

Lockwoods Folly River Watershed Public Participation Process



SCOPING REPORT



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EXECUTIVE SUMMARY

In the summer of 1998, the Wilmington District of the US Army Corps of Engineers (US ACE, and also identified in the report as the Corps) contracted with the Natural Resources Leadership Institute at North Carolina State University (NCSU) to conduct a public participation scoping study in the Lockwoods Folly River watershed. The scoping study is a component of the Corps' reconnaissance level study of water quality problems in the Lockwoods Folly River. The objectives of the scoping study were to: (1) identify the primary and secondary stakeholders in the watershed; (2) identify and assess stakeholders' issues; (3) identify informational needs; and (4) examine the feasibility of creating a collaborative effort for investigating water quality concerns in the watershed.

Data on issues and stakeholder perceptions were collected through personal interviews of 36 stakeholders from the Lockwoods Folly River watershed, Brunswick County, and the coastal region. Interviews were conducted between August 21 and September 14, 1998.

Stakeholders contacted by NCSU included those who have the authority to make decisions, those who have the potential or the power to obstruct an agreement or its implementation, and those who are potentially affected by a solution to the problems within the Lockwoods Folly River watershed. The following stakeholder categories were represented in the interviews:

- Community Elders: *Long-time residents in a variety of occupations*
- Barrier Island Residents: *Home/landowners who live on the barrier islands*
- Upper River Residents: *Home/landowners who live above the mouth of the river*
- Lower River Residents: *Home/landowners who live near the mouth of the river*
- Recreational Fishing: *Fishing clubs and marinas*
- Commercial Fishing: *Commercial fishers, seafood retailers and wholesalers*
- Residential Developers: *Residential developers and land surveyors*
- Golf Course Development: *Golf course developers and managers*
- Local Government: *Elected officials, county and town employees, public health*
- Forest Landowners: *Commercial forest landowners*
- Agricultural Landowners: *Farmers*
- Environmentalists /Conservationists: *Environmentalists from regional organizations*
- Environmental Consultants: *Consultants*
- Businesses: *Chambers of Commerce*

The NCSU team identified five factors that have exacerbated the level of controversy in the Lockwoods Folly River watershed. Two factors of particular importance are a lack of close and continuous contact between public officials and the concerned public, and the fact that problems in the Lockwoods Folly River watershed affect the lives of community members in different ways.

Central issues of importance identified by respondents were divided into the following groupings: (1) river circulation, (2) growth and development, (3) existing sources of pollution, (4) aquatic resources including shellfish and finfish, (5) general water quality, (6) the US Army Corps of Engineers, (7) boating, (8) recreation and tourism, (9) beach erosion, (10) conservation and preservation, and (11) other miscellaneous issues. The following list of important issues is presented by stakeholder interest category and identifies the interests that are most important to people within those categories:

- ***Community Elders***
 - " river circulation
 - " growth and development (installation of a county-wide sewer system)
 - " general water quality (clean up river)
- ***Barrier Island Residents***
 - " river circulation
 - " beach erosion (erosion of Long Beach Point caused by dredging “solutions”, and beach erosion generally)
- ***Upper River Residents***
 - " water quality
 - " river circulation
- ***Lower River Residents***
 - " other (involving all stakeholders in developing collaborative solutions, instead of allowing a few to dictate solutions for everyone else)
 - " the US ACE (negative impacts of some federal projects)
- ***Recreational Fishing***
 - " water quality
 - " growth and development (impact of the residential development and golf courses on the river; septic systems)
 - " aquatic resources
- ***Commercial Fishing***

- " river circulation
- " aquatic resources
- ***Residential Developers***
 - " water quality
 - " (other) overall quality in the area
 - " growth and development (septic systems)
- ***Golf Course Management***
 - " other (continue to search for ways to be part of the solution)
- ***Local Government***
 - Bolivia:
 - " river circulation
 - " aquatic resources
 - Long Beach:
 - " beach erosion (potential affects of Eastern Channel dredging on the Blue Water Point Marina)
 - " water quality
 - " other (long-range planning, and transportation access)
 - Holden Beach:
 - " water quality (adjacent to island)
 - County:
 - " water quality
 - " aquatic resources
- ***Forest Landowners***
 - " other (plans and proposals for the watershed as all issues are important)
- ***Agricultural Landowners (farmers):***
 - " river circulation
 - " other (beaver activity in upper watershed)
- ***Environmentalists/Conservationists***
 - " growth and development (potential increase in boat traffic)
 - " conservation and protection (the inability of the ORW standards to protect Lockwoods Folly)
- ***Environmental Consultants***

- " other (implementation of best management practices)
- ***Business***
 - " navigation (safety issues for boaters, recreationists, tourists, and the public in general)
 - " aquatic resources
 - " beach erosion

Overall, respondents recognized that a water quality problem exists in the Lockwoods Folly River watershed. Definitions of “water quality” vary by respondent. As their perceptions of water quality vary, so do their perceptions of the causes of the problems and the solutions to the problems. Respondents recognized that information exchange between stakeholder interests is lacking, and identified gaps in the information available on the watershed. The overall awareness of the need to share information and open up discussion indicates that the climate is conducive for creating a collaborative process in the Lockwoods Folly River watershed. The opportunity exists, therefore to bring the stakeholders together to participate in a collaborative process for determining an action plan for improving water quality in the watershed.

To move forward with this process, federal and state agencies and local governments in the watershed must commit to supporting a participatory decision-making process and provide resources to carry out the project.

BACKGROUND AND PURPOSE OF THE STUDY

The Lockwoods Folly River drains a small watershed in south central Brunswick County, North Carolina, reaching the Atlantic Ocean through the Lockwoods Folly Inlet. Crossing the inlet between Varnamtown and Sunset Harbor is the Intracoastal Waterway. During construction of the Waterway in the 1930's, water flow through Lockwoods Folly Inlet was altered. The original channel was diverted and a new channel was dredged and widened.

