Hanratty, Elizabeth.

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Oyster River Watershed Study: Final Report

Summary and Recommendations

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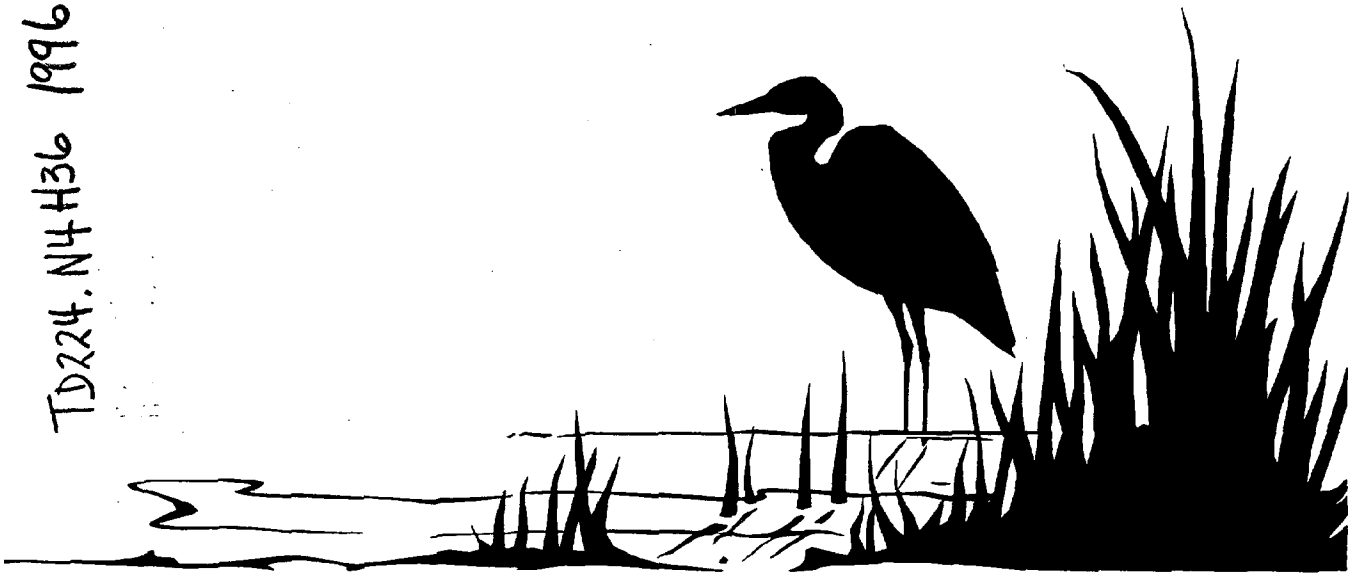

Elizabeth Hanratty, MS Degree Candidate
Robert A. Robertson, Ph.D.
Edmund Jansen, Ph.D.

Resource Administration and Management Program
Department of Resource Economics and Development
University of New Hampshire
Durham, NH 03824

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INTRODUCTION

● Study was completed by the University of New Hampshire's Department of Resource Economics and Development.

In the fall of 1995, the University of New Hampshire's Department of Resource Economics and Development conducted a study of residents of the Oyster River Watershed in Southern New Hampshire. This study was made possible through the assistance of the NH Coastal Program, the Strafford Regional Planning Commission, and the concerned citizens and the local officials of the Oyster River Watershed. Funding for this project was through grants from the Office of State Planning, NH Coastal Programs, as authorized by the National Oceanic and Atmosphere (NOAA), Award Number NA570Z0320, and from the New Hampshire Agricultural Experiment Station, Hatch Grant Number 371.

● This study provides information from and about residents which will assist in the planning and development of the non point pollution programs in the Oyster River Watershed.

This report provides the baseline information necessary to plan and develop programs to abate and prevent nonpoint pollution within the Oyster River Watershed. The information contained in this report can be used by local government officials, planners, coastal and water resource management not for profit environmental organizations, university researchers, educators and others interested in the understanding the "Human Dimensions" of non-point pollution within the Oyster River Watershed. The information will also assist in the planning implementing and evaluating non-point pollution control, rumination, and programs, coastal policies, and education programs for various target populations. This study builds on previous human dimensions research that focus on non-point pollution control and management programs.

● The report includes findings, management implications, practical applications and future research recommendations.

KEY
● Miscellaneous Comment.
◎ Policy Implications.
○ Practical Application.
◆ Research Recommendation.

This narrative reports the results from the study and is organized as a concise summary of the findings as well as a detailed reference. The body of the report contains the findings and the associated policy implications (i.e. provides a broad view of the research findings in relation to current and future, local, state and federal non-point pollution policies), practical applications (i.e. reports how and why specific findings are relevant to non-point pollution within the watershed), and research recommendations (i.e. specifies the findings in terms of both the need for additional data collection to complement future and to validate this research). Miscellaneous comments serve to highlight important findings and generally interpret the results. The data reported are found in Appendix A and Appendix B includes a copy of the summary report distributed to the 129 respondents who requested the results. This section describes the rationale, objectives, and the methods used in conducting the study.

Rationale for the Study

● The most challenges facing the Oyster River Watershed originate from human activity.

The Oyster River and adjacent lands are important resources for New Hampshire. Most of the challenges facing the Oyster River Watershed originate directly or indirectly from human activity. Some of these activities adversely affect water quality (i.e., residential and commercial development, road maintenance, lawn care), while other activities (i.e., recreation, tourism, fishing) are adversely affected by water quality.

Technical solutions to many land use and water quality problems affecting New Hampshire coastal waters are available, but obstacles exist to their implementation. These obstacles include the public's lack of understanding or appreciation of the complexity of water quality problems and land use issues, and local governments' lack of fiscal and administrative resources necessary to implement corrective or remedial actions. This is particularly true for nonpoint pollution, where numerous unrelated actions and management decisions have significant impacts on the watershed system. In New Hampshire, municipalities have the authority to enact local land use controls and therefore play a key role in preventing and abating nonpoint pollution. Increased public awareness and positive public attitudes will also be necessary to control or minimize the impacts of nonpoint pollution on the quality of the watershed.

● Local, state and federal officials need a better understanding of the social and economic obstacles to implementation of available solution to nonpoint pollution.

Section 6217 of the Coastal Zone Reauthorization Amendments of 1990 (CZRA) requires coastal states with approved coastal zone management programs to address nonpoint pollution impacting or threatening coastal waters. The New Hampshire Coastal Program is currently developing a Coastal Nonpoint Pollution Control Program (CNPCP) to enhance state and local efforts to manage land use activities that may contribute to nonpoint source pollution. As part of this program, the Oyster River Watershed Study Steering Committee was created to oversee the Oyster River Watershed Study. The Oyster River Watershed Study's Steering Committee included representatives from the Strafford Regional Planning Commission, local government officials (e.g., selectmen, conservation commissioners, planning board members, etc.), UNH Administrators and concerned citizens from watershed communities (Durham, Madbury, Lee, Barrington and Dover).

● Federal law requires States to address non point pollution impacting coastal waters.

Objectives of the Study

The purpose of this research was to collect information on the attitudes, behaviors, knowledge and perceptions of Oyster River Watershed residents in regard to nonpoint pollution within their watershed. More specifically, the data collected from the study:

- identified perceptions of the magnitude of nonpoint pollution within the Oyster River Watershed;
- measured awareness, knowledge and perceptions of the various causes and potential consequences of nonpoint pollution within the watershed;
- determined current behaviors with relevance to nonpoint pollution and the use of coastal resources; and
- determined preferences for various nonpoint pollution management practices.

● This research collects data which will assist in the development of NPP programs within the Oyster River Watershed.

Description of Study Area

● Parts of five communities are located within the Oyster River Watershed are Durham, Barrington, Lee, Madbury and Dover.

● The total acreage of the watershed is approximately 20,000 acres.

The Oyster River Watershed is located in Southeastern New Hampshire and encompasses the land surrounding the Oyster River, an offshoot of the Great Bay. The watershed is approximately twenty thousand acres with more than half of that amount in forest lands. Three thousand acres are attributed to urban land cover and seventeen hundred acres are attributed to agricultural lands. The entire University of New Hampshire campus and agricultural lands are included in the watershed. Approximately seventy-five percent of the town of Durham, including the town's water plant (the local source of drinking water) is located within the watershed, with approximately seventy percent of the town of Lee, including the Lee Traffic Circle and surrounding businesses. The watershed also extends to Barrington, including portions roughly adjacent to Hall Road, as well as seventy-five percent of Madbury and a small sliver of Dover near Route 108.

Study Methods

● The research design and questionnaire was created with assistance of a steering committee, representing a wide range of interests.

The first step of this study was to host a meeting with many local officials, representative from various federal and state agencies. .This meeting provided an opportunity to frame current non-point pollution issues and to identify information needs. The meetings concluded with the formation of a Steering Committee to assist in all phases of the study process (i.e. research design, data collection, analysis and the development of implementation of recommendations.

The Survey. The research instrument was an eleven page survey divided into the following nine sections: community issues (radon, safe bike paths, school support); information sources (newspaper, television, government agencies); nonpoint pollution sources (boating activities, oil spills, acid rain); major concerns (contaminated drinking water, loss of wildlife, health threats); potential local contributors (UNH campus, gas stations, Lee traffic circle) ; environmental attitudes (who is responsible); potential solutions (regulatory, monetary, education); recreation and household activities (boating, watering lawns, recycling); waste water disposal (septic system or municipal); and about your household (basic demographics). The questionnaire was developed with input and suggestions from members of the Steering Committee composed of local officials and concerned citizens.

● The research design utilized a stratified random sample to represent all households in the Oyster River Watershed at the 95% confidence level.

The Sample. The goal of this research was to complete a survey of a representative sample of the Oyster River Watershed. The survey was distributed to a stratified random sample of households within the Oyster River Watershed. A conservative formula was used to establish the number of completed surveys needed to insure representation. It was calculated that three hundred and forty eight surveys would need to be collected to achieve a 95% confidence level.

● A total of 600 surveys were distributed door to door within the Oyster River Watershed.

The project achieved a 95% confidence level with the collection of 385 completed surveys. The number distributed within each community was based upon the total number of households within the watershed (3262) and their distribution (Figure 1). For example, since eighteen percent of the households within the watershed are in the town of Lee, it would follow that 18% of the completed surveys should be from Lee in order to be a representative sample. In the communities of Madbury and Barrington, additional surveys were collected to ensure enough data for comparisons. The following chart illustrates the distribution of households within the watershed as well as the distribution of completed surveys within the watershed.

● The distribution of the completed surveys paralleled the distribution of the households within the watershed.

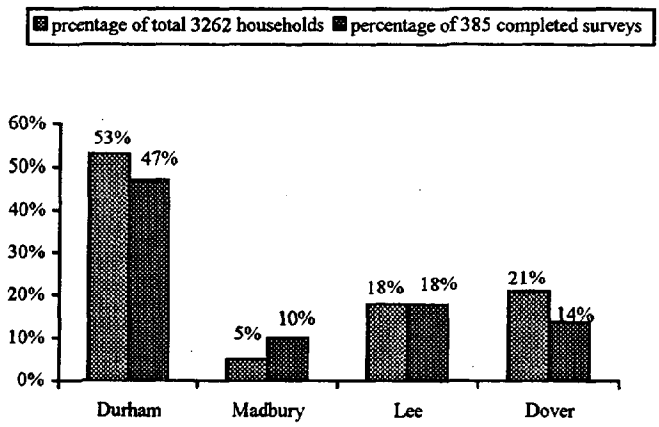

Figure 1 Survey Distribution

● Each household had an equal opportunity of being included in the sample.

Each area of the communities within the watershed were divided into zones of distribution. Thirty surveys were distributed in each zone, reflecting the percentage of total household distribution within the watershed. Each zone had a random starting point which is where the distribution began. Surveyors approached each home, explained the project and the survey and asked if the resident would be willing to complete a survey. If the response was yes, the survey was then left with the resident to be collected the next day, in an agreed upon location (screen door, mailbox, newspaper box). If the completed survey was not there, the surveyor would ask the resident if it was complete and agree to come back at a later time, or would leave a postage paid envelope to mail back the survey when completed. Each surveyor recorded the total number of houses approached, the total number of negative and positive responses, the total number of completed surveys collected, and the total number of envelopes left with residents.

