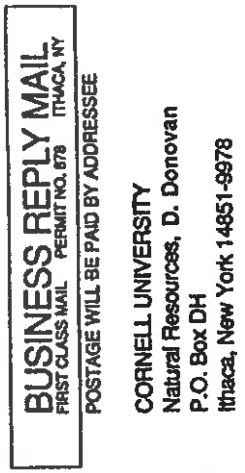
[___] NO
[___] YES
If YES, please specify: _____.

Please use this space for additional comments that you may have.

THANK YOU FOR YOUR ASSISTANCE!

TO RETURN THIS QUESTIONNAIRE, simply seal it and drop it in the nearest mailbox (return postage has been provided).





APPENDIX C

Survey instrument used in this study of the nonrespondents' attitudes and beliefs about sewage sludge management strategies.

Last month we sent you a green questionnaire seeking your opinions about sludge management technologies for New York. According to our records you did not return your questionnaire. We are conducting an additional study to determine if those who chose not to participate are different from those who did participate. It would greatly help our research efforts at Cornell University if you would take **1 MINUTE** and answer this short questionnaire.

1. **Do you remember receiving a green questionnaire about waste management in New York?**

   ☐ NO

   ☐ YES

2. **How <u>active</u> would you say you have been with respect to environmental issues of any kind, such as clean air or clean waterways (please check only <u>one</u> response)?**

   ☐ EXTREMELY ☐ QUITE ☐ SLIGHTLY ☐ NOT AT ALL

Below are some possible methods of sewage sludge management. Please rank these methods of sewage sludge management according to YOUR overall preference (fill in the appropriate letter).

A. **BURY IN LANDFILLS**
B. **INCINERATION (BURNING)**
C. **APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF HUMAN FOOD**
D. **APPLICATION TO AGRICULTURAL LAND FOR PRODUCTION OF ANIMAL FEEDS**
E. **LAWN AND GARDEN FERTILIZER OR SOIL-CONDITIONER PRODUCTS**
F. **APPLICATION TO FOREST LANDS**

3. _____ first choice

4. _____ second choice

5. _____ third choice

6. _____ fourth choice

7. **Are you interested in learning more about sewage sludge management?**

   ☐ NO

   ☐ YES

(TURN OVER)

8. **Please check (√) the one statement which best describes the level of involvement that you feel citizens should have in deciding <u>which</u> sludge management technologies should be used in their area.**

- ☐ A. THE PLANNING AND THE DECISION MAKING SHOULD BE LEFT TOTALLY TO THE EXPERTS
- ☐ B. EXPERTS SHOULD FIRST OBTAIN THE VIEWS OF THE AFFECTED CITIZENS AND THEN PROCEED TO DO THE PLANNING AND MAKE THE FINAL DECISION
- ☐ C. EXPERTS SHOULD <u>ONLY</u> DO THE EARLY PLANNING AND PROVIDE THE ALTERNATIVES FROM WHICH CITIZENS CAN SELECT
- ☐ D. CITIZENS SHOULD CONTROL THE ENTIRE PLANNING AND DECISION MAKING PROCESS AND USE EXPERTS ONLY AS CONSULTANTS AND TO IMPLEMENT THEIR FINAL PLAN

9. **Please read each statement carefully and <u>circle</u> the response which best indicates how strongly you agree or disagree with each statement.**

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Sludge management is becoming a significant problem for many large cities in New York.....	1	2	3	4	5
Sludge management is becoming a significant problem for many small cities in New York.....	1	2	3	4	5
Sludge management is becoming a significant problem in your county.....	1	2	3	4	5
Ocean dumping of municial sewage sludge is mandated to end December 31, 1991. How do you feel about this decision?.....	1	2	3	4	5
I am not concerned with how cities manage their sewage sludge.....	1	2	3	4	5
I would be opposed to sewage sludge being applied to agricultural land near where I live (within my Township).....	1	2	3	4	5
In general, I am very concerned about environmental issues, such as clean air and clean waterways.....	1	2	3	4	5

THANK YOU FOR YOUR COOPERATION. PLEASE RETURN THE QUESTIONNAIRE USING THE ADDRESSED, PRE-PAID RETURN ENVELOPE PROVIDED.

Research conducted by: Human Dimensions Research Unit
Department of Natural Resources, Fernow Hall
Cornell University
Ithaca, New York 14853

APPENDIX D

Selected tables for the analysis of attitudes and beliefs about sewage sludge management strategies in New York, 1991.

Table D-1. Beliefs (by category) about sludge management strategies (general public vs. selected groups) in New York, 1991.

CATEGORY

BELIEFS ABOUT SLUDGE MANAGEMENT STRATEGIES:

Municipal sewage sludge composition and thus quality can vary greatly from one community to another.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=400)	59.8	35.0	5.3
SELECTED GROUPS (N=529)	66.5	28.5	4.9

(X^2=4.73; df=2; p=.094)

Municipal sewage sludge can be managed within most city boundaries.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=402)	32.6	46.5	20.9
SELECTED GROUPS (N=530)	24.3	36.2	39.4

(X^2=36.85; df=2; p<.001)

BELIEFS ABOUT BENEFITS OF SEWAGE SLUDGE STRATEGIES:

Sewage sludge can be beneficial to agricultural or forest soils thus improving plant growth.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=398)	62.1	32.2	5.8
SELECTED GROUPS (N=530)	74.2	21.9	4.0

(X^2=15.53; df=2; p<.001)

BELIEFS ABOUT NUISANCE PROBLEMS AND SAFETY OF SEWAGE SLUDGE STRATEGIES:

An application of sewage sludge to a forest site would spoil the aesthetics (beauty) of the area for several years.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=400)	11.8	47.5	40.8
SELECTED GROUPS (N=530)	6.8	38.7	54.5

(X^2=19.36; df=2; p<.001)

Odor problems will persist for a year or more after one application of sludge to land.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=400)	7.8	60.0	32.3
SELECTED GROUPS (N=530)	4.5	43.4	52.1

(X^2=37.01; df=2; p<.001)

Table D-1. (cont.)

CATEGORY

BELIEFS ABOUT NUISANCE PROBLEMS AND SAFETY OF SEWAGE SLUDGE STRATEGIES:

If properly managed, sewage sludge can be applied to land without causing water pollution.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=401)	52.1	37.2	10.7
SELECTED GROUPS (N=531)	63.5	28.6	7.9

(X^2=12.15; df=2; p=.002)

Toxic chemical problems associated with the application of sewage sludge to land can be avoided with proper management techniques.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=401)	49.9	42.2	7.7
SELECTED GROUPS (N=529)	59.4	33.6	7.0

(X^2=8.54; df=2; p=.014)

Incineration is the only disposal method for sewage sludge which is safe to human health.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=400)	9.5	52.8	37.8
SELECTED GROUPS (N=528)	4.9	42.6	52.5

(X^2=22.57; df=2; p<.001)

BELIEFS ABOUT REGULATIONS CONCERNING SEWAGE SLUDGE MANAGEMENT:

Governmental regulations for sewage sludge management are too strict.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=398)	17.3	45.0	37.7
SELECTED GROUPS (N=529)	28.4	36.5	35.2

(X^2=16.15; df=2; p<.001)

Governmental regulations for sewage sludge management adequately protect the public's health and environment.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=397)	29.0	42.8	28.2
SELECTED GROUPS (N=531)	38.0	40.9	21.2

(X^2=10.45; df=2; p=.005)

Table D-1. (cont.)