Like the rest of coastal North Carolina, coastal Brunswick County has been experiencing significant urban growth and development since the 1980s. Water quality in the Lockwoods Folly River has been deteriorating over the past two decades. Shellfish closures have been relatively common. The common belief is that the river's circulation has been reduced to the extent that the outflow of fresh water (and any associated nutrients and bacteria) and the inflow of salt water, is severely constricted. However, there is controversy over the causes of deteriorating water quality in the river, and disagreement over potential solutions.

The US Army Corps of Engineers Wilmington District (also identified in this report as US ACE and the Corps), has been authorized under Section 216 of P.L.91-611 to conduct an investigation of water quality problems in the Lockwoods Folly River. The reconnaissance level study will utilize existing data related to water quality and aquatic resource conditions to identify potential concerns in the watershed and recommend appropriate federal actions. The US ACE reconnaissance study will document previous studies and records, perform a scoping of public viewpoints of problems, and needs in the study area, and develop a project schedule for a future feasibility-level study.

This report contains the scoping component of the reconnaissance study, conducted by North Carolina State University. The objectives of the scoping study are to:

1. **Identify the primary and secondary stakeholders.** Tasks undertaken to achieve this objective include identifying the parties that should be involved in the stakeholder process, assessing linkages among parties, and identifying the positions and interests of each party.
2. **Identify and assess the issues.** This objective requires assessing the history of the situation, assessing the conditions for controversy, and assessing how each party describes its own central issues.

3. **Identify information needs.** This includes identifying information that is currently available to each party, assessing the perception of data validity of available information, and identifying areas where data is lacking.
4. **Identify potential options for issue resolution.** Canvas respondents to assess how each sees available options for resolution of the issues.
5. **Identify potential forums or processes to resolve issues.** Based on information collected from the respondents about the issues and stakeholders, an assessment of the most effective forum or process to resolve these issues will be made.

Data on issues and stakeholder perceptions were collected through personal interviews of 36 stakeholders from the Lockwoods Folly River watershed, Brunswick County, and the coastal region. Interviews were conducted between August 21 and September 14, 1998.

DESCRIPTION OF METHODS

DIFFERENCES BETWEEN PUBLIC HEARINGS AND COLLABORATIVE PROBLEM SOLVING PROCESSES

Formal Public Hearing Process

Public hearings are held to solicit the public's comments on plans proposed by an agency or governing body before they are finalized. These hearings guarantee citizens the opportunity to comment on actions that may or may not be taken, as well as the opportunity to exchange information. Public hearings often can be adversarial, with few opportunities for two-way discussion and problem solving.

Participatory Decision Making

Participatory decision-making is a collaborative problem solving process in which participants who represent stakeholder groups or interests come together to negotiate a mutually acceptable solution to the problem at hand. The important principle in this process is to strive for a consensus decision rather than operating by voting or majority rule.¹ To accomplish this, stakeholders must share information, focus on interests rather than positions, and create solutions to satisfy all. This process enables the stakeholders to understand the differences among their interests, *why* they want what they want, and their positions, *how* they want to go about getting what they want.

Unlike a public hearing, the participatory decision-making process ends with, rather than begins with, a proposed plan. It also begins with the possibility of collaboration. Before stakeholders convene as a group, a scoping process is usually undertaken to identify the stakeholders and their interests, analyze the conflict surrounding an issue, and determine the feasibility of bringing the stakeholders together to resolve the issue. If conditions for collaboration are justified, then a strategy is designed to convene the stakeholders to identify problems, to research the problems together, generate options, and reach consensus on the solutions.

¹ For more information on collaborative problem solving processes, refer to *Best Practices for Government Agencies: Guidelines for Using Collaborative Agreement-Seeking Processes*, published by the Society of Professionals in Dispute Resolution, 815 15th Street, NW, Suite 530, Washington, DC 20005.
Phone 202-783-7277, Fax 202-783-7281.

METHODS

For the Lockwood Folly River watershed scoping process, the US ACE initiated the possibility of collaboration, suggesting its willingness to share control for the problem defining process and the providing recommendations to resolve them. To determine whether a collaborative process is an appropriate mechanism for resolving the problem of the Lockwood Folly River watershed and improving water quality, a diverse group of stakeholders was interviewed to determine their needs for participating in a collaborative process. This particular group was identified by first recognizing specific interests in the watershed, such as commercial fishing, tourism, and residential development. Organizations or individuals were matched to those interests and contacted for interviews (refer to *Appendix A* for the complete list of stakeholder interests). Other organizations and individuals were identified with assistance from the Brunswick County Cooperative Extension Service, and through correspondence with the U.S. Army Corps of Engineers regarding the Lockwoods Folly River watershed. Additional names of stakeholders were obtained upon recommendations of survey respondents.

The North Carolina State University interview team contacted 78 stakeholders by telephone, and arranged interviews with 36 people between August 24 through September 11, 1998. The response rate of 46% is reasonable and represented a wide range of stakeholder interests although all the individuals contacted were not able to participate. Hurricane Bonnie interrupted the interview process in the first week of scheduled interviews. Brunswick County residents were busy preparing for the hurricane's arrival during the week of August 24, and were contending with the aftermath well into the following week. Several interviews were canceled as a direct result of Bonnie, and the team suspects that several telephone calls were not returned because residents were either dealing with this natural disaster, or simply out of town. Some individuals declined to be interviewed, others chose not to respond to the requests for an interview and one did not keep a scheduled appointment.