Profile of Survey Respondents

The information in this section provides a profile of the respondents and an approximation of characteristics of the watershed residents. Table 1 presents a profile of those individuals who completed this survey.

● A comparison of the demographic characteristics of the survey respondents with census data for the five communities suggests that the study adequately represents the population.

◎ Policy Implications: Over 80% of the respondents own their own home. Home owners have made a substantial investment in the watershed and should be more willing to take the necessary actions to protect this investment.

◎ Policy Implications: 76 % of the sample have a college degree or above. Suggesting that the residents of the watershed are a very educated group, open to learning and understanding.

SUMMARY OF DEMOGRAPHIC INFORMATION

• Age	48 years (mean) 47 (mode) 46 (median)
• Gender	56% male 44% female
• Years in residence	15 yrs (mean) 3 yrs (mode) 10(median)
• Own/rent	80% own their house
• Run business from home	10%
• Registered to vote	89%
• Employment	70% employed 21% retired
• Education	1% Grammar School 23% High School 38% College 21% Masters 18% Ph.D /Professional

Table 1: Demographic Information.

(1) FINDINGS: COMMUNITY ISSUES WITHIN THE OYSTER RIVER WATERSHED

● This section identifies the relative importance of a range of community issues.

Community residents were presented with a list of twenty-three potential community problems, and were then asked to indicate the severity of the problem in their own community (not, small, medium, or serious). The listed potential problems covered a range of issues which communities face in their planning and development (e.g. school support, air pollution, community planning, radon).

Table 2 displays an interpretation of responses through an examination of the community issues which received the greatest proportion of responses within each of the categories.

O Practical Applications: Quality if drinking water is considered one of the top three community issues: an excellent indication a NPP program is warranted.

◎ Policy Implications: Lack of community participation in decision making was identified as a medium size problem. This study is an attempt to improve quantity and quality of input into the decision making process.

● Unsightly/smelly garbage and winter snow removal were listed as "not" a problem, a good reflection on a municipal services.

COMMUNITY ISSUES	Percent
Top three issues identified as a SERIOUS problem...	
• Safe paths for bike riders	28%
• Lack of support for schools	14%
• Quality of drinking water	11%
Top three issues identified as a MEDIUM-SIZED problem...	
• Lack of citizen participation in community decision making	35%
• Safe paths for bike riders	34%
• Lack of long range community planning	28%
Top three issues identified as a SMALL-SIZED problem...	
• Litter in streets and parks	58%
• Repair of local roads	48%
• Radon	45%
Top three issues identified as NOT a problem...	
• Unsightly/smelly garbage dumps	68%
• Winter snow removal	59%
• Lack of parks and green space	59%

Table 2: Challenges Facing Oyster River Watershed Communities.

◎ Policy Implications: Policy makers and planners need to make explicit the link between alternative transportation systems and the protection of water quality. For example, a "bike path for clean water coalition" could be created in the watershed linking conservation commissions with biking and other recreation interests.

The need for safe bike paths was identified as the most serious issue facing the resident of Oyster River Watershed. The development of bike paths would allow residents to commute to work and minimize the impact of single passenger vehicles of water and other resources.. The lack of support for schools was also identified as a serious concern. This concern is not unique to the watershed. It is a common concern across the state and nation (and is identified as such is most community needs assessments. Alternatively, residents seem to feel the communities do a good job with snow removal and garbage collection, both being listed as "not a problem".

(2) FINDINGS: NONPOINT POLLUTION ISSUES WITHIN THE OYSTER RIVER WATERSHED

● This section will allow for an understanding of residents perceptions of the nonpoint pollution from a national to a local perspective.

Size of nonpoint pollution problem. Figure 2 indicates the percentage of respondents who feel there is a nonpoint pollution problem in the country, state, and town, along with their own drinking water. Residents' perceptions of the size of the nonpoint pollution problem varied based on proximity to their homes (i.e., the closer the issue was to their own drinking water, the less serious they perceived the problem). When asked in another question 47 percent of the respondents indicated that they thought their drinking water was threatened by nonpoint pollution (32% were unsure).

◎ Policy Implications: Perceptions of the size of non-point pollution problems varied based on the proximity of the problem to the respondents home.

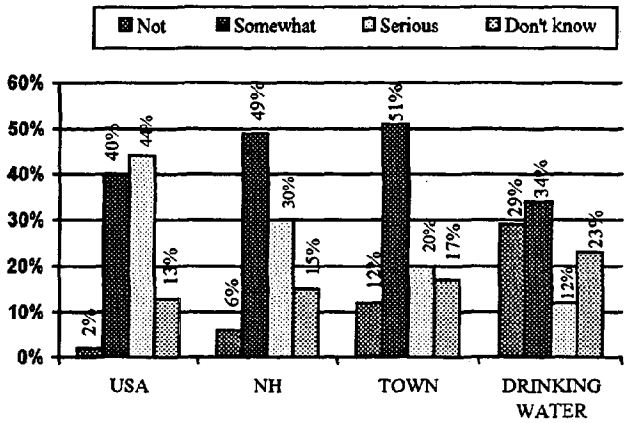

Figure 2 Perceptions of Non Point Pollution

● Slightly over half of the residents consider there to be a nonpoint pollution problem in the coastal zone and 40% felt their drinking water was threaten by nonpoint pollution..

In a related question, 50% of total respondents disagreed with the statement that "the severity of the nonpoint pollution problem in the New Hampshire coastal is exaggerated" and 37% were unsure. This suggests that many residents consider there to be a problem in the region and many residents remain unsure about nonpoint pollution issues in the region.

◎ Policy Implications: A majority of residents feel "somewhat" knowledgeable about NPP. . But only a small minority (15%) felt they were knowledgeable or very knowledgeable. This finding provides a strong rationale for policies directed towards public education initiatives.

Levels of knowledge. When asked how knowledgeable they are about nonpoint pollution, the majority responded that they are "somewhat knowledgeable" about nonpoint pollution. However, 33% considered themselves not knowledgeable, suggesting a need for increased education programming. This 33% corresponds quite closely with the 37% who indicated that they were unsure if a nonpoint pollution problem exists in the coastal zone. Only 15% of the sample consider themselves to be knowledgeable about nonpoint pollution. This is somewhat surprising given the high level of education. of the sample. Of the 4% who feel they are "very knowledgeable" about nonpoint pollution, the majority have gained that knowledge from some sort of work experience. Figure 3 illustrates the breakdown of responses in regard to residents' level of knowledge.

O Practical Applications: There is a need to develop and distribute education materials to the residents of the watershed to increase the number of people in the knowledgeable and very knowledgeable categories.

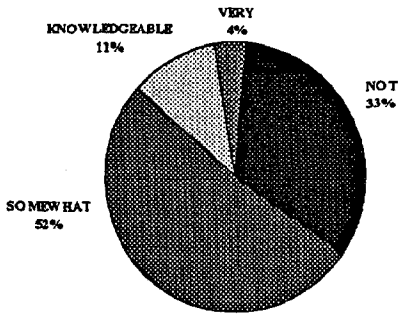

Figure 3 Level of Knowledge of Non-Point Pollution

A related finding in another section of the questionnaire suggests that 82% of the respondents support the development of education programs on nonpoint pollution. Thus, there is a substantial support base for the development of a comprehensive nonpoint pollution education program.

Sources of knowledge. Table 3 presents the results from a a series of questions that asked respondents how much information on environmental issues (e.g., land use planning, water quality, nonpoint pollution, etc.) they received from a listing of various information sources. The results suggest that there are several primary sources of knowledge for environmental information. The data indicates 32.2% of respondents receive information on nonpoint pollution from newspaper articles in Fosters Daily Democrat (has the largest circulation in the watershed) and 27% consider the Boston Globe a primary source. Environmental groups are getting their message out with nearly 20% considering these organizations a primary sources of information.

● Fosters Daily Democrat and the Boston Globe are important sources of information on nonpoint pollution in the coastal region.

One the other end of this spectrum residents do not consider local officials (5.5%), state officials (5%) or federal officials (4.6%) to be primary source of information. Likewise, contrary to the common view only 6% of the sample considered annual town meetings to be a primary source of information. On a local level many people depend on their friends and neighbors for information. Thus even if only a small number of people attend education initiatives, these results suggest that the information will diffuse through informal information networks.

◎ Policy Implications: The Oyster River Study Steering Committee should share the results from this study with local and regional media outlets to encourage more environmental articles and programming.

When asked the direct question "What is the primary source of your knowledge of nonpoint pollution?" newspapers were identified as the primary source for 32% of the sample, work was identified by 14%, 9.5% identified television, and 5% identified other people or books as the their primary source. Again, 26% indicated that had limited knowledge on nonpoint pollution.

◆ Research Recommendation: Further analysis of this data base should investigate the relationship between information sources and actual and perceived knowledge.

INFORMATION SOURCES	Percent
Top three PRIMARY SOURCE for quantities of information...	
• Foster's Daily Democract	32%
• Television	29%
• Public Radio	28%
Top three SOMEWHAT A SOURCE for quantities of information ...	
• Conversations with people	70%
• Television	61%
• News Magazines(Time, U.S. News)	54%
Top three NOT A SOURCE for quantities of information ...	
• Portsmouth Herald	71%
• Union Leader	68%
• Transcript	64%

Table 3 . Sources for Information.

O Practical Applications: Results provide a strong rationale for the development of peer education programs. Persons attending education programs should be encouraged to share what they learned and their learning materials with family and friends.

Trust of Information Sources

● While newspapers and television are listed as top sources of information, the majority of residents only feel they in "some trust."

Table 4 presents the results from the question set that asked respondents to rate their level of trust that they place in various source of environmental information. The results suggests that sample place the most trust in the environmental information presented by National Public Radio, UNH Cooperative Extension, environmental groups and books. It is important to note that books was the only source that ranked in the top five for both sources of information and levels of trust. State and federal government officials prompted the lowest level of trust from respondents.

● UNH Cooperative Extension is considered by the sample to be a trusted source of information.

O Practical Applications: Consider the development of a certification program for residents who participate in nonpoint pollution education programs so they can improve their credibility with their friends and neighbors.

◎ Policy Implications: Nonpoint pollution education and information programs and materials should be presented and prepared at the local level since many residents of the watershed question the credibility of state and federal officials as information sources.

LEVELS OF TRUST	Percent
Top three MOST TRUSTED sources for information...	
• Professional Journals	24%
• Public Radio	22%
• UNH Cooperative Extension	16%
Top three TRUST sources for information...	
• UNH Cooperative Extension	51%
• Books	34%
• Other Magazines	28%
Top three SOME TRUST sources for information ...	
• Television	67%
• Commercial Radio	65%
• Conversation with people	63%
Top three NOT TRUSTED sources for information...	
• Union Leader	38%
• Federal Government Officials	24%
• State Government Officials	20%

Table 4 Levels of Trust of Information Sources.

● The survey was an important education tool for the sample of Oyster River Watershed residents.

The survey itself was an important public education tool. For example, the survey required that 385 residents think about the nonpoint pollution issues in their watershed in answering the questions. In addition, twenty five percent of the persons completing the survey, expressed a need for more information about nonpoint pollution and related topics. This providing a valuable foot in the door for the provision of education materials.

◆ Research Recommendation: There is a need to do further analysis with this data in order to better understand how personal and behavioral factors influence "trust".

Residents' perceptions and attitudes are shaped to some extent by these various sources. Town officials need to examine the possible sources in determining the best avenue for public education. When asked in related attitudinal questions, 93% agreed with the statement "every person is responsible for protecting the quality of the natural environment".

(3) FINDINGS: LEVEL OF CONCERN WITH THE NEGATIVE IMPACTS OF NONPOINT POLLUTIN IN THE OYSTER RIVER WATERSHED

● This section documents residents level of concerns with the many potential consequences of nonpoint pollution.

This section presents the results from a series of questions intended to measure the Oyster River Watershed (ORWS) residents level of concern with the many potential adverse consequences of the nonpoint pollution within the watershed. The sample of residents were asked to indicate their level of concern for potential impacts from nonpoint pollution (not, slightly, concerned or very), was measured with a list of 13 negative impacts of nonpoint pollution.