CATEGORY

BELIEFS ABOUT REGULATIONS CONCERNING SEWAGE SLUDGE MANAGEMENT:

DEC regulations meet or exceed EPA regulations for human health and environmental safety.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=401)	18.7	76.1	5.2
SELECTED GROUPS (N=529)	26.3	69.0	4.7

(X^2=7.38; df=2; p=.025)

DEC regulations forbid the use of sewage sludge management on agricultural lands.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=401)	8.2	83.0	8.7
SELECTED GROUPS (N=527)	9.3	59.0	31.7

(X^2=74.39; df=2; p<.001)

It is the Department of Environmental Conservation's (DEC) responsibility to choose the sludge management technique for an area to make sure that human health and the environment are protected.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=402)	56.2	22.1	21.6
SELECTED GROUPS (N=529)	45.0	22.9	32.1

(X^2=14.95; df=2; p<.001)

Sludge management decisions are made at the county level but must meet DEC regulations for human health and environmental safety.

	PERCENT		
SURVEY	AGREE	DON'T KNOW	DISAGREE
GENERAL PUBLIC (N=402)	61.7	32.8	5.5
SELECTED GROUPS (N=532)	64.3	25.5	10.2

(X^2=12.34; df=2; p=.006)

Table D-2. Perceived importance of the problem of sludge management in New York, 1991.

Sludge management is becoming a significant problem for many large cities in New York.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=395)	41.5	48.1	9.9	0.5	0.0
SELECTED GROUPS (N=532)	47.7	43.6	8.3	0.4	0.0

(X^2=3.69; df=4; p=.297)

Sludge management is becoming a significant problem for many small cities in New York.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=400)	30.8	50.0	15.8	3.3	0.3
SELECTED GROUPS (N=532)	36.1	49.1	10.5	4.1	0.2

(X^2=7.36; df=4; p=.116)

Sludge management is becoming a significant problem in your county.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=399)	22.1	44.1	22.6	10.5	0.8
SELECTED GROUPS (N=531)	29.9	43.3	13.0	13.6	0.2

(X^2=20.95; df=4; p<.001)

Table D-3. Attitudes towards sewage sludge management strategies in New York, 1991.

I would be opposed to sewage sludge being applied to agricultural land near where I live (within ny Township).

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=397)	5.5	20.7	20.2	46.1	7.6
SELECTED GROUPS (N=528)	4.7	17.8	15.5	51.7	10.2

(X^2=7.25; df=4; p=.123)

I would be opposed to sewage sludge being applied to forest land near where I live (within ny Township).

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=398)	6.8	22.9	20.1	41.5	8.8
SELECTED GROUPS (N=532)	4.1	13.9	16.2	54.9	10.9

(X^2=24.66; df=4; p<.001)

I would be opposed to sewage sludge products being applied to public areas such as parks, gardens, golf courses, etc.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=399)	8.3	26.6	20.6	37.6	7.0
SELECTED GROUPS (N=530)	6.4	20.0	15.7	47.2	10.8

(X^2=16.78; df=4; p=.002)

I would be opposed to a sewage sludge incineration plant being built near where I live (within ny Township).

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=401)	26.2	23.4	22.4	24.4	3.5
SELECTED GROUPS (N=528)	14.8	23.7	24.2	31.3	6.1

(X^2=22.16; df=4; p<.001)

Table D-3. (cont.)

I would be opposed to sewage sludge being placed in landfills near where I live (within ny Township).

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=397)	14.4	32.5	22.9	26.7	3.5
SELECTED GROUPS (N=530)	7.9	25.5	17.2	42.6	6.8

(X^2=37.15; df=4; p<.001)

Ocean dumping of municipal sewage sludge is mandated to end December 31, 1991. How do you feel about this decisions?

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=402)	44.5	36.6	11.2	5.5	2.2
SELECTED GROUPS (N=530)	38.9	39.1	13.6	7.0	1.5

(X^2=4.67; df=4; p=.322)

Table D-4. Attitudes towards sewage sludge management boundaries in New York, 1991.

Sewage sludge should be managed within municipal boundaries.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=399)	12.8	47.1	18.0	20.1	2.0
SELECTED GROUPS (N=526)	8.0	35.6	15.6	34.6	6.3

(X^2=39.79; df=4; p<.001)

Sewage sludge should be managed within county boundaries.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=397)	10.6	55.7	17.1	15.1	1.5
SELECTED GROUPS (N=526)	8.4	49.4	11.4	25.9	4.9

(X^2=28.20; df=4; p<.001)

Counties should be allowed to transport their sewage sludge to any other county willing to accept it.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=401)	7.2	51.6	12.7	20.0	8.5
SELECTED GROUPS (N=530)	11.9	57.7	8.9	16.0	5.5

(X^2=14.79; df=4; p=.005)

If managed and regulated properly, farmers should be allowed to use sewage sludge on their farms regardless of what area the sludge came from.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=397)	9.1	43.3	14.1	26.4	7.1
SELECTED GROUPS (N=530)	10.6	44.2	12.3	27.9	5.1

(X^2=2.79; df=4; p=.594)

I would be opposed to any sewage sludge being brought into my county from another county even if there were benefits for my county.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=395)	12.2	27.6	16.7	37.7	5.8
SELECTED GROUPS (N=530)	7.9	21.9	12.6	48.1	9.4

(X^2=19.13; df=4; p=.001)

Table D-5. Number of sludge management strategies opposed and accepted in New York, 1991.

NUMBER OF STRATEGIES	OPPOSED TO		WOULD ACCEPT	
	NUMBER	PERCENT	NUMBER	PERCENT
0	315	33.4	224	23.8
1	226	24.0	119	12.6
2	167	17.7	121	12.8
3	88	9.3	160	17.0
4	78	8.3	170	18.0
5	69	7.3	149	15.8
TOTAL	943	100.0	943	100.0
(MEAN)	(1.6)		(2.4)	

Table D-6. Relationship of attitudes and beliefs about the safely, nuisance problems and potential benefits of sludge management with attitudes towards sewage sludge management strategies (number opposed and number accepted).