Most interviews were conducted face-to-face at the NC Cooperative Extensions Service Center in Brunswick County. Several interviews were conducted by telephone. Interviews followed a questionnaire designed for this project (see *Appendix B* for a the interview questions). Respondents were also encouraged to add additional information. Interviews lasted anywhere from 30 minutes to two hours. *Appendices C and D* contain direct comments from the interviews.

DESCRIPTION OF STAKEHOLDERS

STAKEHOLDER INTERESTS

Stakeholders contacted by NCSU included those who have the authority to make decisions, those who have the potential or the power to obstruct an agreement or its implementation, and those who are affected or potentially affected by a solution to the problems within the Lockwoods Folly River watershed. Considerable efforts then, were made to engage those who might have a stake in the various issues regarding the basin. The following stakeholder categories were represented in our interviews:

- Community Elders: *Long-time residents who are from a variety of occupations*
- Barrier Island Residents: *Home/landowners who live on the barrier islands*
- Upper River Residents: *Home/landowners who live beyond the mouth of the river*
- Lower River Residents: *Home/landowners who live near the mouth of the river*
- Recreational Fishing: *Fishing clubs and marinas*
- Commercial Fishing: *Commercial fishers, seafood retailers and wholesalers*
- Residential Developers: *Residential developers & land surveyors*
- Golf Course Development: *Golf course developers and managers*
- Local Government: *Elected officials, county and town employees, public health*
- Forest Landowners: *Commercial forest landowners*
- Agricultural Landowners: *Farmers*
- Environmentalists /Conservationists: *Environmentalists from regional organizations*
- Environmental Consultants: *Consultants*
- Businesses: *Chambers of Commerce*

Interests identified and contacted but unable to include in the interview process were local environmental organizations, tourists, sawmill interests, interests of the African-American community, local hunting club interests, lower river landowners, other governmental officials, and parks and recreation interests. Secondary stakeholders were not included in the scoping process. Secondary stakeholders include state and federal regulatory agencies and governing bodies that provide technical data and resources to local governments, as well as implement statutory decision-making.

STAKEHOLDER ORGANIZATIONS AND LINKAGES

Understanding the structure and leadership of stakeholder groups is useful for determining the individuals who should participate in a collaborative decision-making process.

Some respondents interviewed represent groups with formal structure and leadership. These include local government officials and employees belonging to hierarchical municipal and county government organizations. Some of the recreational fishers interviewed belong to fishing clubs. These typically are non-profit community organizations with semi-formal structure and leadership. Chambers of commerce are formal organizations that represent interests of businesses in the area. Two environmental organizations may have a stake in the watershed. One is local and its affiliations with other regional and national organizations is unknown. Also, an active grass-roots effort had been organized to protect the shellfish nurseries in the river. Although this group has since disbanded, several leaders remain in the area and are still active in accomplishing their original mission. Much of the residential development in the watershed has been in golf course communities. Subsequently, linkages exist between real estate developers and golf course developers and managers.

Many of the people interviewed know one another, or at least are familiar with one another, particularly those who have lived in the watershed area for a long time. An informal communication network exists between many of the long-time residents in the community (referred to here as “community elders”). They have attended public meetings together over the years, and maintain close contact with local government officials. In addition, community elders hold a position of esteem and respect, even though other residents do not always agree with them. In fact, some residents conceal their disagreements with the elders simply out of respect for them. Other residents may not conceal their disagreement, believing some of the community elders exert too much influence in the community.

Not all stakeholders in the Lockwoods Folly River watershed have connections to one another. In particular, forest landowners, agricultural landowners, and many residents of the beach and river function independently and do not have close contact with other formal stakeholder groups.

HISTORY OF THE SITUATION AND CONDITIONS FOR CONTROVERSY

HISTORY OF THE SITUATION

The Lockwoods Folly River watershed has been a controversial issue for many years. Shortly after the 1930s, residents began to voice their concerns regarding problems in the watershed. A brief local history was gleaned from respondents' comments, as well as other materials, and is summarized below.

- 1930's The US ACE constructs the Atlantic Intracoastal Waterway (AIWW). Eventually concerns will be voiced that the dredging and widening of a new channel in the AIWW changed the circulation patterns of the river, diverting flow from the original Lockwood Folly River Eastern Channel.
- 1950 Population of Brunswick County is 19,238.²
- 1954 Hurricane Hazel opens an inlet on Long Beach where the Blue Water Point Marina now exists. Oyster growth up river is observed by locals to flourish following the opening of the inlet through Long Beach.
- 1958 The US ACE fills the Hazel inlet with county landfill materials to slow erosion of the inlet and provide residents of Long Beach access to the mainland. Around this time, a group of citizens unsuccessfully petitions the Corps to construct a jetty to stabilize the inlet.
- 1960 Population of Brunswick County is 20,278.
- 1970 Population of Brunswick County is 24,223.

² Population figures for 1950-2000 were taken from a draft of the Brunswick County Land Use Plan 1997 Update, published by the Brunswick County Board of Commissioners, The Brunswick County Planning Department, Glenn Harbeck Associates, and Division of Coastal Management and Coastal Resource Advisory Commission representatives.