O Practical Applications: The level of residents concern with the potential impacts of nonpoint pollution can be used as a mechanism to mobilize citizen and community actions.

The results to this question are interpreted through an examination of the negative impacts which received the greatest proportion of responses within each categories (Table 6). Concerns voiced by residents centered primarily on personal health and safety. This is evident by the top three responses in both the "very concerned" and "concerned" categories. The residents were not as concerned with loss of tourism revenue, diminished property values, and closed shellfish areas.

◎ Policy Implications: Education programs need to provide Oyster River Watershed residents with accurate information on the impact of nonpoint pollution on health and water quality.

It is important to ascertain the concerns of a community in order to find the most effective direction for an education program. Based upon their findings, a public education program within the Oyster River Watershed should be targeted to the health concerns of residents to be most effective.

◆ Research Recommendation: There is a need to examine the relationship between property values and nonpoint pollution. Residents are not overly concerned about the threat that nonpoint pollution represents to tourism and property values. Research should investigate if nonpoint pollution is a threat to tourism and property values

◎ Policy Implications: To be most effective in securing public support for nonpoint pollution, control public information efforts should focus on health and environmental concerns, as opposed to economic or interest group concerns.

CONCERNS WITH THE CONSEQUENCE OF NONPOINT POLLUTION	Percent
Top three conditions identified as VERY CONERNED	
• Health threats	48%
• Chemicals in water	38%
• Contaminated drinking water	37%
Top three conditions identified as CONCERNED	
• Excess nutrient supplies which cause excessive algae blooms	47%
• Bacteria in water(posted swimming warnings)	42%
• Loss of recreational opportunities	40%
Top three conditions identified as SLIGHTED CONCERNED	
• Loss of tourism revenues	38%
• Diminished property value	34%
• Loss of recreational opportunities	31%
Top three conditions identified as NOT CONCERNED	
• Loss of tourism revenues	31%
• Diminished property values	21%
• Closed shellfish areas	13%

Table 5:Nonpoint Pollution Concerns of Oyster River Residents.

4) FINDINGS: POTENTIAL NONPOINT POLLUTION SOURCES AND POTENTIAL LOCAL CONTRIBUTORS.

● This section document residents perception of the extent to which various activities contribute to the nonpoint pollution problem.

The potential sources of nonpoint pollution within the Oyster River Watershed are numerous. Residents were given a list of 32 possible sources of nonpoint pollution and asked their opinion of the extent that each of the 32 potential sources of nonpoint pollution affect the Oyster River Watershed. Residents could choose between "does not affect", "slightly affects", "moderately affects", "strongly affects", and "most strongly affects" options. Respondents where also provided a "don't know option". Table 6 reports the results from these questions.

◆ There is a need for additional research that investigates the accuracy of residents perceptions of the causes of nonpoint pollution and the extent that know self-reported levels of knowledge effect perceptions of sources of nonpoint pollution..

● Acid rain was identified as most strongly affecting the Oyster River Watershed.. Each of these sources are beyond the control of local residents. Only 2% of the sample identified logging as contributing to nonpoint pollution and only 3% identified house construction as contributing to the problem.

O Practical Applications: There is a need for more volunteer water quality monitoring so that the actual contribution of some of these potential contributors can be determined.. These monitoring programs will also serve an important education role.

● It is important to note that two of the top three "don't know" responses have been identified as nonpoint pollution contributors within the watershed.

SOURCES OF NON POINT POLLUTION	Percents
Top three issues identified as MOST STRONGLY affects nonpoint pollution...	
• Acid Rain	21%
• Toxic waste	20%
• Oil spills	19%
Top three issues identified as STRONGLY affecting nonpoint pollution...	
• Runoff from urban areas	25%
• Household septic systems	25%
• Discharges or dumping from boats	22%
Top three issues identified as MODERATELY affecting nonpoint pollution...	
• Home lawn and garden chemicals	32%
• Runoff from cropland	31%
• Runoff from urban areas	30%
Top three issues identified as SLIGHTY affecting nonpoint pollution...	
• Wildlife	41%
• House construction	41%
• Logging or timber harvest	34%
Top three issues identified as NOT affecting nonpoint pollution...	
• Medical waste	21%
• Mining	16%
• Logging or timber harvest	15%
Top three issues identified as DON"T KNOW affecting nonpoint pollution...	
• Fuel storage tanks	24%
• Medical waste	22%
• Boat moors	21%

Table 6 Potential Nonpoint Pollution Sources.

Based on the list of 32 potential sources of nonpoint pollution, respondents were asked to identify the top three sources of nonpoint pollution, 12 percent of the respondents identified acid rain, 11% identified household septic systems and 6% identified oil spills.

● The Steering Committee wanted to know who local residents blame for Oyster River's nonpoint pollution problems.

A number of members of Oyster River Watershed Study Steering Committee expressed a need for a better understanding of residents perceptions of the extent to which specific locations within the watershed contribute to the area's nonpoint pollution problems. Table 7 presents the results to this question. Respondents were provided a list of ten contributors and were asked if the identified source "very strongly contributes", "strongly contributes", "slightly contributes", and "does not contribute". The results to this question are interpreted through an examination of the potential contributors which received the greatest proportion of responses within each of the categories.

● The nonpoint pollution impacts of the development at the Lee Traffic Circle was a concern of some of the members of the Steering Committee but was not considered an important contributor by respondents.

Residents perceived the UNH campus, home septic systems, and automobiles as top contributors in the area. Residents indicated several that they feel do not contribute to nonpoint pollution within the Oyster River Watershed. The Lee Traffic Circle created the least concern with 14% of respondents feeling it "does not contribute." Industrial parks (10%) and commercial agriculture (10%) were not considered serious contributors to nonpoint pollution within the Oyster River Watershed.

◎ Policy Implications: All of the "very strong" potential local contributors to nonpoint pollution were all related to single passenger vehicles (i.e., much of UNH Campus contributions are related to parking lots) providing more support for planning and policy initiatives that focus on the reducing the university community's dependence on single passenger vehicles.

O Practical Applications: Construction activities and UNH Farms and Home Lawns &Gardens were not perceived by the sample as very strongly contributing to nonpoint pollution. Education initiatives need to address this perception..

◎ Policy Implications: It is important to note that respondents separate the UNH campus from the University farming activities.

POTENTIAL LOCAL CONTRIBUTORS	Percent
Top three identified VERY STRONG contributors...	
• Automobiles	13%
• Gas stations	11%
• UNH campus	10%
Top three identified as STRONG contributors....	
• Automobiles	48%
• UNH campus	47%
• Gas stations	42%
Top three identified as SLIGHT contributors...	
• Construction activities	65%
• UNH farms	61%
• Commercial agriculture	56%
Top three identified as NOT contributors...	
• Lee traffic circle	14%
• Industrial park	10%
• UNH farms	8%

Table 7:Potential Local Contributors.

(5) FINDINGS: SEPTIC SYSTEMS

● Fifty percent of the survey respondents have septic system. This is a very close approximation to the proportion of the total non UNH student population.

Septic system users. Fifty percent of survey respondents have septic systems. Of the respondents who have septic systems, 93% know the location of the septic system. The average year of installation for septic systems in the Oyster River Watershed was 1980.

◎ Policy Implications: Residents with septic systems accept responsibility for the maintenance and upgrading of their systems.

The use and maintenance of these systems was identified as a potential nonpoint pollution sources by survey respondents, therefore the actual maintenance practices of those with systems are of interest. Figure 4 demonstrates how often residents check the level of sludge and scum in their septic system. Septic system owners, for the most part, are willing to take responsibility for maintenance. One question asked opinions concerning an acceptable cost sharing scheme between the homeowner, town, county, state and federal government, to finance the upgrade or replacement of the system. On the average, homeowners listed a cost sharing scheme of 63.3% for homeowners, with the remaining distributed between various levels of government. Of particular note seventy seven percent of respondents felt homeowners should carry all of the cost associated with upgrading and/or replacing septic systems.

● A majority of the sample (53%) have never checked their sludge level, only check it when there is a problem or only check once every three years.

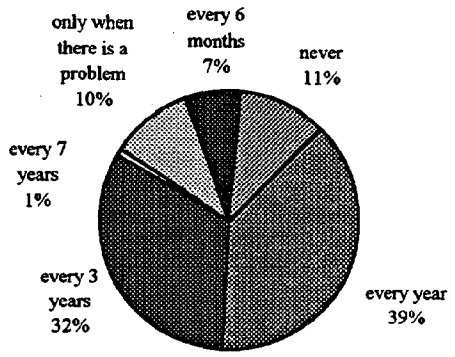

Figure 4: Frequency of Checking Sludge Levels

O Practical Applications: Education materials need to be developed and distributed to residents about the care of their septic systems.

Septic system owners would be an excellent target population for public education. Many homeowners move onto property with septic systems without being properly educated about the maintenance of their systems. According to this research, almost half (44%) of septic system owners are putting products harmful to septic systems, such as bleach and food waste, into their systems. When asked what would motivate them to regularly maintain their septic system, 51.7% of respondents stated they already maintain their systems.

O Practical Applications: Results suggest that local septic system companies might improve business if they offer coupon and send reminders (i.e., like dentist offices).

Table 5 lists various motivations for maintaining septic systems with corresponding percentages of residents who feel the method would motivate them to maintain the system. It is interesting to note the top three motivations: to avoid replacing the system (52.8%), a property tax discount (34.4%), and more information (31.7%). Regulations were thought to be the least effective method of motivation (12.8%), as were cash coupons (18.9%).

O Practical Applications: Education materials need to be developed and distributed to residents that explains that routine maintenance will extend the life of their septic systems and protect water quality at the same time.

O Practical Applications: Septic systems owners would be an excellent group to target for education. Addresses are available or in communities with no municipal systems - town mailings, information in newsletter, etc.

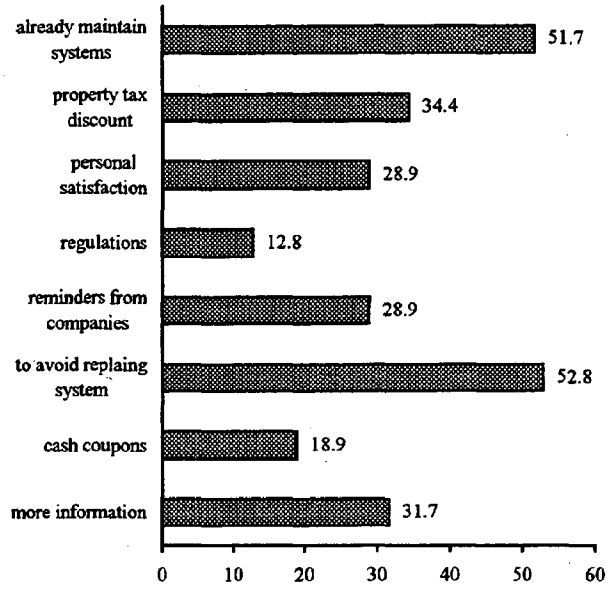

Figure 5: Motivations to Check Sewer System

◆ Research Recommendation Future research projects might test and evaluate the effectiveness of different information and incentives programs (e.g., actually test response to various types of offers—could be done in cooperation with reputable septic system service companies).

Within the Oyster River Watershed, residents tend to know the importance of maintaining their systems, and on the whole can afford to take care of their systems. Looking to the future, how will the communities deal with the increasingly difficult task of disposing of the pumped sludge? By targeting system owners, this group can be involved in future community decisions which will definitely impact them, such as when communities switch over to municipal sewer systems.

(6) FINDINGS: IMPACT BEHAVIORS AND CONSERVATION BEHAVIORS

● A vast majority (93%) of the residents believe that we are all equally responsible for protecting the natural environment.

Watershed resident behaviors. Many individual behaviors will impact the extent that nonpoint pollution impacts water quality in an area. There are a number of behaviors that need to be monitored or controlled to prevent misuse and subsequent pollution. A vast majority (93%) of respondents feel that every person is responsible for protecting the quality of the natural environment. Table presents the results of a question which established residents' behavior are impacted by nonpoint pollution. The results to this question are interpreted through an examination of the behaviors which received the greatest proportion of responses within each of the categories.