All sludge management technologies have some elements of human health risk.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=16.89; df=1; p<.001)	1.7	1.1
ACCEPTED (F=22.85; df=1; p<.001)	2.3	3.2

All sewage sludge management technologies probably have unknown risks.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=28.19; df=1; p<.001)	1.9	1.1
ACCEPTED (F=40.73; df=1; p<.001)	2.2	3.2

Municipal sewage sludge is too dangerous to manage with technologies such as applying it to land as a fertilizer.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=318.01; df=1; p<.001)	3.0	1.0
ACCEPTED (F=357.45; df=1; p<.001)	1.1	3.4

Application of sewage sludge to agricultural land can be done without odors.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=117.08; df=1; p<.001)	1.2	2.6
ACCEPTED (F=87.02; df=1; p<.001)	3.1	1.7

It would be a waste not to recycle the nutrients in municipal sewage sludge.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=22.51; df=1; p<.001)	1.4	2.5
ACCEPTED (F=10.90; df=1; p<.001)	2.7	1.8

Table D-6. (cont.)

Sewage sludge can be beneficial to agricultural or forest soils thus improving plant growth.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=151.17; df=1; p<.001)	1.2	3.6
ACCEPTED (F=80.66; df=1; p<.001)	3.0	0.8

An application of sewage sludge to a forest site would spoil the aesthetics (beauty) of the area for several years.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=193.34; df=1; p<.001)	3.1	1.0
ACCEPTED (F=156.43; df=1; p<.001)	1.2	3.3

If properly managed, sewage sludge can be applied to land without causing water pollution.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=367.26; df=1; p<.001)	1.0	3.8
ACCEPTED (F=193.40; df=1; p<.001)	3.2	0.9

Odor problems will persist for a year or more after one application of sludge to land.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=174.77; df=1; p<.001)	3.5	1.1
ACCEPTED (F=140.85; df=1; p<.001)	0.7	3.2

Toxic chemical problems associated with the application of sewage sludge to land can be avoided with proper management techniques.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=163.49; df=1; p<.001)	1.1	3.3
ACCEPTED (F=100.77; df=1; p<.001)	3.1	1.1

Table D-6. (cont.)

Incineration is the only safe disposal method for sewage sludge which is safe to human health.

MEAN NUMBER OF STRATEGIES	AGREE	DISAGREE
OPPOSED (F=72.28; df=1; p<.001)	2.8	1.2
ACCEPTED (F=81.23; df=1; p<.001)	1.3	3.2

Table D-7. Beliefs about sludge management strategies in New York, 1991.

least threat to ENVIRONMENTAL QUALITY :	PERCENT(N=865)
BURY IN LANDFILLS	10.6
INCINERATION	23.4
APPLICATION TO AG. LAND FOR HUMAN FOODS	2.0
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	13.5
LAWN AND GARDEN FERTILIZER PRODUCTS	17.8
APPLICATION TO FOREST LANDS	19.4
NO OPINION	13.3

greatest threat to ENVIRONMENTAL QUALITY:	PERCENT(N=856)
BURY IN LANDFILLS	32.7
INCINERATION	23.1
APPLICATION TO AG. LAND FOR HUMAN FOODS	21.0
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	1.8
LAWN AND GARDEN FERTILIZER PRODUCTS	3.4
APPLICATION TO FOREST LANDS	2.6
NO OPINION	15.4

least ECONOMIC COST (cheapest method):	PERCENT(N=861)
BURY IN LANDFILLS	26.5
INCINERATION	11.5
APPLICATION TO AG. LAND FOR HUMAN FOODS	3.5
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	17.7
LAWN AND GARDEN FERTILIZER PRODUCTS	8.8
APPLICATION TO FOREST LANDS	16.2
NO OPINION	15.7

greatest ECONOMIC COST (most expensive method):	PERCENT(N=851)
BURY IN LANDFILLS	19.6
INCINERATION	41.0
APPLICATION TO AG. LAND FOR HUMAN FOODS	9.6
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	0.9
LAWN AND GARDEN FERTILIZER PRODUCTS	5.9
APPLICATION TO FOREST LANDS	3.4
NO OPINION	19.5

Table D-7. (cont.)

least threat to HUMAN HEALTH:	PERCENT(N=872)
BURY IN LANDFILLS	13.3
INCINERATION	24.0
APPLICATION TO AG. LAND FOR HUMAN FOODS	2.1
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	9.1
LAWN AND GARDEN FERTILIZER PRODUCTS	12.4
APPLICATION TO FOREST LANDS	25.0
NO OPINION	14.2

greatest threat to HUMAN HEALTH:	PERCENT(N=854)
BURY IN LANDFILLS	18.1
INCINERATION	19.6
APPLICATION TO AG. LAND FOR HUMAN FOODS	41.1
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	1.1
LAWN AND GARDEN FERTILIZER PRODUCTS	2.5
APPLICATION TO FOREST LANDS	1.1
NO OPINION	16.6

least adverse impact on nearby PROPERTY VALUES:	PERCENT(N=857)
BURY IN LANDFILLS	8.5
INCINERATION	12.0
APPLICATION TO AG. LAND FOR HUMAN FOODS	1.9
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	10.0
LAWN AND GARDEN FERTILIZER PRODUCTS	19.4
APPLICATION TO FOREST LANDS	28.6
NO OPINION	19.6

greatest adverse impact on nearby PROPERTY VALUES:	PERCENT(N=842)
BURY IN LANDFILLS	34.0
INCINERATION	32.3
APPLICATION TO AG. LAND FOR HUMAN FOODS	5.2
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	2.4
LAWN AND GARDEN FERTILIZER PRODUCTS	3.7
APPLICATION TO FOREST LANDS	3.7
NO OPINION	18.8

Table D-8. Relationship between beliefs about and preferences for sludge management strategies.

IMPACTS OF LANDFILLS (F=27.72; df=5; p<.001)	
SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING[a]
BURY IN LANDFILLS	1.3
INCINERATION	-0.7
APPLICATION TO AG. LAND FOR HUMAN FOODS	-0.8
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	-0.6
LAWN AND GARDEN FERTILIZER PRODUCTS	-0.6
APPLICATION TO FOREST LANDS	-0.5

IMPACTS OF INCINERATION (F=79.26; df=5; p<.001)	
SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING
INCINERATION	1.2
BURY IN LANDFILLS	-0.6
APPLICATION TO AG. LAND FOR HUMAN FOODS	-0.5
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	-1.1
LAWN AND GARDEN FERTILIZER PRODUCTS	-0.8
APPLICATION TO FOREST LANDS	-1.2

IMPACTS OF APPLICATION TO AG. LAND FOR HUMAN FOODS (F=16.71; df=5; p<.001)	
SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING
APPLICATION TO AG. LAND FOR HUMAN FOODS	0.4
BURY IN LANDFILLS	-1.0
INCINERATION	-0.9
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	-0.3
LAWN AND GARDEN FERTILIZER PRODUCTS	-0.6
APPLICATION TO FOREST LANDS	-0.7

IMPACTS OF APPLICATION TO AG. LAND FOR ANIMAL FEEDS (F=48.47; df=5; p<.001)	
SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	1.3
BURY IN LANDFILLS	0.1
INCINERATION	0.2
APPLICATION TO AG. LAND FOR HUMAN FOODS	0.0
LAWN AND GARDEN FERTILIZER PRODUCTS	0.3
APPLICATION TO FOREST LANDS	0.3

Table D-8. (cont.)