- 1970's Tidal flow continues to decrease through the west end of the Eastern Channel and sand covers the oyster beds in Galloway Flats. The west end of the Eastern Channel is nearly closed by sand by the late 70's.
- 1980 Population of Brunswick County is 35,777.
- 1980's NC Division of Shellfish Sanitation closes shellfish harvesting for the first time in 1980. Closures move farther down the river to the mouth by 1998. Local residents begin petitioning Congress to assist them in maintaining water quality and the integrity of the Lockwoods Folly River. Residents continue to voice their concerns about the lack of navigation in the old Eastern Channel.
- 1989 A Division of Environmental Management study on the Lockwoods Folly River identifies urban runoff and septic tank effluent as sources of pollution in the river. The Environmental Management Commission implements management strategies similar to those designated for Outstanding Resource Waters (ORW). Local citizens and a citizen action group lobby for dredging of the Eastern Channel.
- 1990 Population of Brunswick County is 50,985.
- 1992 The US ACE conducts a numerical circulation study that indicates that dredging the old Eastern Channel would not increase overall flushing. Results indicate that the AIWW does not contribute significantly to degradation in water circulation.
- 1993 The Lockwoods Folly River Channel is dredged in a major project 2 1/2 miles up the river. Significant amount of dredge material is placed on Long Beach strand. Some residents fear that eventually currents will move sand to Galloway Flats onto oyster beds.
- 1994 Citizens petition US Congressman Rose for funds to dredge the Eastern Channel. Efforts to obtain funding are unsuccessful. The Corps investigates the effect of the AIWW on tidal circulation by numerically modeling the closure of the existing connection between the Lockwoods Folly Inlet and the AIWW. Again, results of the study indicate that dredging of the Eastern Channel would not improve the flow path or provide flushing of the shell fish areas. Results are briefed to local interests and Congressman Rose in November.

- 1996 Population of Brunswick County is estimated at 62,856. Population predicted to grow to about 70,000 by the year 2000.
- 1997 US Congressman McIntyre introduces House Bill 1905, to direct the Secretary of the Army to carry out an environmental restoration project at the Eastern Channel of the Lockwoods Folly River. Project features of the bill state that the Secretary shall open the Old Eastern Navigation Channel at the mouth of the Lockwoods Folly River and partially close the present ocean channel between the west end of Sheep Island and the northeast point of Holden Beach. Appropriations requested are \$5,000,000.
- US Senator Faircloth meets with a number of people in Brunswick County during November of 1997 who urge him to direct the Corps to reopen the original outlet
- 1998 Senator Faircloth introduces Senate Bill 1607, to direct the Secretary of the Army to carry out an environmental restoration and enhancement project at the Eastern Channel of the Lockwoods Folly River. Project features of the bill state that the Secretary shall open the old Eastern Navigation Channel at the mouth of the Lockwoods Folly River and partially close the ocean channel between the west end of Sheep Island and the northeast point of Holden Beach. Appropriations requested are \$5,000,000.
- House Bill 1905 is referred to the House Committee on Transportation and Infrastructure.
- Senate Bill 1607 is referred to the Senate Committee on Environment and Public Works.
- The Corps begins the Reconnaissance study on the Lockwoods Folly River watershed. A public participation contract has been awarded to define and refine the issues and levels of public interest and participation in a watershed study.

CONDITIONS FOR CONTROVERSY

In an ideal world, public participation would be rationally developed and participants would become involved to ensure that their interests are met. In the real world another factor intervenes: controversy. As an issue evolves into controversy, its resolution becomes more difficult to achieve. A series of factors combine to create a climate for controversy. Factors of controversy and their importance in the Lockwoods Folly River watershed follow³:

FACTOR 1 *Local action groups gain outside support for their cause.* Local residents formed a citizen action group in the 1980's to address their concerns about reduced shellfish harvests. It is unknown whether the group has worked with other local, regional, or national groups but they have been very active politically. Although the group has since disbanded, its members remain active in petitioning politicians for their cause to reopen the Old Eastern Navigation Channel at the mouth of the Lockwoods Folly River and partially close the ocean channel between the west end of Sheep Island and the northeast point of Holden Beach.

FACTOR 2 *A climate of concern about the issues extends beyond the immediate community.* Other groups beyond Brunswick County are interested in issues concerning the Lockwoods Folly River watershed. These groups include environmental organizations, state agencies, federal agencies, and lawmakers at the state and federal level. While some stakeholders trust government agencies to maintain and protect the river, others are distrustful of government officials from a historical perspective. Other stakeholders contend that state and federal agencies are not forthright with their information, have a political agenda, and have already decided how the issues should be handled for Brunswick County.

FACTOR 3 *A lack of close and continuous contact exists between public officials and the concerned public.* Several stakeholders mentioned they had difficulty in obtaining information about the watershed from state and federal agencies. Other stakeholders had not read information from the Corps because they did not have access to, or know how to access Corps reports. Some stakeholders also felt that concern about the river only surfaced before elections.

³ Adapted from the Institute for Conflict Analysis and Resolution. *Introduction to Negotiation and Conflict Resolution*. George Mason University, Fairfax, VA. 1993.

FACTOR 4 *An issue or event touches an important aspect of people’s lives, and affects the lives of community members differently.* Most of the respondents interviewed hold strong opinions about how to solve the problems of the watershed especially those problems that directly affect them. People worry about sustaining their livelihoods, maintaining the values of their properties, having access to property and waterways, sustaining and increasing the local economy, maintaining recreational opportunities, sustaining the ecological processes in the waters, and maintaining the overall aesthetic qualities of the watershed.

FACTOR 5 *Stakeholders are capable of taking some action regarding the issue or circumstance.* As a whole, each of the stakeholders has or is in the process of taking action to resolve problems in the watershed. Each of the interviewed respondents expressed a genuine concern regarding problems in the watershed and solutions they can implement as individuals and as part of their community. A general overview of these actions is described in the *Recommendations for Issue Resolution* section, and individual comments are provided in *Appendix D*.

DESCRIPTION OF CENTRAL ISSUES

During the interview process, each individual was asked to provide his or her opinions and concerns about the Lockwoods Folly River watershed. These opinions and concerns are the issues that people believe are unresolved and the heart of the problems in the watershed. This section describes the central issues presented by the respondents, identifies the most important issues identified by the respondents, and provides an overall description of the respondents' interests. The section concluded with a framing statement to provide an opportunity for the stakeholders to view this situation in a different way (for individual comments on the central issues, please refer to the *Appendix C*).