Table 8 presents the relative frequency that residents participate in a wide range of outdoor recreation activities. The survey provide the respondents with a list of various outdoor recreation activities and asked them how often they participate in each from never to very often (results were collapsed from 5 response choices to 3).

●Appreciative recreation activities (i.e., enjoying scenery, hiking bird watching) had the highest participation rates and consumptive activities (hunting, harvesting shellfish, etc.) had some of the lowest.

O Practical Applications: Understanding how people use the watershed allows for a better understanding of the types things that might motivate them to protect it.

◆ Research Recommendation Further analysis of this data set should investigate the relationship between participation in various outdoor recreation activities and support for various nonpoint pollution control initiatives .

RECREATION ACTIVITIES	Often	Some	Not
Sail, canoe, kayaks	15%	42%	43%
Swim in the Oyster River/Great Bay	6%	53%	41%
Water ski	2%	20%	79%
Jet ski	.6%	6%	93%
Wind surf	2%	9%	90%
Enjoy scenery	87%	12%	.6%
Bird/nature walk	55%	42%	13%
Hunt waterfowl	2%	6%	91%
Fish	13%	35%	53%
Harvesting shellfish	2%	13%	89%
Snowmobile	2%	9%	89%

Table 8: Participation in Recreational Activities.

Table 9 presents the relative frequency that residents participate in a various community activities. The survey provide the respondents with a list of 5 community activities and asked them how often they participate in each from never to very often (results were collapsed from 5 response choices to 3). The results indicate that a majority of the sample use UNH facilities. The question was nebulously worded, so the use could range for recreation facilities, concerts, or special events (Durham and UNH share library resources). Residents of the watershed are also very active in volunteer activities with only 16 percent of sample indicating that they never volunteer. Somewhat of surprise was the finding that 26% of those completing the survey indicated that they never attend annual town meetings.

◎ Policy Implications: Over 70 percent of watershed households never participate in Coast Week activities but a majority of the sample volunteer at least "sometime" suggesting that the NH Coastal Program may need to evaluate their programming and/or promotional efforts.

◆ Research Recommendation: Further analysis of this data to investigate the relationship between participation in various volunteer and town function s knowledge, attitudes and behaviors towards nonpoint pollution

COMMUNITY ACTIVITIES	Often	Some	Not
Attend town meetings	21%	53%	26%
Participate in community activities	16%	70%	14%
Participate in volunteer activities	22%	62%	16%
Utilize UNH facilities	29%	55%	16%
Participate in coastal week activities	2%	27%	70%

Table 9: Participation in Communities Activities.

Table 10 presents the relative frequency that residents participate in a various household activities. The survey provide the respondents with a list of eight household activities and asked them how often they participate in each from never to very often (results were collapsed from 5 response choices to 3).

● A majority of the sample use salt on driveways, apply lawn chemicals and garden pesticides.

● Approximately half of the watershed residents periodically test their water. This suggests that they are concerned about water quality.

HOUSEHOLD ACTIVITIES	Often	Some	Not
Use salt on your driveway or walks	6%	55%	39%
Apply lawn chemicals/fertilizer	6%	53%	41%
Apply garden pesticides/chemicals	2%	48%	50%
Change the oil of your car at home	13%	10%	70%
Apply water to your lawn	13%	66%	21%
Wash you car at home	12%	69%	19%
Test the water quality at home	4%	46%	50%
Water your garden	26%	55%	13%

Table 10: Participation in Various Household Activities.

◎ Policy Implications: Residents household activities in that it will allow policy makers and educators pinpoint the more prevalent behaviors and target policy or education programs based on that information..

Table 11 presents the relative frequency that residents participate in a various household activities. The survey provide the respondents with a list of eight household activities and asked them how often they participate in each from never to very often (results were collapsed from 5 response choices to 3).

◆ Research Recommendation: Further analysis of this data should investigate the relationship between household activities/ conservation activities and support for various nonpoint pollution control programs.

● A vast majority of the sample (88%) recycle and a large percentage use environmentally friendly products at least sometimes.

CONSERVATION ACTIVITIES	Often	Some	Not
Change your car oil at a commercial establishment	66%	23%	11%
Use environmentally friendly household products	54%	44%	2%
Pump out septic system	19%	29%	46%
Reduce water usage	37%	59%	4%
Remove trees/shrubs near septic system	15%	34%	53%
Compost	31%	30%	38%
Recycle	89%	10%	3%
Use low phosphate detergents	59%	32%	9%

Table 11:Participation in Various Conservation Activities.

O Practical Applications: A running faucet puts 3-5 gallons of water down the drain every minute it is on. If you turn off the water you can save up to 9 gallons each time you brush your teeth and 14 gallons each time you shave.

Table 12 presents a summary of the characteristics of the households within the watershed. Information is presented on water conserving behavior membership in environmental organizations, their source of drinking water, methods of waste water disposal and the rate of use of common household appliances (i.e., dishwashers, washing machines). The table below lists a number of water conservation behaviors and the corresponding percentage of Oyster River Residents who participate in these behaviors. When asked about possible conservation solutions, 75% feel effective long range solutions to environmental problems depend upon changing lifestyles to fit nature.

O Practical Applications: A faucet aerator is a simple device which costs less than $4 and can be installed on faucets to save on water use. Aerators cut use by as much as 280 gallons a month for a typical family of four. Although the flow is reduced, it seems stronger because air is mixed with the water as it leaves the tap. Only 12% of respondents have installed any type of low-flow taps; if even 50% of respondents (193 households) installed them it would result in roughly 635,250 gallons of water saved every year.

● Although the level of participation in environmental groups would initially appear somewhat low according to American Public Opinion Data the national average is only about 3%. Therefore most of the listed organizations in this survey actually have an above average participation level based upon this representative sample of residents.

● Over 9% of the sample drink bottled water. This suggest that many residents have concerns about their drinking water.

● 8% of this sample do not know where their waste water goes.

HOUSEHOLD CHARACTERISTICS	
Behaviors	
• Install low flow shower head	12%
• Install water conservers in toilet	21%
• Install low flow toilets	23%
• Recycle gray water on garden	6%
• Turn off water while soaping	16%
• Install low flow taps	12%
• Stop running water while shaving	48%
• Stop washing car	21%
• Stop watering lawns	28%
Activities	
Membership in environmental groups	
• Nature Conservancy	12%
• Society for Protection of NH Forests	8.3%
• NH nonpoint	5.4%
• Sierra Club	3.1%
• Friends of Seacoast Science Center	3.1%
• NH Lakes Association	1.4%
• Strafford Rivers Conservancy	1.1%
• Great Bay Conservation Trust	.6%
• NHDES Volunteer River Program	3%
Household Characteristics	
Primary source of drinking water	
• well on property	45.8%
• municipal water	34.6%
• bottled water	9.4%
• filtered tap water	6.7%
• do not know	.3%
Method of waste disposal	
• public sewer system	40.1%
• septic system	51.7%
• do not know	8.2%
• Number of bathrooms in home	2.2(mean)
• Number of showers in home	1.7(mean)
• Dishwasher in home	74.8%
• average times run per week	3.2(mean)
•Washing machine in home	89.7%
• average times run per week	4.5(mean)

Table 12: Summary of Information..

(7)FINDINGS: ENVIRONMENTAL ATTITUDES AND POTENTIAL SOLUTIONS

Table 13 presents the results from a series of questions that asks respondents for their opinions of who is or should be responsible for controlling or abating nonpoint pollution. Residents were presented with ten statements which list a wide range of responsible parties. Identifying who the public feels is responsible is an important first step in the prevention and abatement of nonpoint pollution.

O Practical Application: Watershed residents feel that everyone is responsible for the quality of the environment. But, they don't believe that citizens will accept responsibility. Thus, providing a rational for government control programs.

O Policy Implication: Watershed residents do not think that voluntary measures will be adequate in controlling nonpoint pollution.

◆ Research Recommendation: Further analysis of this data should investigate the underlying dimensions of the "responsibility" construct.

O Policy Implication: Nonpoint pollution programs and policies should be an cooperative effort between all levels of government.

RESPONSIBLE PARTY	Disagree	Unsure	Agree
Every person is responsible for protecting the quality of the natural environment	3%	4%	93%
Citizens are willing to take personal responsibility to reduce pollution from nonpoint sources	41%	25%	34%
Responsibility for developing nonpoint pollution prevention programs should lie mainly with the state government	42%	27%	31%
If there is continual pollution of our lakes, streams, and air, nature's process will purify the systems	83%	10%	7%
I don't need to be concerned about reducing nonpoint pollution because other people are doing so	88%	7%	5%
Waterfront landowners should be more strictly regulated concerning nonpoint pollution than inland landowners	36%	26%	38%
Voluntary measures are adequate in controlling nonpoint pollution	65%	22%	13%
Responsibility for developing nonpoint pollution should lie mainly with the local town government	36%	30%	34%
Responsibility for developing nonpoint pollution should lie mainly with the federal government	52%	31%	17%
Development of nonpoint pollution prevention programs should be a shared responsibility between local and federal government	11%	14%	75%

Table 13 Attitudes towards Responsible Parties

Table 14 presents the results from a series of questions that asks respondents to evaluate a series of potential solutions which may be necessary to control or abate nonpoint pollution. Residents were presented with ten statements which encompass potential solution paths for nonpoint pollution abatement and control. These solutions addressed such possibilities as regulations, monetary solutions and voluntary measures.

O Practical Application: A majority of the watershed residents recognize that mandatory requirements and penalties may be necessary to control nonpoint pollution.

◎ Policy Implications: A large portion of the residents are "unsure" what they think about potential solutions. This suggest that a combination of well thought out policy and public information could produce a viable solution.

◆ Research Recommendation: Further analysis of this data should investigate behavioral and attitudinal influences on support for the various solutions.

POTENTIAL SOLUTIONS	Disagree	Unsure	Agree
I am willing to pay higher property taxes to protect the quality of my drinking water	32%	33%	18%
Mandatory requirements and penalties are necessary to ensure control of nonpoint pollution	13%	24%	63%
I would be willing to make a voluntary contribution to control nonpoint pollution within the Oyster River Watershed	25%	40%	34%
Strict government-wide measures will need to be imposed since few people will address nonpoint pollution themselves	24%	31%	45%
State lottery monies should be used to control nonpoint pollution.	27%	34%	39%
When communities contribute to the nonpoint pollution problem, the community should pay for the proper disposal or cleanup	7%	24%	69%
The benefits of nonpoint pollution controls outweigh any fiscal costs	25%	42%	33%
My local government is genuinely interested in reducing nonpoint pollution in the Oyster River Watershed	7%	55%	38%
A local surtax should be passed to control nonpoint pollution	42%	45%	13%
Any program to reduce nonpoint pollution should combine public education and moderate government regulations	5%	13%	82%

***Table 14** Preference for Potential Solutions.*

SUMMARY

A number of implicating applications and recommendations have been drawn from the findings and are noted in the text.

The specific purpose of this study was to collect the base line information necessary to prevent nonpoint pollution within the watershed. The information was collected through a scientific survey (drop off and pick up questionnaire) of a representative sample of all households within the watershed. The data presented represents all watershed households with at a 95% confidence level. We found that the residents of the watershed are well educated, fairly affluent, typically own their own home, and are employed in professional positions.

The research estimates the most serious concerns in the watershed relate to availability of safe paths for bike riders, lack of funding for schools and quality of drinking water. Although lack of citizen participation in community decision making and lack of cooperation between watershed communities, are a concern, respondents are

generally satisfied with most facets of their community. They were very satisfied with the amount of public access to waters and parks and open space. Water pollution was considered a small or non existent problem by over 70% of the sample.

The results show that over 80% of the watershed residents consider themselves "less than knowledgeable" about nonpoint pollution. Newspapers are the primary source of knowledge about environmental issues, and did not garner a high level of trust. "Conversations with other people" and our "work" also represent an important source of knowledge. Somewhat surprisingly local, state and federal government officials were not listed an important source of information or a highly trusted one. Residents have the most trust for information provided by UNH Cooperative Extension and professional journals.

Health and environmental impacts were found to be of most concern to the watershed residents. Residents are less concerned about economic issues associated with special interests. The residents identified acid rain as the most important contributors to nonpoint pollution in the watershed. The UNH campus, automobiles, and septic systems were identified as contributing the most to nonpoint pollution problems.