IMPACTS OF LAWN AND GARDEN FERTILIZER PRODUCTS (F=44.85; df=5; p<.001)

SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING
LAWN AND GARDEN FERTILIZER PRODUCTS	1.2
BURY IN LANDFILLS	0.1
INCINERATION	0.0
APPLICATION TO AG. LAND FOR HUMAN FOODS	0.5
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	0.2
APPLICATION TO FOREST LANDS	0.4

IMPACTS OF APPLICATION TO FOREST LANDS (F=60.04; df=5; p<.001)

SLUDGE MANAGEMENT STRATEGY PREFERENCE	MEAN IMPACT RATING
APPLICATION TO FOREST LANDS	1.8
BURY IN LANDFILLS	0.3
INCINERATION	0.4
APPLICATION TO AG. LAND FOR HUMAN FOODS	0.4
APPLICATION TO AG. LAND FOR ANIMAL FEEDS	0.6
LAWN AND GARDEN FERTILIZER PRODUCTS	0.5

[a]Each strategy was given +1 for each time the strategy was picked as:
the least threat to environmental quality
the least threat to human health
the least adverse impact on nearby property values
the cheapest method
and each strategy was given -1 for each time the strategy was picked as:
the greatest threat to environmental quality
the greatest threat to human health
the greatest adverse impact on nearby property values
the most expensive method
and the impact rating is the sum of these two scores.

Table D-9. Relationship between preferences for and beliefs about sludge management strategies.

INCINERATION = FIRST CHOICE:	PERCENT
greatest threat to environmental quality (N=194)	
INCINERATION	2.0
all other methods	82.5
no opinion	15.5
greatest threat to human health (N=191)	
INCINERATION	3.1
all other methods	84.3
no opinion	12.6
greatest adverse impact on nearby property values (N=187)	
INCINERATION	10.2
all other methods	71.1
no opinion	18.7
greatest economic costs (most expensive method)(N=190)	
INCINERATION	42.6
all other methods	37.4
no opinion	20.0
least threat to environmental quality (N=194)	
INCINERATION	71.1
all other methods	20.7
no opinion	8.2
least threat to human health (N=196)	
INCINERATION	67.9
all other methods	20.9
no opinion	11.2
least adverse impact on nearby property values (N=189)	
INCINERATION	30.7
all other methods	49.7
no opinion	19.6
least economic costs (cheapest method)(N=192)	
INCINERATION	18.3
all other methods	67.0
no opinion	14.7

Table D-9. (cont.)

LAWN AND GARDEN FERTILIZER OR SOIL-CONDITIONER PRODUCTS = FIRST CHOICE:	PERCENT
greatest threat to environmental quality (N=185)	
LAWN AND GARDEN PRODUCTS	2.2
all other methods	85.4
no opinion	12.4
greatest threat to human health (N=186)	
LAWN AND GARDEN PRODUCTS	0.0
all other methods	81.7
no opinion	18.3
greatest adverse impact on nearby property values (N=185)	
LAWN AND GARDEN PRODUCTS	2.2
all other methods	80.0
no opinion	17.8
greatest economic costs (most expensive method)(N=185)	
LAWN AND GARDEN PRODUCTS	5.4
all other methods	75.1
no opinion	19.5
least threat to environmental quality (N=191)	
LAWN AND GARDEN PRODUCTS	46.6
all other methods	39.3
no opinion	14.1
least threat to human health (N=191)	
LAWN AND GARDEN PRODUCTS	33.0
all other methods	51.3
no opinion	15.7
least adverse impact on nearby property values (N=187)	
LAWN AND GARDEN PRODUCTS	42.8
all other methods	39.6
no opinion	17.6
least economic costs (cheapest method)(N=190)	
LAWN AND GARDEN PRODUCTS	17.4
all other methods	66.3
no opinion	16.3

Table D-9. (cont.)

APPLICATION TO FOREST LAND = FIRST CHOICE:

	PERCENT
greatest threat to environmental quality (N=192)	
FOREST LAND	0.5
all other methods	89.6
no opinion	9.9
greatest threat to human health (N=192)	
FOREST LAND	1.0
all other methods	87.0
no opinion	12.0
greatest adverse impact on nearby property values (N=190)	
FOREST LAND	2.1
all other methods	84.7
no opinion	13.2
greatest economic costs (most expensive method)(N=194)	
FOREST LAND	1.0
all other methods	86.6
no opinion	12.4
least threat to environmental quality (N=195)	
FOREST LAND	52.3
all other methods	40.5
no opinion	7.2
least threat to human health (N=195)	
FOREST LAND	60.0
all other methods	30.3
no opinion	9.7
least adverse impact on nearby property values (N=194)	
FOREST LAND	50.5
all other methods	34.5
no opinion	14.9
least economic costs (cheapest method)(N=192)	
FOREST LAND	20.6
all other methods	60.4
no opinion	10.9

Table D-9. (cont.)

APPLICATION TO AG. LAND FOR PRODUCTION OF ANIMAL FEEDS = FIRST CHOICE:	PERCENT
greatest threat to environmental quality (N=140)	
AG. LAND FOR ANIMAL FEEDS	0.0
all other methods	89.3
no opinion	10.7
greatest threat to human health (N=142)	
AG. LAND FOR ANIMAL FEEDS	1.4
all other methods	87.2
no opinion	11.3
greatest adverse impact on nearby property values (N=139)	
AG. LAND FOR ANIMAL FEEDS	2.9
all other methods	83.5
no opinion	13.7
greatest economic costs (most expensive method)(N=141)	
AG LAND FOR ANIMAL FEEDS	0.0
all other methods	86.5
no opinion	13.5
least threat to environmental quality (N=140)	
AG. LAND FOR ANIMAL FEEDS	46.4
all other methods	42.1
no opinion	11.4
least threat to human health (N=144)	
AG. LAND FOR ANIMAL FEEDS	26.4
all other methods	62.5
no opinion	11.1
least adverse impact on nearby property values (N=144)	
AG. LAND FOR ANIMAL FEEDS	30.6
all other methods	56.3
no opinion	13.2
least economic costs (cheapest method)(N=143)	
AG. LAND FOR ANIMAL FEEDS	40.6
all other methods	50.3
no opinion	9.1

Table D-9. (cont.)