RIVER CIRCULATION

It is commonly believed that inadequate river circulation is the main contributing factor to the various problems affecting the Lockwoods Folly River watershed. Circulation is the process of the river flushing itself, with saltwater tidal flow coming in and up the river and freshwater tidal flow flowing out, draining into the Atlantic. The areas of greatest concern have been identified as: the Eastern Channel, Davies Creek, Galloway Flats, Sheep Island, the mouth of the Lockwoods Folly River, the upper river of the Lockwoods Folly and its tributaries, and the Atlantic Intracoastal Waterway (AIWW).

Nearly all the of respondents interviewed commented about the lack of circulation and/or improper rate of circulation within the watershed and the effects this had on them. The level of concern varies among the respondents. Some have merely read that circulation is an issue, others would support investigating circulation if it is deemed an issue, and still others fervently believe that it is the main issue facing the community. These latter respondents believe that until river circulation is restored, water quality will continue to deteriorate, no matter what other measures are taken up or downstream. There are very concerned residents whose livelihood and well being depend on the availability of shellfish resources, commercially as well as recreationally. Some of these individuals believe that instead of allowing salt water to move up over Galloway Flats, that the inlet instead, brings in sand and silt and destroys the nurseries. There is a concern that lack of circulation is assisting in the formation of a treacherous navigational inlet as well as low-depth navigational channels. Many stated that lack of proper circulation is affecting overall water quality, and in the perception of some respondents, moving existing bacteria further up the river and not back out into the Atlantic. Another respondent has suggested that beavers are damming up the upper river, contributing to river circulation problems.

In general, the respondents believe that the AIWW has contributed directly or indirectly to the current circulation issues but also believe that other factors have influenced the circulation issue as well. Several problems, according to those interviewed are attributed to the AIWW. One is that it has redirected the natural river current and drainage patterns, increasing the propensity for shoaling in river beds, in channels, and the mouth of the river. In addition, some respondents suggest that various feeder rivers that once flowed through the Galloway Flats, were cut off as a result of the AIWW. Another respondent holds the theory that closing several old inlets during the construction of the AIWW such as Mary's Inlet, has constricted drainage in many nearby watersheds. This suggests that there are now too few inlets and too many disturbances between the current inlets of the Cape Fear, the Shallotte, and Lockwoods Folly to allow proper watershed drainage.

Although for the most part, respondents identified circulation as an issue, there is little agreement on how this issue can best be resolved. Positions vary widely on whether the Eastern Channel should be dredged and a retaining wall added near Sheep Island. Some view this as the only solution, while others are apprehensive that dredging the Eastern Channel will "blow-out" the Hazel inlet, similar to what Hurricane Hazel did in the 1950's. One respondent suggests dredging the mouth of the river. Still others believe that there are more direct routes for the river to drain. Further, other respondents suggest that the recent rate of and amount of land changes have diverted the flow of a natural slow moving water system. In addition, one respondent suggests that clumping of sand and shells near the oyster beds is acting like a jetty, effecting river circulation. (For more information on recommendations for resolving these issues, please refer to the next section in this report and for specific comments, refer to *Appendix D.*)

GROWTH AND DEVELOPMENT

Brunswick County is one of the fastest growing counties in North Carolina. Ranked third in growth, according to the Brunswick County Planning department, the population is expected to double between 1980 and 2000. Most of this growth is attributed to people moving into the area to enjoy the county's quality of life.

Respondents voiced their concerns about increases in population and urban development, and their doubts about whether the county is prepared to handle these concerns. Some respondents are concerned that the county government is focusing its long-range planning efforts on rural development rather than the urban area that the county is developing into. In addition, some have expressed concern that the present pattern of development will result in urban sprawl similar to Myrtle Beach. Some respondents expressed a desire to plan for sustainable development within the county, and to focus on whether to develop at low-density or high-density development. Others do not think that development is a problem for the area at all, while others believe that a

development problem is concentrated at the mouth of the river. Some have a growing concern that development in the upper river is beginning to contribute to overall water quality problems. With residential population growth doubling, and new commercial and residential development increasing, especially along the river, many are concerned that sufficient water quality monitoring is not taking place. Some express concern that impacts of population growth are not known. Several respondents suggested that there is a need for a county wide sewer system to meet the growing population.

A different, but related issue surfaced during the interviews. This one concerns the placement of a second bridge at either Middleton or Sunset Harbor, spanning to Long Beach. While some perceive the bridge as an important safety measure for local communities, others fear that a new bridge will increase traffic on the barrier island and further deteriorate water quality.

The following developmental factors have been identified as contributing to overall poor water quality (not listed in order of importance): (1) stormwater run-off from impervious surfaces, like road systems and the larger developments within the watershed or the large impervious surfaces just above the watershed such as I-40 (2) increases in the use of septic systems (3) nutrient run-off from golf courses, and (4) ditches and canals.

Developers themselves, known as progress people by some, think that the spotlight has unfairly turned on them. Residential developers interviewed think that they are the focus of the Lockwoods Folly River and its problems, and because of this narrow focus other contributing sources are not being investigated. Developers also maintain that they are obeying all regulations and are providing unique solutions to water quality problems. Developers also stated that they have mechanisms in place to control nutrient run-off from golf courses, including retention ponds, and new golf course techniques to reduce or eliminate runoff hazards.

EXISTING SOURCES OF POLLUTION

Respondents identified existing sources of pollution in the watershed (not listed in order of importance): septic tanks; the Hazel Inlet fill; stormwater run-off; impervious surfaces; golf course run-off; the increase in ditches and canals which allow clearer drainage of nutrients; residential lawn maintenance run-off; agricultural run-off, especially from hog-farms; timber harvest run-off, especially if near a tributary; dumping of sewage from boats, the county landfill that backs up to Royal Oak Creek; (in full operation until December 1997, now classified as a C & D landfill, accepting Construction and Demolition materials only) and from those who illegally discharge into the water, such as straight pipes believed to still be in use near the headwater area. Some respondents' observations included the smell and color of the water, the decline in fresh and salt-water aquatic resources, and the growth in algae.