The results show that watershed residents recognize that "new technologies won't solve non point pollution problems" and that "effective long range solutions require changing lifestyles to fit with nature". Ninety -three percent of the sample say they agree or strongly agree with the statement that "Every person is responsible for protecting the quality of the environment". Most (74%) think that nonpoint pollution prevention programs should be a shared responsibility between local and federal governments. Thus the results from this study suggest that residents are aware that nonpoint pollution problem will not go away on its own and that some "change in lifestyle" is necessary to improve that situation.

In examining septic systems issues, more closely, slightly more than half (52%) of the residents had a septic systems (8% didn't know). Generally persons with septic systems accepted responsibility for their maintenance and upgrade. Receiving information on how to maintain their system and avoiding costly repairs provided the strongest incentive for maintaining the system.

When asked about potential solutions most (72%) agreed that any programs to reduce nonpoint pollution programs should combine public education and moderate government regulations. A majority agreed that mandating penalties are necessary to ensure control of nonpoint pollution. However, only 37% were willing to pay higher property taxes to protect water quality (31 % opposed and 33% were unsure). This same divergence was present when residents were asked about the remination of the problem of storm water runoff problem. Sixty eight percent considered storm water runoffs a serious concern and 87% thought that storm drain systems should be upgraded if they contribute problems. However, the median amount of respondents said they were willing to pay to correct the problem was $50.00 and the mode response was 0.

Only 12% of the residents feel voluntary measures are adequate in controlling nonpoint pollution. This is reflected in the voluntary conservation behaviors being utilized in the watershed. Fifty-six percent are low flow shower heads, 52% stop running water while shaving, and 47% wash their car less often.

In conclusion, this research provides insights into the characteristics, behaviors and knowledge of watershed residents. Oyster River Watershed residents are, for the most part, highly educated and are open to gaining more information on what they can do to contribute to local issues. Any state or local policies mandating abatement of nonpoint pollution should include mechanisms to insure compliance and to promote teamwork between the units of government and the respective communities. The approach should foster cooperation and cohesion between communities within the watershed. This project was the first step in this process. It facilitated cooperation and collaboration between all levels of government, nonpoint organizations and the research community.

Appendix A

Questionnaire and Frequencies

)YSTER RIVER WATERSHED STUDY

Number of Valid Responses)

'hank you for agreeing to participate in this study. This survey is one part of a project being conducted by the)yster River Watershed Task Force to assess nonpoint pollution in the Oyster River Watershed. Nonpoint ollution is pollution that, in general, does not come from the end-of-a-pipe. For years, efforts were focused on educing pollution from specific end-of-pipe sources and these efforts have been largely successful. We now ealize pollution also comes in many diffuse forms such as parking lot runoff, poorly maintained septic systems, unoff from timber harvest, agricultural or barnyard runoff, and runoff from streets and stormdrains. This runoff an contain high amounts of bacteria, metals, sediment, and nutrients which can pollute our waters.

'he results from this study will allow town officials and resource managers to gain important insights from their ommunity residents, which in turn will help in formulating policies and programs that are more effective for your ommunity. Please take the time to complete this questionnaire. You may be assured of confidentiality. We do ot ask you to put your name or title anywhere on the questionnaire. The results will be presented in aggregate orm only; therefore, you will not be personally associated with the answers you give.

What is the primary source of your drinking water? (Please check one) **N = (373) M = (1.895)**

45.8% From a well on my property	9.4% Purchased bottled water	1.3% Unknown
34.6% Municipal water	6.7% Filtered tap water	2.1% Other, _____

Where does the stormwater runoff from your property go? (Please check all that apply.) **N = (366)**

(.497)50.3% Local creeks and ponds	(.303)30.3% Oyster River	(.139) 13.9% Atlantic Ocean
(.298)29.8% Don't Know	0% Connecticut River	(.011)1.1% Cocheco River
(.027)2.7% Lamprey River	(.052)5.2% Gulf of Maine	(.15)15.0% Great Bay
(.046)4.6% Bellamy River		

In general, do you think nonpoint pollution is a serious problem, somewhat of a problem, or not a problem in each of the following (please check ☑): **N = (360)**

	Not a Problem	Somewhat of a Problem	Serious Problem	Don't Know
United States of America (mean w/o don't know) 2.476	2.2%	41.1	43.6	13.1
New England (2.389)	2.5	46.9	34.2	16.4
New Hampshire (2.297)	5.6	49.3	29.8	15.4
Your county (2.230)	7.3	49.7	25.1	17.9
Your town (2.110)	11.7	51.4	19.8	17.1
Your own drinking water (1.794)	29.4	34.9	12.4	23.3

- Please check () the choice which best shows how you feel about the size of the problem in your community or neighborhood.

  NOT means it is **not a problem** in your community.
  SMALL means it is a **small problem** in your community.
  MEDIUM means it is a **medium-sized** problem in your community.
  SERIOUS means it is a **serious problem** in your community.

	Size of the Problem in Your Community			
	NOT	**SMALL**	**MEDIUM**	**SERIOUS**
Litter in streets, roads and parks **(362) 1.080**	19.1	58.0	18.8	4.1
Lack of citizen participation in community decision making **(346) 1.347**	20.2	34.7	35.3	9.8
Unsightly and smelly garbage dumps **(351) .419**	67.8	23.9	6.8	1.4
Community growing too fast **(355) 1.079**	31.0	39.7	19.7	9.6
Lack of attention to citizen complaints about local government **(342) .997**	33.0	40.1	21.1	5.8
Lack of intergovernment cooperation **(323) 1.173**	25.4	40.2	26.0	8.4
Repair of local roads and streets **(351) 1.017**	27.9	47.9	18.8	5.4
Adequate zoning regulations **(336) .810**	40.8	40.8	15.2	3.3
Radon **(310) 1.074**	26.8	44.8	24.2	4.2
Long range community planning **(329) 1.14**	27.4	38.0	28.0	6.7
Safe paths for bike riders **(347) 2.62**	15.3	22.2	34.0	27.7
Quality of drinking water **(351) 1.236**	25.4	38.2	25.4	11.1
Lack of support for schools **(350) 1.129**	38.6	25.7	21.4	14.3
Place where citizens can take complaints **(339) .909**	41.0	36.0	15.6	7.4
Not enough emphasis on safe handling of hazardous waste **(340) .991**	37.9	34.4	18.2	9.4
Traffic congestion **(356) 1.11**	31.5	36.0	22.8	9.8
Adequate sewage treatment facilities **(326) .868**	42.0	35.0	17.2	5.8
Air pollution **(349) .894**	37.5	40.7	16.6	5.2
Garbage collection and disposal **(353) .646**	55.5	28.6	11.6	4.2
Water pollution **(339) 1.103**	25.7	44.8	24.5	5.0
Lack of parks and green space **(352) .645**	58.5	24.1	11.6	5.7
Winter snow removal **(355) .592**	58.9	27.6	9.0	4.5
Public access to lakes **(342) .936**	45.0	26.3	18.7	9.9

ıformation Sources

ıumber of potential sources of information are listed below. Please indicate (☑) how much information on environmental issues (e.g. land use planning, water ılity, nonpoint pollution) you have gotten from the following and how much trust you place in each of the following information source?

	Quantity of Information					Level of Trust				
Mean	Not a Source	Somewhat of a Source	A Primary Source	#N		No Trust	Some Trust	Trust	Most Trust	Mean
2.183	18.9	49.4	31.7	328	Foster's Daily Democrat (287)	9.8	56.4	32.1	1.7	2.338
1.342	71.1	22.8	6.0	298	Portsmouth Herald (131)	19.1	49.6	27.5	3.8	2.16
1.441	62.4	30.5	7.1	295	Transcript (159)	18.2	54.1	26.4	1.3	2.107
1.37	68.0	26.3	5.7	297	Union Leader (152)	37.5	37.5	21.1	4.0	1.947
1.951	32.2	40.5	27.3	304	Boston Globe (219)	6.9	39.7	39.7	13.7	2.598
1.495	63.8	23.0	13.3	196	Other Newspapers (see nxt pg)(93)	11.8	37.6	36.6	14.0	2.527
1.862	33.3	47.2	19.5	246	Books (166)	4.2	41.6	46.4	7.8	2.578
1.986	23.9	53.6	22.5	280	News magazines (Time, U.S. News)(212)	4.7	44.8	41.0	9.4	2.552
2.08	48.9	30.9	19.7	188	Other magazines (see nxt pg.)(100)	7.0	35.0	46.0	12.0	2.63
1.636	52.3	31.8	15.9	258	Professional journals (144)	4.2	27.1	45.1	23.6	2.882
2.246	10.7	60.5	28.8	309	Television (272)	7.7	66.5	21.0	4.8	2.482
2.056	22.9	48.7	28.4	306	Public Radio (243)	3.7	36.6	37.4	21.8	2.901
1.792	34.7	51.4	13.9	288	Radio (207)	7.7	68.6	20.3	2.9	.5
1.556	51.1	42.2	6.7	270	Commercial Radio (164)	15.9	65.2	16.5	2.4	2.005
2.056	12.2	70.1	17.8	304	Conversations with people (252)	7.5	63.1	24.6	4.8	2.266
1.623	47.5	46.1	6.4	284	Government publications (182)	12.6	54.4	31.3	1.6	2.22
2.024	24.7	55.0	19.9	291	Environmental groups (230)	8.7	40.9	37.8	12.6	2.543
1.696	42.2	52.2	5.5	289	Local government officials (197)	15.7	56.3	25.4	2.5	2.264
1.599	45.0	50.0	5.0	282	State government officials (189)	20.1	60.3	18.5	1.1	2.005
1.569	47.7	47.7	4.6	281	Federal government officials (180)	23.9	52.8	21.7	1.7	2.011
1.682	44.8	42.3	12.9	286	UNH Cooperative Extension (187)	5.9	26.7	51.3	16.0	2.775
1.556	51.0	42.3	6.6	286	Annual Town Meetings (175)	11.4	57.7	26.9	4.0	2.234
1.582	49.6	42.6	7.8	282	Local Public Hearings (174)	11.5	56.3	28.7	3.4	2.241

How knowledgeable do you feel you are about nonpoint pollution? (344) 2.051
33.4 Not knowledgeable 51.5 Somewhat knowledgeable 10.8 Knowledgeable 3.8 Very knowledgeable

What is the primary source of your knowledge of nonpoint pollution? (Please list)(214)
Top 5: 32.2% newspapers; 13.6% work; 8.9% TV; 5.1% people; and 5.1% books (source of knowledge)

Nonpoint Pollution Sources

- Below is a list of possible sources of nonpoint pollution. For each source, please check (☑) the respo category which best describes, in your opinion, the degree the sources affect the Oyster River Watershe

	Does not Affect	Slightly Affects	Moderately Affects	Strongly Affects	Most Strongly Affects		Don Kno
a. Household chemicals (e.g., oil, paints)(335)	3.9	32.5	26.6	16.1	6.6	1.871	14.3
b. Household septic systems (336)	2.7	24.1	29.8	24.7	7.1	2.108	11.6
c. Runoff from cropland (334)	4.2	26.0	31.1	17.7	6.9	1.965	14.1
d. Logging or timber harvest (331)	15.4	34.4	19.3	7.9	1.8	1.318	21.1
e. Livestock waste (332)	5.1	33.1	26.8	12.7	5.1	1.753	17.2
f. Runoff from urban areas (328)	2.7	10.1	30.2	25.0	9.8	2.215	12.2
g. Discharges or dumping from boats (332)	6.3	24.7	23.5	21.7	9.3	2.035	14.5
h. Boating activities (331)	6.3	30.5	29.6	15.1	5.1	1.794	13.3
i. Boat moors (327)	13.5	32.4	19.9	9.2	3.7	1.455	21.4
j. Mining (e.g., sand and gravel pits) (330)	15.8	29.1	18.8	10.0	5.8	1.508	20.6
k. Oil spills (325)	12.9	26.2	12.0	11.1	18.5	1.950	19.4
l. Acid rain (335)	2.7	20.6	27.5	20.0	20.9	2.526	8.4
m. Litter or garbage (335)	5.1	32.8	29.0	16.1	8.1	2.02	9.0
n. Home lawn and garden chemicals (335)	3.0	26.6	32.2	20.3	10.1	2.087	7.8
o. Stormwater drainage (332)	3.9	26.8	31.3	20.2	6.6	1.986	11.1
p. Toxic waste (327)	9.2	23.2	17.1	10.7	19.9	2.11	19.9
q. Medical waste (327)	20.5	28.4	6.1	10.1	12.5	1.559	22.3
r. Agricultural activities (330)	5.8	30.6	28.8	11.8	8.5	1.844	14.5
s. Wildlife (e.g., beavers, geese, swans) (332)	15.4	41.0	18.4	9.6	3.0	1.390	12.6
t. Runoff and leaching from landfills (331)	6.3	23.6	28.4	16.0	9.7	1.989	16.0
u. House construction (329)	12.2	41.0	10.7	8.2	3.3	1.409	14.6
v. Industrial development (329)	10.0	28.0	21.0	16.7	8.8	1.838	15.5
w. Loss of wetlands (327)	8.3	20.5	17.7	19.3	18.7	2.232	15.6
x. Highway maintenance practices (333)	3.3	24.6	28.8	18.3	11.7	2.121	13.2
y. Parking lots & paved areas (334)	5.1	29.9	23.7	20.4	7.2		13.8
z. Fuel storage tanks (330)	5.8	27.9	17.9	13.0	11.2	1.948	24.2
aa. Sediments due to erosion (323)	6.8	32.2	24.1	10.8	6.8	1.736	19.2
bb. Other (please list): (45) _____	2.2	11.1	4.4	11.1	11.1	2.444	60.0

- From the above list, please list the letter of the top three sources of nonpoint pollution.