BURY IN LANDFILLS = FIRST CHOICE:

	PERCENT
greatest threat to environmental quality (N=77)	
LANDFILLS	6.5
all other methods	75.3
no opinion	18.2
greatest threat to human health (N=77)	
LANDFILLS	3.9
all other methods	87.9
no opinion	18.2
greatest adverse impact on nearby property values (N=77)	
LANDFILLS	15.6
all other methods	63.7
no opinion	20.8
greatest economic costs (most expensive method)(N=77)	
LANDFILLS	7.8
all other methods	72.8
no opinion	19.5
least threat to environmental quality (N=79)	
LANDFILLS	49.4
all other methods	34.1
no opinion	16.5
least threat to human health (N=81)	
LANDFILLS	53.1
all other methods	33.3
no opinion	13.6
least adverse impact on nearby property values (N=78)	
LANDFILLS	25.6
all other methods	51.3
no opinion	23.1
least economic costs (cheapest method)(N=80)	
LANDFILLS	40.0
all other methods	46.2
no opinion	13.7

Table D-9. (cont.)

APPLICATION TO AG. LAND FOR PRODUCTION OF HUMAN FOOD = FIRST CHOICE:	PERCENT
greatest threat to environmental quality (N=29)	
AG. LAND FOR HUMAN FOOD	10.3
all other methods	72.5
no opinion	17.2
greatest threat to human health (N=29)	
AG. LAND FOR HUMAN FOOD	10.3
all other methods	72.3
no opinion	17.2
greatest adverse impact on nearby property values (N=28)	
AG. LAND FOR HUMAN FOOD	17.9
all other methods	57.2
no opinion	25.0
greatest economic costs (most expensive method)(N=28)	
AG LAND FOR HUMAN FOOD	10.7
all other methods	64.3
no opinion	25.0
least threat to environmental quality (N=27)	
AG. LAND FOR HUMAN FOOD	37.0
all other methods	48.2
no opinion	14.8
least threat to human health (N=28)	
AG. LAND FOR HUMAN FOOD	21.4
all other methods	64.3
no opinion	14.3
least adverse impact on nearby property values (N=28)	
AG. LAND FOR HUMAN FOOD	7.1
all other methods	67.7
no opinion	25.0
least economic costs (cheapest method)(N=27)	
AG. LAND FOR HUMAN FOOD	25.9
all other methods	55.6
no opinion	18.5

Table D-10. Relationship between respondents' first choice preference with attitudes towards the use of sludge management strategies within respondents' township.

I would be opposed to a sewage sludge incineration plant being built near where I live (within ny Township).

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	61.9	38.1	63
INCINERATION.....	48.1	51.9	156
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	57.1	42.9	28
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	59.8	40.2	112
LAWN & GARDEN FERTILIZER.....	57.0	43.0	149
APPLICATION TO FORESTS.....	57.9	42.1	159

(X^2=5.84; DF=5; P=.323)

I would be opposed to sewage sludge being placed in landfills near where I live (within ny Township).

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	46.3	53.7	67
INCINERATION.....	61.3	38.7	163
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	46.2	53.8	26
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	45.2	54.8	126
LAWN & GARDEN FERTILIZER.....	48.7	51.3	154
APPLICATION TO FORESTS.....	37.9	62.1	169

(X^2=19.11; DF=5; P=.002)

I would be opposed to sewage sludge being applied to forest land near where I live (within ny Township).

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	42.0	58.0	69
INCINERATION.....	43.9	56.1	157
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	20.0	80.0	25
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	21.7	78.3	129
LAWN & GARDEN FERTILIZER.....	23.5	76.5	162
APPLICATION TO FORESTS.....	16.7	83.3	186

(X^2=43.79; DF=5; P<.000)

Table D-10. (cont.)

I would be opposed to sewage sludge products being applied to public areas such as parks, gardens, golf courses, etc.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	43.1	56.9	65
INCINERATION.....	60.1	39.9	168
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	21.4	78.6	28
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	29.2	70.8	130
LAWN & GARDEN FERTILIZER.....	25.0	75.0	164
APPLICATION TO FORESTS.....	26.3	73.7	167

(X^2= 64.55 DF=5; P<.001)

I would be opposed to sewage sludge being applied to agricultural land near where I live (within ny Township).

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	36.5	63.5	63
INCINERATION.....	50.9	49.1	161
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	13.3	86.7	30
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	12.2	87.8	131
LAWN & GARDEN FERTILIZER.....	22.0	78.0	164
APPLICATION TO FORESTS.....	25.4	74.6	177

(X^2=66.62; DF=5; P<.001)

Table D-11. Relationship between respondents' first choice preference with beliefs about the safety, noxious aspects and benefits associated with the sludge management strategies.

Application of sewage sludge to agricultural land can be done without odors.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	66.1	33.9	62
INCINERATION.....	61.2	38.8	129
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	86.4	13.6	22
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	83.9	16.1	118
LAWN & GARDEN FERTILIZER.....	73.0	27.0	137
APPLICATION TO FORESTS.....	71.6	28.4	148

(X^2=19.11; DF=5; P=.002)

Municipal sewage sludge is too dangerous to manage with techniques such as applying it to land as a fertilizer.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	36.8	63.2	57
INCINERATION.....	52.6	47.4	135
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	12.0	88.0	25
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	9.2	90.8	119
LAWN & GARDEN FERTILIZER.....	20.9	79.1	148
APPLICATION TO FORESTS.....	21.2	78.8	156

(X^2=75.73; DF=5; P<.001)

All sludge management technologies have some elements of human health risk.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	87.1	12.9	70
INCINERATION.....	92.3	7.7	168
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	72.7	27.3	22
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	78.7	21.3	122
LAWN & GARDEN FERTILIZER.....	83.0	17.0	153
APPLICATION TO FORESTS.....	85.0	14.8	169

(X^2=14.16; DF=5; P=.015)

Table D-11. (cont.)

It would be a waste not to recycle the nutrients in municipal sewage sludge.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	85.7	14.3	63
INCINERATION.....	90.1	9.9	152
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	96.4	3.6	28
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	97.1	2.9	137
LAWN & GARDEN FERTILIZER.....	95.9	4.1	170
APPLICATION TO FORESTS.....	94.8	5.2	172

(X^2=14.94; DF=5; P=.011)

All sewage sludge management technologies probably have unknown risks.

FIRST CHOICE PREFERENCE	STRONGLY AGREE and AGREE (%)	STRONGLY DISAGREE and DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	83.1	16.9	65
INCINERATION.....	90.9	9.1	164
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	65.0	35.0	20
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	79.6	20.4	113
LAWN & GARDEN FERTILIZER.....	75.7	24.3	136
APPLICATION TO FORESTS.....	80.3	19.7	157

(X^2=16.76; DF=5; P=.005)

Sewage sludge can be beneficial to agricultural or forest soils thus improving plant growth.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	82.8	17.2	58
INCINERATION.....	82.2	17.8	129
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	100.0	0.0	28
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	98.2	1.5	136
LAWN & GARDEN FERTILIZER.....	96.0	4.0	151
APPLICATION TO FORESTS.....	99.4	0.6	158

(X^2=57.50; DF=5; P<.001)

Table D-11. (cont.)