Overall, respondents were concerned that septic systems are the primary source of pollution in the watershed. Comments reflected respondents' concerns toward septic system performance and whether these systems are protecting the water bodies from pollution. They identified several reasons to support their claims: septic systems are under-regulated since there are no mechanisms in place to monitor each individual system. In particular, as one source commented, "essentially, they have failed when you smell the stench, and that is the only monitoring source available to us." Septic systems, according to another stakeholder, have traditionally had a high propensity to fail once installed, which is an inherent hazard. In addition, homeowners are not adequately informed on how to maintain these systems and often are under the incorrect assumption that septic systems maintain themselves. Some even question whether the porous nature of the coastal soil is conducive to proper septic system operation. And finally, shellfish closures due to the presence of fecal coliforms suggest human wastes and/or animal wastes are draining into the watershed.

Although many respondents suggested that the county establish sewer districts or a countywide sewer system, others fear that this solution will increase population density and add to the list of problems for the Lockwoods Folly River watershed. Behind this concern is the assumption that sewer systems can handle a large population, and therefore enable an increase in the region's development capacity.

AQUATIC RESOURCES

This issue includes shellfish, saltwater finfish, freshwater finfish, and other aquatic resources.

Respondents interviewed agree that there has been an overall decline in the aquatic resources in the Lockwoods Folly River watershed. "Decline" refers to the reduction in the amount of aquatic resources available for either commercial or recreational harvest, the decline in the quality of the resources (oysters may not be growing as fast and large as they used to) and the decline in normal ecological processes. Recent shellfish closures, an overall decline in certain species of salt and freshwater finfish, a decline in other aquatic resources such as water lilies, sewage-like smell of the water, and algae blooms are points of concern for the respondents.

Although respondents are concerned about the decline of aquatic resources, they do not agree on the reasons for the decline. With respect to aquatic resource quality, some respondents mentioned that climate changes might be affecting oyster growth. They suspect that the recent years of increasing warming weather patterns are contributing to the overall decline in oyster growth since oysters need cooler temperatures to flourish. Still other respondents suggest that sediment is covering and suffocating the shellfish beds and affecting the quality and quantity

available. Possible sources of sediment identified were sand from US ACE sidecaster projects, suspended materials that flow down the AIWW, sediment entering the system from the Cape Fear Inlet, and sand eroding from beaches. Another respondent suggested that a clumping of sand and shells has created a jetty near the nurseries, preventing the flushing that these filter feeders require. Still, other respondents believe that commercial and recreational over-fishing is contributing to the decline. Further, there is concern over the particular harvest methods used by clammers and how this method might be destroying the resource base. Clammers rake the oyster rocks to harvest the clams beneath them, often destroying the oyster beds in the process. These stakeholders maintain that even if the Lockwood Folly area could return to its pre-AIWW condition, natural production is insufficient to meet current harvest pressure. Still other stakeholders suggest that over-fishing is not the issue, in particular for upper river aquatic resources, since public access is limited.

Some respondents attribute the decline in aquatic resources to poor water quality. Since 1980, the presence of fecal coliforms has resulted in shellfish closures. Closures are thought to be more common now and last longer than the initial closures in the early 1980's. Respondents do not agree on the sources of the fecal coliforms. Sources cited by respondents include poor septic system performance, concentrated wildlife wastes, storm-water run-off. One respondent questioned the data used as a basis for closing some of the shellfish beds.

Reasons for concern about aquatic resources vary. Several respondents expressed concern for overall public health due to the decline in quality of the aquatic resources. Specifically, there is concern for high-risk populations such as the elderly, and the potential for the transmission of diseases from shellfish. Another respondent is concerned about health problems from finfish that might harbor toxins.

Some respondents are concerned with losing a way of life. These respondents noted that shellfishing is the sole source of income for many in Brunswick County. Yet, other respondents counter this concern by suggesting that commercial fishers are depleting a resource that cannot meet the demand and should look into other markets. Some respondents are concerned about the loss of recreational fishing opportunities and its impacts on local and tourism recreation. Others take the opposite view by suggesting that the increased pressures from tourism and new residents will compromise the availability of aquatic resources for future generations.

GENERAL WATER QUALITY

This issue pertains to concerns for public health, the lack of aquatic resources, the peculiar color and smell of the water, its potential for harboring pfiesteria, the increase in algal blooms, oxygen-depletion areas, deterioration of marsh areas and estuaries, and the nutrification of the estuary. In addition, some respondents identified their concerned about well water, and have resorted to drinking bottle water, fearing their well water is impaired.

Several stakeholders would like to see efforts made to protect water quality by: monitoring the upper river beaver activity, adding riparian buffers, reducing impervious surfaces, investigating the impact of nutrients transported by canals and ditches, educating the local citizens and tourists about water quality and how to protect it, reducing the impacts of stormwater run-off, investigating the proper drainage of the feeder rivers, and exploring whether the current ORW classification is a sufficient protective measure for the area.

Some respondents advise using caution when comparing water quality measures between years, recognizing how changes in technology makes comparisons difficult. Some respondents reported that they would like to compare overall water quality in the Lockwood Folly River with other inlet areas and investigate ways others have dealt with these issues. Also, they would like to see if other watersheds are contributing to the Lockwoods Folly problems. One respondent suggested that there is “dirty” water is draining from the Cape Fear inlet down near Ocean Isle, and would like to investigate how sediment from the Cape Fear drainage is entering the slow moving waters of the Lockwoods inlet. This respondent further suspects that this Cape Fear sediment is being deposited on the shellfish beds and contributing to the shellfish decline.