1. Acid Rain 11.5% 2. Household Septic Systems 11.0% 3. Oil Spills 6.2%

'ajor Concerns

Possible negative impacts of nonpoint pollution in the Oyster River Watershed are listed below. For each situation, please check (✓) the response which best describes your level of concern with current conditions.

	Not Concerned	Slightly Concerned	Concerned	Very Concerned
Contaminated drinking water (341) 1.979	9.1	20.2	34.3	36.4
Contaminated fish and game (336) 1.875	8.3	24.1	39.3	28.3
Diminished property value (335) 1.421	20.9	33.7	27.8	17.6
Loss of wildlife (337) 1.923	7.7	24.0	36.5	31.8
Bacteria in the water (e.g. posted swimming warnings) (334)	8.1	18.0	41.6	32.3
Loss of recreational opportunities (336) 1.646	11.3	31.0	39.6	18.2
Closed shellfish areas (336) 1.693	12.8	27.4	37.5	22.3
Unpleasant odors (339) 1.676	12.1	29.2	37.8	20.9
Health threats (339) 2.192	6.2	16.8	28.6	48.4
Chemicals in water (334) 2.093	5.4	18.3	38.0	38.3
Excess nutrient supplies that cause extensive algae blooms (332) 1.816	7.8	25.6	43.7	22.9
Loss of tourism revenues (336) 1.083	31.0	37.8	23.2	8.0
Loss of unique or endangered plants and animals (336) 1.896	10.4	22.3	34.5	32.7

ɪtential Contributors

Possible contributors to nonpoint pollution within the Oyster River Watershed are listed below. Please check (✓) the response which best describes the degree to which you feel each contributes to nonpoint pollution.

	Does Not Contribute	Slightly Contributes	Strongly Contributes	Very Strongly Contributes
UNH campus (314) 1.637	2.5	41.1	46.5	9.9
Home lawns and gardens (316) 1.354	7.3	54.4	33.9	4.4
Commercial agriculture (307) 1.378	6.5	55.7	31.3	6.5
Downtown Durham (314) 1.427	4.1	55.1	34.7	6.1
Home septic systems (318) 1.456	6.3	50.0	35.5	8.2
Gas stations (321) 1.601	4.7	43.3	41.1	10.9
Lee traffic circle (305) 1.233	13.8	55.1	25.2	5.9
Industrial park (293) 1.304	9.9	54.6	30.7	4.8
Automobiles (314) 1.713	3.8	34.4	48.4	13.4
UNH farms (315) 1.270	7.9	61.3	26.7	4.1
Highway maintenance (314) 1.532	2.9	49.7	38.9	8.6
Construction activities (302) 1.291	4.3	65.2	27.5	3.0
Other (13) 1.462	0	69.2	15.4	15.4

'rom the above list, please list the letter of the top THREE contributors of nonpoint pollution.

1. UNH Campus 16% 2. Home Septic Systems 13% 3. Automobiles 13%

Environmental Attitudes

- Please read each of the following statements. Check (✓) the box that indicates the extent you agree or disagree with the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strong Agre
New technology will solve the problems of nonpoint pollution. **(334) 2.796**	6.9	30.2	41.0	20.1	1.8
The severity of the nonpoint pollution problem in the New Hampshire coastal zone is exaggerated. **(332) 2.551**	9.3	40.4	37.3	11.7	1.2
The balance of nature is very delicate and easily upset. **(338) 3.891**	2.4	11.5	11.5	43.8	30.8
Every person is responsible for protecting the quality of the natural environment. **(339) 4.375**	1.2	2.1	3.8	44.0	49.0
The benefits of modern consumer products are more important than the pollution that results from their production and use. **(332) 2.069**	30.4	44.3	15.1	8.4	1.8
Citizens are willing to take personal responsibility to reduce pollution from nonpoint sources. **(334) 2.901**	6.0	35.3	24.6	30.8	3.3
Responsibility for developing nonpoint pollution prevention programs should lie mainly with the state government. **(327) 2.859**	8.01	34.3	26.9	25.7	5.2
If there is continual pollution of our lakes, streams and air, nature's processes will purify the systems. **(331) 1.931**	33.2	49.5	10.0	5.4	1.8
The best way to address nonpoint pollution is through public education rather than government regulations. **(335) 3.537**	4.25	12.5	24.5	43.0	15.8
I don't need to be concerned about reducing nonpoint pollution because other people are doing so. **(333) 1.823**	34.5	53.8	7.26	3.9	.6
I would support more public education on nonpoint pollution in the Oyster River Watershed. **(336) 3.985**	2.4	3.63	11.6	58.0	24.4
Waterfront landowners should be more strictly regulated concerning nonpoint pollution than inland landowners. **(336) 3.063**	5.4	30.1	26.2	29.8	8.6
My drinking water is threatened by nonpoint pollution. **(332) 3.340**	3.62	16.9	32.5	35.8	11.1
Voluntary measures are adequate in controlling nonpoint pollution. **(331) 2.360**	13.9	51.4	22.1	10.3	2.4
Effective long-range solutions to environmental problems depend upon changing lifestyles to fit nature. **(331) 3.879**	1.8	5.7	16.6	54.4	21.5
Responsibility for developing nonpoint pollution prevention programs should lie mainly with the local town government. **(330) 2.994**	3.9	32.1	30.0	28.5	5.5
Actions to prevent nonpoint pollution are desirable regardless of whether or not there is an immediate problem. **(332) 3.946**	1.5	4.8	12.0	60.8	20.8
Responsibility for developing nonpoint pollution prevention programs should lie mainly with the federal government. **(328) 2.558**	13.4	38.4	31.4	12.5	4.3
I am willing to use low-phosphate laundry detergent. **(332) 4.093**	.6	3.3	8.1	62.0	25.9
Development of nonpoint pollution prevention programs should be a shared responsibility between local and federal governments. **(332) 3.798**	4.5	6.9	13.6	54.2	20.8

ecreation and Household Activities

Various recreation and household activities are listed below. Indicate (☑) how often you participate in each.

	Never	Seldom	Sometimes	Often	Very Often
Use salt on a driveway or walks (344) .968	38.7	34.3	20.9	4.7	1.2
Apply lawn chemicals/fertilizer (343) 1.038	40.8	23.3	29.2	5.5	.9
Apply garden pesticides/chemicals (340) .765	49.7	28.2	19.4	2.1	.3
Change the oil of your car at home (344) .721	69.5	7.3	10.8	6.7	5.8
Apply water to your lawn (344) 1.465	20.6	28.8	37.2	11.0	2.0
Wash your car at home (346) 1.711	18.8	28.0	41.3	8.1	3.5
Test your water quality at home (343) .781	50.4	26.2	19.5	2.3	1.5
Water your garden (346)	18.8	19.1	35.5	22.3	4.0
Sail, canoe, kayaks (342) 1.333	43.0	21.6	19.9	11.4	3.8
Swim in Oyster River/Great Bay (343) .335	79.0	11.4	7.6	1.2	.9
Water ski (344) .323	78.5	13.4	6.1	1.5	.6
Jet ski (345) .110	93.3	3.2	2.9	.3	.3
Wind surf (343) .184	89.2	5.8	3.5	.3	1.2
Enjoy scenery (348) 3.388	.6	2.0	10.1	33.6	53.3
Bird or nature watch (344) 2.320	12.8	12.2	29.7	22.1	23.
Hunt waterfowl (343) .187	91.3	2.6	3.5	1.5	1.2
Fish (344) .936	52.9	18.3	16.3	7.3	5.2
Harvesting shellfish (344) .224	88.8	8.1	4.4	1.5	.3
Snowmobile (343) .184	89.2	6.1	2.6	1.2	.9
Attend town meetings (345) 1.504	25.8	29.3	23.8	12.2	8.7
Participate in community activities (344) 1.648	14.0	30.8	39.2	9.6	6.1
Participate in volunteer activities (343) 1.697	15.7	29.7	32.4	13.4	8.7
Utilize UNH facilities (343) 1.875	16.3	23.0	31.8	14.6	14.3
Change your car oil at a commercial establishment (342) 2.664	11.1	6.7	16.4	36.3	29.5
Use environmentally friendly household products (340) 2.603	1.5	5.0	39.1	40.6	13.8
Participate in coast week activities (332) .470	70.2	17.2	9.9	1.8	.6
Pump out septic tank (341) n/a 5.6 1.537	45.7	9.1	19.9	15.0	4.1
Reduce water usage (343) 2.248	4.4	12.5	46.1	28.0	9.0
Remove trees/shrubs near septic system (332) n/a 8.4 1.470	52.7	11.1	12.7	9.3	5.4
Compost (340) 1.621	37.9	13.5	16.5	15.6	15.6
Recycle (347) 3.524	.3	3.7	6.6	23.1	66.0
Use low phosphate detergents (340) 2.662	9.4	9.1	22.6	23.5	35.3

Potential Solutions

- Please read each of the following statements. Check the box (☑) that indicates the extent you agree or disagree with each statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I am willing to pay higher property taxes to protect the quality of my drinking water. **(339) 2.959**	14.5	17.1	33.0	28.6	6.2
Mandatory requirements and penalties are necessary to ensure control of nonpoint pollution. **(336) 3.604**	3.6	9.2	24.1	49.1	13.4
I would be willing to make a voluntary contribution to control nonpoint pollution within the Oyster River Watershed. **(333) 3.075**	6.9	18.3	39.9	29.7	4.5
Strict government-wide measures will need to be imposed since few people will address nonpoint pollution themselves. **(332) 3.250**	5.4	18.1	31.3	37.7	7.2
State lottery monies should be used to control nonpoint pollution. **(337) 3.122**	10.4	16.9	33.5	29.7	9.2
When communities contribute to the nonpoint pollution problem, the community should pay for the proper disposal or clean up. **(335) 3.740**	1.8	4.8	24.2	57.3	11.6
The benefits of nonpoint pollution controls outweigh any fiscal costs. **(335) 3.101**	6.3	18.8	41.5	26.6	6.6
My local government is genuinely interested in reducing nonpoint pollution in the Oyster River Watershed. **(328) 3.351**	1.2	5.5	54.9	35.1	3.0
A local surtax should be passed to control nonpoint pollution. **(333) 2.583**	15.6	26.1	45.3	11.4	1.2
Any program to reduce nonpoint pollution should combine public education and moderate government regulations. **(330) 3.991**	1.5	3.0	13.0	60.3	21.8

Stormwater runoff from paved areas often contains pollutants such as road sand, automobile fluids, bacteria, fertilizers, a metals. Many storm drains discharge directly to rivers and streams without going to a waste water treatment facility. Property management of stormwater runoff can prevent potential adverse impact on water quality. There are many best management practice (BMPs) that have been development for stormwater management. They are typically applied in nev developments in order to protect water resources. Applying BMPs to existing, older, stormdrains is another managemen option, but can be costly. Also, inspecting and maintaining all stormwater structures is important. For example, catch basins need to be cleaned periodically to ensure they function properly.