An application of sewage sludge to a forest site would spoil the aesthetics (beauty) of the area for several years.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	25.0	75.0	48
INCINERATION.....	30.8	69.2	104
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	9.5	90.5	21
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	15.2	84.8	99
LAWN & GARDEN FERTILIZER.....	13.0	87.0	108
APPLICATION TO FORESTS.....	3.0	97.0	135

(X^2=39.46; DF=5; P<.001)

If properly managed, sewage sludge can be applied to land without causing water pollution.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	75.0	25.0	56
INCINERATION.....	72.2	27.8	126
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	96.2	3.8	26
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	97.4	2.6	117
LAWN & GARDEN FERTILIZER.....	89.4	10.6	132
APPLICATION TO FORESTS.....	91.9	8.1	148

(X^2=48.27; DF=5; P<.001)

Odor problems will persist for a year or more after one application of sludge to land.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	23.8	76.2	42
INCINERATION.....	27.5	72.5	80
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	0.0	100.0	19
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	4.2	95.8	95
LAWN & GARDEN FERTILIZER.....	5.2	94.8	96
APPLICATION TO FORESTS.....	7.3	92.7	110

(X^2=40.68; DF=5; P<.001)

Table D-11. (cont.)

Toxic chemical problems associated with the application of sewage sludge to land can be avoided with proper management techniques.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	83.3	16.7	54
INCINERATION.....	76.4	23.6	127
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	95.0	5.0	20
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	96.2	3.8	104
LAWN & GARDEN FERTILIZER.....	93.7	6.3	126
APPLICATION TO FORESTS.....	90.4	9.6	135

(X^2=30.35; DF=5; P<.001)

Incineration is the only disposal method for sewage sludge which is safe to human health.

FIRST CHOICE PREFERENCE	AGREE (%)	DISAGREE (%)	NUMBER
BURY IN LANDFILLS.....	11.8	88.2	34
INCINERATION.....	48.4	51.6	91
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	10.5	89.5	19
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	0.0	100.0	91
LAWN & GARDEN FERTILIZER.....	3.3	96.7	121
APPLICATION TO FORESTS.....	5.6	94.4	125

(X^2=133.15; DF=5; P<.001)

Table D-12. Relationship of sex with first choice preference for a sewage sludge strategy.

FIRST CHOICE PREFERENCE	FEMALE(%) (N=160)	MALE (%) (N=704)
BURY IN LANDFILLS.....	8.8	9.8
INCINERATION.....	20.0	25.0
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	1.9	3.8
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	8.0	19.2
LAWN & GARDEN FERTILIZER.....	31.3	21.2
APPLICATION TO FORESTS.....	30.0	21.0
	100.0	100.0

(X^2=22.63; DF=5; P<.001)

Table D-13. Relationship of income with first choice preference for a sewage sludge strategy.

FIRST CHOICE PREFERENCE	MEAN INCOME CATEGORY[1]	95% CONFIDENCE INTERVAL
BURY IN LANDFILLS.....	4.8	4.3 -- 5.3
INCINERATION.....	4.3	4.0 -- 4.6
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	3.4	2.7 -- 4.0
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	4.6	4.2 -- 5.0
LAWN & GARDEN FERTILIZER.....	4.7	4.3 -- 5.0
APPLICATION TO FORESTS.....	5.1	4.7 -- 5.4

(F=4.54; DF=5; P<.001)

[1]Income Categories:
1 = Less than $10,000
2 = $10,000 - $19,999
3 = $20,000 - $29,999
4 = $30,000 - $39,999
5 = $40,000 - $49,999
6 = $50,000 - $59,999
7 = $60,000 - $69,999
8 = $70,000 - $79,999
9 = $80,000 or More

Table D-14. Relationship of age with first choice preference for a sewage sludge strategy.

FIRST CHOICE PREFERENCE	MEAN AGE	95% CONFIDENCE INTERVAL
BURY IN LANDFILLS.....	57.0	54.3 -- 59.6
INCINERATION.....	56.7	54.7 -- 58.6
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	57.1	51.0 -- 63.1
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	50.0	47.6 -- 52.4
LAWN & GARDEN FERTILIZER.....	47.9	46.0 -- 49.8
APPLICATION TO FORESTS.....	49.7	47.9 -- 51.6

(F=19.98; DF=5; P<.001)

Table D-15. Relationship of interest in learning more about sewage sludge management with first choice preference for a sewage sludge strategy.

FIRST CHOICE PREFERENCE	INTEREST IN LEARNING MORE YES (%)	NO (%)	NUMBER
BURY IN LANDFILLS.....	65.4	34.6	78
INCINERATION.....	70.5	29.5	200
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	66.7	33.3	30
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	82.5	17.5	143
LAWN & GARDEN FERTILIZER.....	81.4	18.6	194
APPLICATION TO FORESTS.....	78.1	21.9	192

(X^2=16.61; DF=5; P=.005)

Table D-16. Environmental attitudes and concern about sludge management in New York, 1991.

In general, I am very concerned about environmental issues, such as clean air and clean waterways.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=400)	50.8	45.5	3.0	0.8	0.0
SELECTED GROUPS (N=533)	44.8	52.2	1.5	1.3	0.2

(X^2=7.56; df=4; p=.109)

Society has a responsibility to manage its waste in the safest possible way regardless of the costs.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=402)	33.6	46.8	4.7	13.7	1.2
SELECTED GROUPS (N=531)	24.3	49.5	4.3	18.3	3.6

(X^2=15.22; df=4; p=.004)

I am not concerned with how cities manage their sewage sludge.

	PERCENT				
SURVEY	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
GENERAL PUBLIC (N=399)	2.5	6.0	16.5	51.6	23.3
SELECTED GROUPS (N=532)	2.1	5.8	7.9	57.7	26.5

(X^2=17.36; df=4; p=.002)

Table D-17. Relationship of environmental attitudes and concern about sludge management with attitudes towards sewage sludge management strategies (number opposed and number accepted).

In general, I am very concerned about environmental issues, such as clean air and clean waterways.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=3.36; df=1; p=.067)	1.6	0.7
ACCEPTED (F=5.79; df=1; p=.016)	1.8	1.2

Society has a responsibility to manage its waste in the safest possible way regardless of the costs.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=7.74; df=1; p<.001)	1.7	1.3
ACCEPTED (F=17.89; df=1; p<.001)	2.3	3.0

I am not concerned with how cities manage their sewage sludge.

MEAN NUMBER OF STRATEGIES	STRONGLY AGREE and AGREE	STRONGLY DISAGREE and DISAGREE
OPPOSED (F=14.57; df=1; p<.001)	2.2	1.5
ACCEPTED (F=10.59; df=1; p=.001)	1.9	2.6

Table D-18. Importance of values (human health, economics, environmental quality, and aesthetics) used in sludge management decisions in New York, 1991.