ARMY CORPS OF ENGINEERS

The US ACE was identified as a central figure in the Lockwoods Folly River watershed since this agency gathers information and conducts studies on the watershed, provides technical assistance on issues affecting the Lockwoods Folly River watershed, and is perceived by some stakeholders as being responsible for the problems affecting the watershed.

Each stakeholder was asked if they had read information distributed by US ACE about the Lockwoods Folly River. About a third of all respondents interviewed said that they had read information distributed by the Corps, such as study reports and news releases regarding the Lockwoods Folly watershed, or had attended public meetings where the Corps distributed information. Some viewed this information as accurate and reasonable, while others believed the information was unfounded, political, and appeared incomplete. Government agencies in general, not just the Corps, were regarded as “suspect” and perceived as “not operating in the interests of

the public in the way the public would want them to operate.” Regarding the recent numerical modeling studies on river circulation conducted by the US ACE, several respondents commented that these studies are a waste of taxpayers’ money since these models were not based on local parameters. Since the model is not representative of the area, it is difficult to support the conclusions of those studies. (For further indication of general validity of information, see the section on respondent’s perception of the data validity).

Respondents varied in their perception of conduct and performance of the US ACE with respect to the issues identified in the watershed. Several comments made by respondents suggest that the Corps is resisting any direct attempts to resolve the issues, which “gives the appearance that they are milking the situation” and “constructing the means to support their existence.” Further, efforts to conduct “more studies” are perceived as a stalling tactic and substantiate the perception that the Corps is unwilling to take action. Some respondents have concluded that since construction of the AIWW altered river patterns, then s the Corps is financially responsible for any negative effects such as erosion of beachfront properties. In addition to the engineering of the AIWW, some respondents suggested that the Corp’s maintenance activities, like dredging of the inlet and the AIWW channel, exacerbate the local situation. Many suspect that the Corp’s dredger, the “sidecaster” is dumping sand in areas that already have shoaling problems, in particular the Eastern Channel.

On the other end of the spectrum are the respondents who have stated that no other agency is as concerned about properly maintaining the Lockwoods Folly area than the Corps. These respondents believe that since the agency is pulled in many directions, and operates within financial constraints as well as defined operational parameters, the actions the Corps has taken are not being recognized. Some respondents suggested that it would benefit the Corps to educate local citizens on the roles and responsibilities of the agency as mandated by Congress, and how the political process drives their ability to accomplish these mandates.

BOATING

This issue includes both commercial and recreational boating.

Some respondents commented on navigational issues, including boater safety, the lack of convenience in maneuvering some channels, and how an increase in boater traffic might have a detrimental effect on water quality. Some commented in particular on the Lockwoods inlet and its instability for recreational and commercial boaters and the difficulty in maneuvering this inlet. There was particular concern for the safety of visiting boaters. Some believe that the inlet could be considered “treacherous”. Others commented on channel areas being unnavigable or not

accessible during low tide for recreational as well as commercial boats. Given the problems with the inlet, commercial boats in particular must use the Southport inlet to enter the AIWW. There was a concern by some that dredging the Eastern Channel would increase boater traffic, stirring up sediment from the rotation of the props, and contribute to declines in water quality. Some voiced the concern that some boaters are dumping sewage into the channels and polluting the river.

RECREATION AND TOURISM

The issue identified here is that water-based recreational activities (fishing and shellfishing, recreational boating, and boating events) and tourism (visitors to the area) in the watershed are negatively affected by declines in water quality, and navigation hazards.

Some respondents are interested in maintaining the overall pristine quality of the area, in particular the upper river area. Others fear that reductions in finfish and shellfish populations, the decline in water quality, and the existence of navigational issues will severely impact recreational activities in the watershed. Some residents felt strongly that preserving the upper river's pristine quality is necessary for maintaining overall integrity of the area. One respondent had serious concerns about public funds being committed to preserve Long Beach Point for recreational activities when the possibility exists that dredging the Eastern Channel will erode the Point, therefore wasting these monies. Some voiced the concern that navigational problems in the inlet will eventually affect the tourism economy. While many respondents feared a decline in recreational activities, others are concerned about the impact of tourism and those activities on the general welfare of the area.

BEACH EROSION

An additional concern for some area residents is beach erosion and the impact of proposed solutions on Long Beach Point and the east end of Holden Beach.

Some stakeholders expressed concerned about the potential erosion effects caused by increased boater traffic, the potential effects from dredging the Eastern Channel of Long Beach Point, and the effects of dredging on the east side of Holden Beach. Several suggestions were made to mitigate these potential situations. Suggestions include straightening the inlet, and providing a restraining wall in the Lockwoods Folly inlet. In addition, locals have discussed needs for beach renourishment projects.

CONSERVATION/ PRESERVATION

A few respondents voiced their concerns about protecting the quality of the environment for future generations, protecting pristine areas of the Lockwoods Folly River watershed, and providing a center for recycling waste materials.

OTHER ISSUES

Other issues that could not be captured in the aforementioned categories include: the concern over experts dictating solutions to local residents, especially when there is a sense that the experts may not agree on the best solutions; implementing solutions to satisfy a particular agenda regardless of impact on others; lack of political follow through on the problems facing the Lockwoods Folly area; the dubious need for more studies; concern that all the stakeholders were interviewed in the initial scoping process; growing public apathy and distrust; and the suspicion that the scoping process is nothing more than a public relations ploy.