Based upon the above information, please answer the following questions:

- Do you feel stormwater runoff is a serious concern? YES 68.0 NO 31.0 (319) (.759)

- If particular storm drain systems are identified as contributing significant pollutants to surface waters, do you feel they should be upgraded so runoff is tre before discharged to surface waters?
  YES 87.1 NO 12.6 (317) (.899)

  If yes, what is the maximum amount that you would be willing to pay each year to implement a town-run stormwater management program? $ 687.937 m 50.00 median 0.00 mode

- Do you feel more maintenance and inspection programs should be funded? YES 73.2 NO 25.8 (295) (.817)
  If yes, what is the maximum amount that you would be willing to pay each year to implement a town-run stormwater management program? $615.351 MI 50.00 MEDIAN 50.00 MODE

'aste Water Disposal

Is your house connected to a public sewer system or a septic system? (check one answer) **(352) 2.094**

40.1 Public Sewer System 51.7 Septic System 8.2 Don't Know

(If your response is public sewer system or you do not know, please skip to the next page and fill out the information about your household.)

How often do you check the level of sludge and scum in your septic system? **(170) 2.453**

7.1 every 6 months
36.5 every year
30.6 every 3 years
4.7 every 7 years
10.0 only when there is a problem
10.6 never

Please indicate what you consider to be an acceptable cost sharing scheme to finance the upgrade or replacement of your home septic system. **(128)**

Source of Cost Share	Cost Share Percentage		
	MEAN	MEDIAN	MODE
Homeowner	63.3 %	70%	100%
Town	12.0 %	0%	0%
County	5.0 %	0%	0%
State	9.82 %	0%	0%
Federal	8.38 %	0%	0%
	100%		

Which of the following products do you put down the drain or flush down the toilet? (Check all that apply).
N = 180

9.4 hair coloring & hair permanent products
15.6 septic tank cleaning agents & degreasers
1.7 diapers and sanitary napkins
5.6 bacteria culture
1.1petroleum products
22.3 cooking oil
43.6 food waste
43.9 bleach
31.1 vinegar
3.9 paint
35.4 soda
3.9 plant food
44.8 fruit juice

Do you know the location of your septic tank? **(181)** Yes 92.8 No ___

What year was it installed? 1980 (MEAN) (152) _____

Which of the following would motivate you to regularly maintain your system? Check all that apply.
N = 180

31.7 more information
18.9 cash coupons
52.8 to avoid having to replace septic system
28.9 reminders from company who service septic system
12.8 regulations
28.9 personal satisfaction
34.4 property tax discount
51.7 already maintain system
1.1 other _____

Have you ever had your water tested for radon? **(177)**

36.2 Yes 52.5 No 11.3 Don't Know

About Your Household

- What community do you live in? **(352)**

  10.2 Barrington
  47.7 Durham
  10.8 Madbury
  15.6 Dover
  15.3 Lee

- Are you a registered voter? **(350)**

  Yes 88.9 No 8.6 Don't Know 2.6

- Are you employed? **(351)**

  Yes 70.7 No 9.1 Retired 20.2

  If yes, please describe your present job (i.e., elementary school teacher, mill worker)

  _____

- Are you a member of any of the following environmental groups or organizations? Check all that appl: **(351)**

  12 Nature Conservancy
  3.1 Friends of the Seacoast Science Center
  5.4 New Hampshire Audubon
  .6 Great Bay Estuarine System Conservation Trust
  0 River Watch Network
  3.1 Sierra Club
  8.3 Society for Protection of NH Forests
  1.1 Strafford Rivers Conservancy
  1.4 NH Lakes Association
  .3 NHDES Volunteer River Assessment Program

- Which of the following have you done at your home to conserve water? **(351)**

  56.4 install low-flow shower heads
  51.0 water lawn less
  28.2 stop watering lawn
  21.4 install water conservers in toilets
  15.7 turn off shower while soaping
  6.3 recycle grey water on garden
  3.4 other_____
  12.3 install low-flow taps
  43.9 wash car less
  21.4 stop washing car
  47.9 stop running water while shaving
  23.4 install low-flow toilets

- How many bathrooms are in your home? 2.2 (MEAN) (number of bathrooms)**(351)**

- How many showers are in your home? 1.7 (MEAN) (number of showers) **(350)**

- Do you have a dishwasher in your home? YES 74.1 NO__ **(349)**
  If yes, on average how many times a week do you run it? 3.2 (MEAN) **(232)**

- Do you have a washing machine in your home? YES 89.7 NO__ **(350)**
  If yes, on average how many times a week do you run it? 4.5 (MEAN) **(289)**

Starting with yourself as person No. 1, please list all people who live in your home by writing their relationship to you in the space provided (e.g. wife, daughter, friend, tenant, etc.), along with their age and gender.

	Relationship to You	MEAN Age	Male/female
ɜrson #1	Yourself(316)	47.9	M(56.3)/F(43.7)
ɜrson #2	(288)	44.7	M(42.7)/F(57.3)
ɜrson #3	(162)	15	M(48.8)/F(51.2)
ɜrson #4	(108)	11.3	M(50)/F(50)
ɜrson #5	(43)	11.6	M(53.5)/F(46.5)
ɜrson #6	(10)	10.8	M(60)/F(40)

What is the highest grade of school you have completed? Please circle your response. **(344) 3.314**

Grammar School	High School	College	Masters	Ph.D./Professional degree
.9	**23.0**	**37.8**	**20.6**	**17.7**

How many years have you lived in this community? 14.6 (MEAN) years **(346) 1.766**

What type of home do you live in? Please circle your response. **(346) 1.766**

Single Family Home	Condominium	Trailer/Mobile Home	Apartment	Duplex/Townhouse
67.1	**10.1**	**8.1**	**8.7**	**6.1**

Do you own or rent your residence? OWN **79.6** RENT **20.4** **(338) 1.202**

Do you run a business out of your home? YES 9.8 NO 90.2 **(337)**

you have any additional comments, please write them on the back of this page. If you ɔuld like some additional information, please complete and detach the form below. Thank ɜ for participating in this study.

I would like more information on the following:

How to maintain your home septic system YES 35 NO ___
General nonpoint pollution YES 60 NO ___
The results of this survey YES 82 NO ___

NAME_____
ADDRESS_____
_____
_____

Appendix B

Four page Summary Report

Oyster River Watershed Study: A Summary Report

*By Elizabeth Hanratty, Robert A. Robertson, and Edmund Jansen**

INTRODUCTION

The Oyster River and adjacent lands are important resources for New Hampshire. Most of the challenges facing the Oyster River Watershed originate directly or indirectly from human activity. Some of these activities adversely affect water quality (i.e., residential and commercial development, road maintenance, lawn care), while other activities (i.e., recreation, tourism, sport fishing) are adversely affected by water quality. Technical solutions to many land use and water quality problems affecting the NH coastal waters are available, but obstacles exist to their implementation. These obstacles include the public's lack of understanding or appreciation of the complexity of water quality problems/land use issues, and local governments lack the fiscal and administrative resources to implement corrective or remedial actions. This is particularly true for nonpoint pollution, where numerous unrelated actions and management decisions have significant impacts on the watershed system. Increased awareness and positive public attitudes will be necessary to control or minimize the impacts of nonpoint pollution.

In response to this need, a preliminary assessment of the "human dimensions" of the Oyster River Watershed was completed by the University of New Hampshire's Department of Resource Economics and Development. This assessment was completed in cooperation with Strafford Regional Planning Commission, local government officials and concerned citizens from watershed communities (Durham, Madbury, Lee, Barrington and Dover). The assessment was completed with support from the UNH College of Life Sciences and Agriculture and the NH Coastal Program.

STUDY OBJECTIVES

The objectives of this research were to collect information on the attitudes, behaviors, knowledge and perceptions of Oyster River Watershed residents in regard to nonpoint pollution. More specifically, the data collected from the project (1) identified perceptions of the magnitude of nonpoint pollution in the watershed; (2) measured awareness and knowledge of the various causes and potential consequences of nonpoint pollution; (3) determined current behaviors with relevance to nonpoint pollution and the use of coastal resources; and (4) determined preferences for various nonpoint pollution management practices.

DESCRIPTION OF STUDY AREA

The Oyster River Watershed is located in Southeastern New Hampshire and encompasses the land surrounding the Oyster River, an offshoot of the Great Bay. The entire University of New Hampshire campus and agricultural lands are included in the watershed. Approximately seventy-five percent of the town of Durham is located within the watershed, including the town's water plant which provides its primary source of drinking water. Approximately seventy percent of Lee is within the watershed, including the Lee Traffic Circle and surrounding businesses. The watershed extends to Barrington, including those portions roughly adjacent to Hall Road. Seventy-five percent of Madbury and a small sliver of Dover near Route 108 are also included in the watershed.

SURVEY METHODS

The survey questionnaire was distributed to a stratified random sample of households within the Oyster River Watershed. The sample was stratified in order to adequately represent the residents of the Watershed. The number distributed to each community was based upon the total number of households within the watershed (3262) and their distribution. For example, eighteen percent of the households within the watershed are in the town of Lee so 18% of the completed surveys should be from Lee in order to be representative. The survey was developed with input and suggestions from members of a steering committee composed of local officials and concerned citizens. Surveys were distributed and collected door to door within the watershed. A total of 385 completed surveys were collected for a response rate of 63%.

PROFILE OF SURVEY RESPONDENTS

Table 1 represents a demographic profile of those individuals who completed the survey. This information provides important estimates of the watershed community makeup. Citizens of the Oyster River Watershed are well educated, informed individuals, who have lived in the community for a relatively long time, with a predominance of single family homes.

Summary of Demographic Information	
Age	47.9 years(mean)
Gender	56.3% male 43.7% female
Years in residence	14.6 years (mean)
Type of home	67.1% single family home 10.1% condominium 8.7% apartment 8.1% trailer/mobile home 6.1% duplex/townhouse
Own/rent	79.6% own their home
Run business from home	9.8%
Registered to vote	88.6%
Employment	70.2% employed 20.8% retired
Education	24% high school 37% college 20% masters 18% Ph.D. / professional

Table 1: Summary of demographic information of respondents.

Table 2 provides summary information on residents behaviors, activities, and household characteristics. The average respondent recycles, uses low phosphate detergents and composts. The primary source of drinking water is from a well on their property with a septic system as the method of waste water disposal. The average respondent has 2.2 bathrooms, 1.7 showers, a dishwasher and a washing machine in their home. Overall membership in specific organizations was only moderate but the majority of respondents participate in both community and volunteer activities.

SUMMARY INFORMATION

Behaviors

- Participate in volunteer activities 84.3%
- Participate in community activities 86.0%
- Recycle 99.7%
- Compost 62.1%
- Use low phosphate detergents 90.6%
- Test home water quality 49.6%

Household Characteristics

- Primary source of drinking water
  - 45.8% well on property
  - 34.6% municipal water
  - 9.4% bottled water
  - 6.7% filtered tap water
  - 1.3% do not know
- Method of water disposal
  - 40.1% public sewer system
  - 51.7% septic system
  - 8.2% do not know
- Number of bathrooms in home 2.2 (mean)
- Number of showers in home 1.7 (mean)
- Dishwasher in home 74.8%
- Average times run per week 3.2 (mean)
- Washing machine in home 89.7%
- Average times run per week 4.5 (mean)

Activities

- Membership in environmental groups
  - 12.0% Nature Conservancy
  - 8.3% Society for Protection of NH Forests
  - 5.4% NH Audubon
  - 3.1% Sierra Club
  - 3.1% Friends of Seacoast Science Center
  - 1.4% NH Lakes Association
  - 1.1% Strafford Rivers Conservancy
  - 6% Great Bay Conservation Trust
  - .3% NHDES Volunteer River Program

Table 2: Information on behaviors, activities and household characteristics of Oyster River Watershed residents

(1) FINDINGS: Community Issues Within the Oyster River Watershed

(This section addresses the communities' general concerns with local issues.)