	HUMAN HEALTH MEAN RATING	(F;df;p)
GENERAL PUBLIC	47.9	(F=0.12; df=1; p=.724)
SELECTED GROUPS	48.4	

	ENVIRONMENTAL QUALITY MEAN RATING	(F;df;p)
GENERAL PUBLIC	22.2	(F=3.05; df=1; p=.081)
SELECTED GROUPS	20.9	

	ECONOMICS MEAN RATING	(F;df;p)
GENERAL PUBLIC	16.4	(F=13.06; df=1; p<.001)
SELECTED GROUPS	18.9	

	AESTHETICS MEAN RATING	(F;df;p)
GENERAL PUBLIC	13.6	(F=7.45; df=1; p=.007)
SELECTED GROUPS	12.1	

Table D-19. Relationship of values (human health, economics, environmental quality, and aesthetics) used in sludge management decisions with first choice preference for a sewage sludge strategy.

FIRST CHOICE PREFERENCE	HUMAN HEALTH MEAN RATING	(F;df;p)
BURY IN LANDFILLS.....	52.5	(F=3.14; df=1; p=.008)
INCINERATION.....	51.0	
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	46.8	
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	46.0	
LAWN & GARDEN FERTILIZER.....	45.9	
APPLICATION TO FORESTS.....	47.8	

FIRST CHOICE PREFERENCE	ENVIRONMENTAL QUALITY MEAN RATING	(F;df;p)
BURY IN LANDFILLS.....	19.8	(F=5.29; df=1; p<.001)
INCINERATION.....	19.1	
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	19.2	
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	23.1	
LAWN & GARDEN FERTILIZER.....	24.1	
APPLICATION TO FORESTS.....	21.5	

FIRST CHOICE PREFERENCE	ECONOMICS MEAN RATING	(F;df;p)
BURY IN LANDFILLS.....	16.3	(F=1.90; df=1; p=.091)
INCINERATION.....	18.0	
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	20.1	
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	18.1	
LAWN & GARDEN FERTILIZER.....	16.4	
APPLICATION TO FORESTS.....	19.1	

FIRST CHOICE PREFERENCE	AESTHETICS MEAN RATING	(F;df;p)
BURY IN LANDFILLS.....	11.5	(F=3.22; df=1; p=.007)
INCINERATION.....	11.9	
APPLICATION TO AG. LAND FOR HUMAN FOOD.....	15.7	
APPLICATION TO AG. LAND FOR ANIMAL FEEDS.....	13.3	
LAWN & GARDEN FERTILIZER.....	14.1	
APPLICATION TO FORESTS.....	11.8	

Table D-20. Self-reported level of activity with respect to environmental issues.

ENVIRONMENTAL ACTIVITY LEVEL	GENERAL PUBLIC % (N=383)	SELECTED GROUPS % (N=519)
EXTREMELY	4.4	11.0
QUITE	21.1	31.8
SLIGHTLY	48.6	48.5
NOT AT ALL	25.8	8.7

(X^2=61.39; df=3; p<.001)

Table D-21. Relationship of preferred level of involvement for citizens in sludge management decisions with attitudes towards sewage sludge management strategies (number opposed and number accepted).

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

	PREFERRED LEVEL OF INVOLVEMENT[1]			
MEAN NUMBER OF STRATEGIES	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
OPPOSED (F=4.75; df=3; p=.003)	2.1	1.4	1.5	1.8
ACCEPTED (F=4.78; df=3; p=.003)	2.0	2.6	2.5	2.1

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

	PREFERRED LEVEL OF INVOLVEMENT[1]			
MEAN NUMBER OF STRATEGIES	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
OPPOSED (F=5.37; df=3; p=.001)	1.8	1.5	1.4	2.0
ACCEPTED (F=2.84; df=3; p=.037)	2.2	2.5	2.5	2.1

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-22. F-value, df and significance probability for the relationships between values (human health, economics, environmental quality and aesthetics) and preferred level of citizen involvement in sludge management issues.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

VALUES	F-VALUE	DF	SIGNIFICANCE PROBABILITY
HUMAN HEALTH	0.96	3	.413
ECONOMICS	1.62	3	.183
ENVIRONMENTAL QUALITY	2.34	3	.072
AESTHETICS	1.20	3	.309

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

VALUES	F-VALUE	DF	SIGNIFICANCE PROBABILITY
HUMAN HEALTH	1.59	3	.191
ECONOMICS	1.28	3	.280
ENVIRONMENTAL QUALITY	0.69	3	.557
AESTHETICS	1.35	3	.258

Table D-23. Relationship of preferred level of involvement for citizens in sludge management decisions with beliefs about the dangers of land application of sewage sludge.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.
WITH
Municipal sewage sludge is too dangerous to manage with techniques such as applying it to land as a fertilizer.

CHI-SQUARE	DF	SIGNIFICANCE PROBABILITY
4.95	3	.175

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.
WITH
If properly managed, sewage sludge can be applied to land without causing water pollution.

CHI-SQUARE	DF	SIGNIFICANCE PROBABILITY
2.68	3	.444

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.
WITH
Municipal sewage sludge is too dangerous to manage with techniques such as applying it to land as a fertilizer.

CHI-SQUARE	DF	SIGNIFICANCE PROBABILITY
4.10	3	.250

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.
WITH
If properly managed, sewage sludge can be applied to land without causing water pollution.

CHI-SQUARE	DF	SIGNIFICANCE PROBABILITY
5.86	3	.119

Table D-24. Relationship of preferred level of involvement for citizens in sludge management decisions with sewage sludge management boundary attitudes.

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	LOCAL ATTITUDES PERCENT (N=543)	REGIONAL ATTITUDES PERCENT (N=169)
LEVEL 1.....	6.3	2.4
LEVEL 2.....	31.1	39.1
LEVEL 3.....	45.7	47.9
LEVEL 4.....	16.9	10.7

(X^2=9.56; df=3; p=.023)

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-25. F-value, df and significance probability for the relationships between the belief that sludge management is becoming a significant problem in New York with preferred level of citizen involvement in sludge management issues.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.
WITH

a) *Sludge management is becoming a significant problem for many large cities in New York.*
b) *Sludge management is becoming a significant problem for many small cities in New York.*
c) *Sludge management is becoming a significant problem* in your county.

	F-VALUE	DF	SIGNIFICANCE PROBABILITY
a)	2.63	3	.049
b)	1.27	3	.283
c)	1.19	3	.314

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.
WITH

a) *Sludge management is becoming a significant problem for many large cities in New York.*
b) *Sludge management is becoming a significant problem for many small cities in New York.*
c) *Sludge management is becoming a significant problem* in your county.