Table 3 presents the results from a question that asked respondents to indicate the severity of potential community problems (not, small, medium, or serious). Residents were provided a list of 23 community issues. The results to this question are interpreted through an examination of the community issues which received the greatest proportion of responses within each of the categories.

Challenges Facing Oyster River Watershed Communities

"Serious" problem

- Safe paths for bike riders 27.7%
- Lack of support for schools 14.3%
- Quality of drinking water 11.1%

"Medium-sized" problem

- Lack of citizen participation in community decision making 35.3%
- Safe paths for bike riders 34.0%
- Lack of long range community planning 28.0%

"Small-sized" problem

- Litter in streets and parks 58.0%
- Repair of local roads 47.9%
- Radon 44.8%

"Not" a problem

- Unsightly/smelly garbage dumps 67.8%
- Winter snow removal 58.9%
- Lack of parks and green space 58.5%

Table 3: Community issues ranked by size of problem.

(2) FINDINGS: Nonpoint Pollution Issues within the Oyster River Watershed

(This section addresses the perceptions of residents and what sources of information are utilized.)

Size of nonpoint pollution problem. Figure 1 indicates the percentage of respondents who feel there is a nonpoint pollution problem in the country, state, and town, along with their own drinking water. Residents' perceptions of the size of the nonpoint pollution problem varied based on proximity to their homes (i.e., the closer the issue was to their own drinking water, the less serious they perceived the problem).

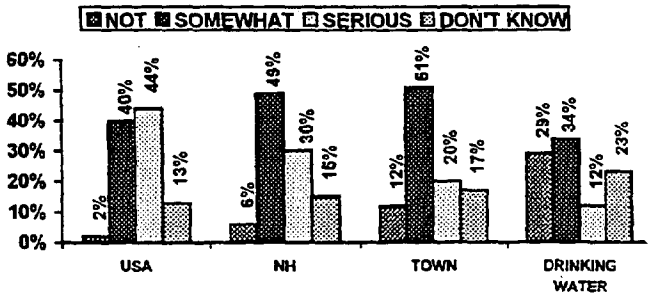

Figure 1: Residents' perception of nonpoint pollution problems.

In a related question, 50% of respondents disagreed with the statement "the severity of the nonpoint pollution problem in the New Hampshire coastal zone is exaggerated." This suggests that many residents consider there to be a problem in the region.

Levels of knowledge. Figure 2 illustrates the breakdown of responses in regard to their levels of knowledge. When asked how knowledgeable they are about nonpoint pollution, the majority responded that they were "somewhat knowledgeable" about nonpoint pollution.

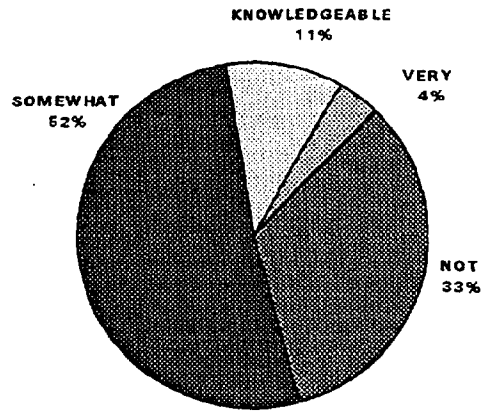

Figure 2: Residents level of knowledge about nonpoint pollution.

Sources of knowledge. The results show that there are several primary sources of nonpoint pollution information. The data indicates 32.2% of respondents receive information on nonpoint pollution from newspaper articles, 13.6% have gained their knowledge from work or other professional experience, and 8.9% gather information from television. Conversations with other individuals and books are also important sources of information for Oyster River Watershed residents. Professional journals and Public Radio are ranked the highest in level of trust of information sources. State and federal government officials prompted the lowest level of trust from the respondents.

The survey itself was an important public education tool. For example, the survey required that 385 residents think about the nonpoint pollution issues in their watershed in answering the questions. In addition, of the persons completing the survey, twenty five percent expressed a need for more information about the nonpoint pollution and related topics.

Residents' perceptions and attitudes are shaped to some extent by these various sources. Town officials need to examine the possible sources for the best avenue for public education. When asked in related attitudinal questions, 59% of respondents feel if there is continual pollution of our lakes, streams and air, nature's processes will purify the system and 82.3% feel they do not need to be concerned about reducing nonpoint pollution because other people are doing so.

(3) FINDINGS: Nonpoint Pollution Impacts in the Oyster River Watershed.

(This section presents the perceived negative impacts nonpoint pollution can have on a watershed.)

The sample of residents were asked to indicate their level of concern for potential impacts from nonpoint pollution (not, slightly, concerned, or very). The sample of residents were provided a list of 13 negative impacts of nonpoint pollution. The results to this question are interpreted through an examination of the negative impacts which received the greatest proportion of responses within each of the categories (Table 4). Concerns voiced by residents centered on personal health and safety. This is evident by the top three responses in both the "very concerned" and "concerned" categories. The residents were not as concerned with loss of tourism revenue, diminished property values, and closed shellfish areas.

Potential Impacts from Nonpoint Pollution and the Corresponding Top Three from Each Response Category	
"Very Concerned"	
Health threats	48.4%
Chemicals in water	38.3%
Contaminated drinking water	36.4%
"Concerned"	
Excess nutrient supplies(algae blooms)	43.7%
Bacteria in water(swimming warnings)	41.6%
Contaminated fish and game	39.3%
"Slightly Concerned"	
Loss of tourism revenues	37.8%
Diminished property value	33.7%
Loss of recreational opportunities	31.0%
"Not Concerned"	
Loss of tourism revenues	31.0%
Diminished property value	20.9%
Closed shellfish areas	12.8%

Table 4: Perceived impacts of nonpoint pollution and residents' level of concern.

(4) FINDINGS: Potential Nonpoint Pollution Sources and Potential Local Contributors.

(This section addresses residents' perceptions of local nonpoint pollution contributors and potential sources.)

The potential local contributors of nonpoint pollution the Oyster River Watershed are numerous. Residents perceived the UNH campus, home septic systems, and automobiles as top contributors in the area. Residents indicated several which they feel do not contribute to nonpoint pollution within the Oyster River Watershed. The Lee Traffic Circle created the least concern with 14% of respondents feeling it "does not contribute". Industrial parks and commercial agriculture were not considered serious contributors to nonpoint pollution within the Oyster River Watershed.

In a related question, residents were given a list of 32 possible sources of nonpoint pollution and asked to rank the level they think each affects the Oyster River Watershed. Acid rain, oil spills and home septic systems were identified as contributing to nonpoint pollution within the Oyster River Watershed. Logging and timber harvesting, medical waste and mining were not considered contributors by residents of the Oyster River Watershed. Medical waste and mining also had the highest percentage of individuals who responded that they do not know the degree to which the Oyster River Watershed is affected by these potential sources.

(5) FINDINGS: Septic Systems.

(This section addresses the issue of septic system maintenance and responsibility.)

Septic system users. Fifty percent of survey respondents have septic systems. Of the respondents who have septic systems, 93.1% know the location of the septic system. The average year of installation for the septic systems in the Oyster River Watershed was 1980.

The use and maintenance of these systems was identified as a potential nonpoint source by survey respondents, therefore the actual maintenance practices of those with systems are of interest. Septic system owners, for the most part, are willing to take responsibility for maintenance. When asked for an acceptable cost sharing scheme between homeowner, town, county, state and federal, to finance the upgrade or replacement of the system, on the average homeowners felt a cost sharing scheme of 63.3% for homeowners, with the remaining distributed between various levels of government. Seventy-seven percent of respondents felt homeowners should carry all of the cost associated with upgrading and/or replacing septic systems.

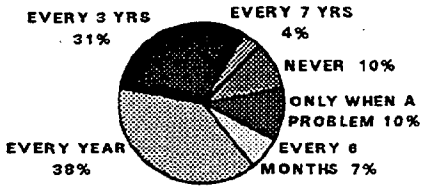

Figure 3: How often residents check the sludge and scum in their septic systems

When asked what would motivate them to regularly maintain their septic system, 51.7% of respondents stated they already maintain their system. Figure 3 demonstrates how often residents check the level of sludge and scum in their septic system. Other motivations favored by respondents include: to avoid having to replace the system (52%), a property tax discount (35%), and more information (31%). Regulations were thought to be the least effective method of motivation (13%), as were cash coupons (20%).

(6) FINDINGS: Impact Behaviors and Conservation Behaviors.

(This section addresses resident behaviors which lead to potential nonpoint pollution , as well as conservation behaviors.)

Watershed resident behaviors. Many individual behaviors will impact the extent that nonpoint pollution impacts water quality in an area. There are a number of behaviors that need to be monitored or controlled to prevent misuse and subsequent pollution. For example, twenty-seven percent of respondents use salt on their driveways "sometimes", "often" or "very often". When it comes to outdoor maintenance, 35% apply lawn chemicals or fertilizer, 22% apply garden pesticides or chemicals, 50% water their lawn and 61% water their gardens. A vast majority (93%) of the respondents felt that every person is responsible for protecting the quality of the natural environment.

Conservation behaviors. Only 12% of residents feel voluntary measures are adequate in controlling nonpoint pollution. This is reflected in the voluntary conservation behaviors of residents. The conservation measures currently being utilized in the Oyster River Watershed include the installation of low flow showerheads (55.6%), watering lawns less often (51.8%), stopping running water while shaving (48.2%), and washing cars less often (44.2%). The conservation measures least practiced in the Oyster River Watershed include recycling grey water onto gardens (6.4%), installing low flow taps (12.3%), and turning off the shower while soaping (16.1%). When asked about possible conservation solutions, 75% feel effective long range solutions to environmental problems depend upon changing lifestyles to fit nature.

CONCLUSIONS

This research provides insights into the characteristics, behaviors and knowledge of watershed residents. Oyster River Watershed residents are, for the most part, highly educated and are open to gaining more information on what they can do to contribute to local issues. Any state or local policies mandating abatement of nonpoint pollution should include mechanisms to insure compliance and to promote teamwork between the units of government and the respective communities. The approach should foster cooperation and cohesion between communities within the watershed. More specifically this research suggests:

- Eighty percent of residents feel lack of participation in community decision making is a problem. It is important to involve the residents of the Oyster River Watershed in the process of creating and enforcing a nonpoint pollution program. Residents realize that some changes in lifestyle are necessary. Therefore, the solution to protecting the Oyster River Watershed rests on the responsible and active participation of the people living within the watershed.

- A faucet aerator is a simple device which costs less than $4 and can be installed on faucets to save on water use. Aerators cut use by as much as 280 gallons a month for a typical family of 4. Although the flow is reduced, it seems stronger because air is mixed with the water as it leaves the tap. Only 12% of responding households have installed any type of low flow taps; if 50% of respondents, 193 households, installed them it would result in roughly 635,250 gallons of water saved every year.

- Homeowners use up to ten times more chemicals per acre than farmers. Sixty percent of responding households have used lawn chemicals at least one time. If 10% of lawnowners used organic pesticides, it would remove 2.5 to 5 millions pounds of chemicals from the environment every year.

- Each time a toilet flushes it uses 5-7 gallons of water. This amount can be reduced by 15%-40% by installing a plastic bottle, displacement bag or toilet dam in the toilet tank. In the Oyster River Watershed 23% of respondents have installed some type of low flow toilets. If the average toilet is flushed about 8 times a day, that means a saving of 8-16 gallons every day....2,900-5,800 gallons a year per household, for 50% of respondents, 193 households, that means a savings of 559,700-1,119,400 gallons a year.

- Septic systems are perceived as a primary contributor to nonpoint pollution. Based on this research, 87% of system owners feel more regulations would not motivate them to maintain their system, while avoiding replacing the system (53%) and more information (32%) would provide motivation.

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**Elizabeth Hanratty is an MS degree candidate at UNH in the Resource Administration and Management Program. Dr. Robert A. Robertson and Dr. Edmund Jansen are faculty members at the University of New Hampshire with the Department of Resource Economics and Development,310 James Hall, Durham, NH 03824, (603)-862-1700; FAX (603)-862-0208.*

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