	F-VALUE	DF	SIGNIFICANCE PROBABILITY
a)	0.71	3	.548
b)	1.30	3	.273
c)	1.99	3	.114

Table D-26. Relationship of preferred level of citizen involvement in sludge management decisions with residential sewage system.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MUNICIPAL SYSTEM PERCENT (N=534)	SEPTIC SYSTEM PERCENT (N=372)
LEVEL 1.....	5.8	7.5
LEVEL 2.....	31.3	39.0
LEVEL 3.....	47.0	40.9
LEVEL 4.....	15.9	12.6

(X^2=8.26; df=3; p=.041)

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MUNICIPAL SYSTEM PERCENT (N=535)	SEPTIC SYSTEM PERCENT (N=372)
LEVEL 1.....	3.7	6.2
LEVEL 2.....	30.7	36.3
LEVEL 3.....	48.8	44.4
LEVEL 4.....	16.8	13.2

(X^2=7.70; df=3; p=.053)

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-27. Relationship of preferred level of citizen involvement in sludge management decisions with age.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN AGE (YEARS)	(F;df;p)
LEVEL 1.....	56.4	(F=5.01; df=3; p=.002)
LEVEL 2.....	53.6	
LEVEL 3.....	50.4	
LEVEL 4.....	52.2	

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN AGE (YEARS)	(F;df;p)
LEVEL 1.....	59.0	(F=5.07; df=3; p=.002)
LEVEL 2.....	52.3	
LEVEL 3.....	50.8	
LEVEL 4.....	52.5	

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-28. Relationship of preferred level of citizen involvement in sludge management decisions with interest in learning more about sewage sludge management.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	WANT TO LEARN MORE ABOUT SLUDGE MANAGEMENT	
	NO (%) (N=219)	YES (%) (N=669)
LEVEL 1.....	11.9	4.8
LEVEL 2.....	37.4	33.3
LEVEL 3.....	35.6	47.4
LEVEL 4.....	15.1	14.5

(X^2=18.68; df=3; p<.001)

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	WANT TO LEARN MORE ABOUT SLUDGE MANAGEMENT	
	NO (%) (N=218)	YES (%) (N=671)
LEVEL 1.....	11.0	3.0
LEVEL 2.....	32.6	32.3
LEVEL 3.....	42.2	48.9
LEVEL 4.....	14.2	15.8

(X^2=23.25; df=3; p<.001)

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-29. Relationship of preferred level of citizen involvement in sludge management siting issues with visiting a sewage treatment plant.

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	VISITING A SEWAGE TREATMENT PLANT NO (%) (N=508)	YES (%) (N=412)
LEVEL 1.....	6.3	3.2
LEVEL 2.....	29.9	36.4
LEVEL 3.....	47.6	45.9
LEVEL 4.....	16.1	14.6

(X^2=8.03; df=3; p=.045)

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-30. Relationship of preferred level of citizen involvement in sludge management strategy decisions with knowledge of how "your" city's sewage sludge is managed.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	KNOW HOW YOUR CITY'S SEWAGE IS MANAGED	
	NO (%) (N=452)	YES (%) (N=464)
LEVEL 1.....	7.7	5.4
LEVEL 2.....	31.2	37.5
LEVEL 3.....	44.0	45.3
LEVEL 4.....	17.0	11.9

(X^2=8.93; df=3; p=.030)

[1]Preferred level of involvement:

LEVEL 1 = The planning and the decision-making should be left totally to the experts.

LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.

LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.

LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

Table D-31. Level of trust in possible entities to oversee the proper management of sewage sludge.

MANAGEMENT ENTITY	MEAN TRUST[1]	(F;df;p)
Private consulting firms hired by local government.		
GENERAL PUBLIC SAMPLE	2.6	(F=45.71; df=1; p<.001)
SELECTED GROUPS SAMPLE	3.4	
Local municipal waste treatment plant supervisor.		
GENERAL PUBLIC SAMPLE	3.0	(F=41.69; df=1; p<.001)
SELECTED GROUPS SAMPLE	3.8	
Private industry hired to manage sewage sludge.		
GENERAL PUBLIC SAMPLE	2.4	(F=39.03; df=1; p<.001)
SELECTED GROUPS SAMPLE	3.2	
NYS Department of Environmental Conservation.		
GENERAL PUBLIC SAMPLE	3.8	(F=5.23; df=1; p=.022)
SELECTED GROUPS SAMPLE	3.5	
Local citizen committee (elected or appointed) to oversee the management of sludge.		
GENERAL PUBLIC SAMPLE	3.8	(F=0.26; df=1; p=.613)
SELECTED GROUPS SAMPLE	3.8	

[1]An eight-point scale was used with 0=NO TRUST to 7=VERY MUCH TRUST.

Table D-32. Relationship of preferred level of citizen involvement in sludge management decisions with trust in entities to oversee the proper management of sewage sludge.

Preferred level of involvement that citizens should have in deciding which sludge management technology should be used in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LEVEL 1	3.9
LEVEL 2	4.1
LEVEL 3	3.5
LEVEL 4	2.6

(F=21.78; df=3; p<.001)

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN PRIVATE CONSULTING FIRMS HIRED BY LOCAL GOVERNMENT
LEVEL 1	2.5
LEVEL 2	3.4
LEVEL 3	3.1
LEVEL 4	2.4

(F=9.84; df=3; p<.001)

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN LOCAL CITIZEN COMMITTEE TO OVERSEE SLUDGE MANAGEMENT
LEVEL 1	2.6
LEVEL 2	3.4
LEVEL 3	4.0
LEVEL 4	4.6

(F=19.60; df=3; p<.001)

Table D-32. (cont.)

Preferred level of involvement that citizens should have in deciding siting issues involving sludge management technologies in their area.

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
LEVEL 1	4.0
LEVEL 2	4.0
LEVEL 3	3.5
LEVEL 4	2.8

(F=16.97; df=3; p<.001)

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN PRIVATE CONSULTING FIRMS HIRED BY LOCAL GOVERNMENT
LEVEL 1	2.9
LEVEL 2	3.3
LEVEL 3	3.1
LEVEL 4	2.6

(F=5.09; df=3; p=.002)

PREFERRED LEVEL OF INVOLVEMENT[1]	MEAN TRUST[2] IN LOCAL CITIZEN COMMITTEE TO OVERSEE SLUDGE MANAGEMENT
LEVEL 1	2.8
LEVEL 2	3.3
LEVEL 3	4.0
LEVEL 4	4.6

(F=19.91; df=3; p<.001)

[1]Preferred level of involvement:

- LEVEL 1 = The planning and the decision-making should be left totally to the experts.
- LEVEL 2 = Experts should first obtain the views of the affected citizens and then proceed to do the planning and make the final decision.
- LEVEL 3 = Experts should only do the early planning and provide the alternatives from which citizens can select.
- LEVEL 4 = Citizens should control the entire planning and decision-making process and use experts only as consultants and to implement their final plan.

[2]An eight-point scale was used with 0=NO TRUST to 7=VERY MUCH TRUST.