IDENTIFICATION OF IMPORTANT CENTRAL ISSUES

During the interview, each respondent was asked to identify the issues that were most important to him or her. Not all respondents were able to rank the issues, or indicated that each issue was equally important. It is also important to note that since the scoping study was designed to gather qualitative information from a predefined grouping of interests, random sampling techniques as not used in selecting the interview participants. Consequently, we cannot quantitatively identify the "most important issue". Hence, the significance of any single issue depends on the respondent's own characteristics with respect to the river and watershed. For example, aquatic resource issues are likely to be more important to commercial fishers than for residential developers. The following list of important issues is presented by interest category and identifies the interests that are most important to people within those categories.

- ***Community Elders*** (*long-time residents in a variety of occupations*):
 - " river circulation
 - " growth and development (installation of a county-wide sewer system)
 - " general water quality (clean up river)
- ***Barrier Island Residents*** (*home/landowners who live on the barrier islands*):
 - " river circulation

- " beach erosion (erosion of Long Beach Point caused by dredging “solutions”, and beach erosion generally)
- **Upper River Residents** (*home/landowners who live above the mouth of the river*):
 - " water quality
 - " river circulation
- **Lower River Residents** (*home/landowners who live near the mouth of river*):
 - " other (involving all stakeholders in developing collaborative solutions, instead of allowing a few to dictate solutions for everyone else)
 - " the US ACE (negative impacts of some federal projects)
- **Recreational Fishing** (*clubs and marinas*):
 - " water quality
 - " growth and development (impact of the residential development and golf courses on the river; septic systems)
 - " aquatic resources
- **Commercial Fishing** (*commercial fishers, seafood retailers and wholesalers*):
 - " river circulation
 - " aquatic resources
- **Residential Developers** (*developers and land surveyors*):
 - " water quality
 - " overall quality in the area
 - " growth and development (septic systems)
- **Golf Course Management** (*golf course developers and managers*):
 - " other (continue to search for ways to be part of the solution)
- **Local Government** (*mangers, elected officials, county and local employees, planning boards & public health*):
 - **Bolivia:**
 - " river circulation
 - " aquatic resources
 - **Long Beach:**
 - " Beach erosion (potential affects of Eastern Channel dredging on the Blue Water Point Marina)
 - " water quality
 - " other (long-range planning, and transportation access)

- **Holden Beach:**
 - " water quality (adjacent to island)
- **County:**
 - " water quality
 - " aquatic resources
- ***Forest Landowners (commercial forest landowners):***
 - " Other (plans, and proposals for the watershed)
- ***Agricultural Landowners (farmers):***
 - " river circulation
 - " other (beaver activity in upper watershed)
- ***Environmentalists /Conservationists (regional environmental organization):***
 - " growth and development (potential increase in boat traffic)
 - " conservation and protection (the inability of the ORW standards to protect Lockwoods Folly)
- ***Environmental Consultants (consultant):***
 - " Other (implementation of best management practices)
- ***Business (Chambers of Commerce):***
 - " navigation (safety issues for boaters, recreationists, tourists, and the public in general)
 - " aquatic resources
 - " beach erosion

SUMMARY OF THE CENTRAL ISSUES

Each of the 36 respondents identified participated in identifying the main central issues: river circulation, growth & development, existing sources of pollution, aquatic resources, water quality, the US ACE, boating, recreation & tourism, beach erosion, conservation and preservation, and other issues. It is important to understand six ideas about the identification of these central issues.

1. *In general terms, the respondents identified similar perceptions about the problems in the watershed (river circulation, growth and development, existing sources of pollution...).*

2. *Each of the eleven central issues touches an important aspect of the stakeholders' lives and affects the community very differently.* The needs of the respondents vary. Respondents are worried about sustaining their livelihoods, maintaining the values of their properties, access to property and waterways, sustaining and enhancing the local economy, maintaining recreational opportunities, sustaining ecological processes, and maintaining the overall aesthetic qualities of the watershed.
3. *Nearly all of the stakeholders interviewed hold strong and well reasoned opinions about how to resolve these issues, especially those problems that directly affect them.* While they agree in general terms on what the issues are, they do not always agree on how to resolve these issues.
4. *Even though some respondents have attempted to resolve these issues, either on their own, or in partnership with others, most issues are multi-faceted and complex and require significant resources and cooperation of their resolution.* Furthermore, local, state, and federal levels of government each possesses some jurisdictional authority in developing and implementing policies and programs in the watershed. Fragmented jurisdiction is a secondary but important issue. A myriad of agencies will have to decide how to share processes and authority while retaining their statutory decision-making responsibilities.
5. *The scoping process is seen by most respondents as a positive development.* Many residents are encouraged that the US ACE is interested in bringing together individuals, groups, and organizations to help identify resource concerns, potential solutions, and to develop a coordinated plan of action. Nearly all respondents interviewed stated that they would be willing to serve on such a committee. One respondent commented that a committee like this would be educational, that “all of us are smarter than any of us.” The public is demanding a say in the policy making process of government, and wants a share in the responsibility for decision-making and its outcomes.
6. *The central issues facing the citizens in the Lockwoods Folly River watershed and Brunswick County can be framed in a way that will enable people to resolve them collaboratively.* A solution-oriented problem statement that may bring people together around the issues might be framed as: “How can we improve and maintain water quality, aquatic resources, and navigation interests in the Lock Folly River watershed while at the same time maintaining quality of life in Brunswick County?”

RESPONDENTS' RECOMMENDATIONS FOR WATERSHED IMPROVEMENT

ACTIONS TAKEN BY RESPONDENTS FOR WATERSHED IMPROVEMENT

The majority of the respondents interviewed have acted at some point in time to try to resolve the problems in the Lockwoods Folly River watershed. The course of actions taken ranges from personal waste recycling efforts and writing songs about the cultural heritage of the river, to the public organizing a local citizen action group to protect the river's resources. A brief description of some actions taken by respondents follows.

Local government officials have been active in attempts to resolve problems in the river basin. Actions taken include: passing resolutions to support legislation to clean up the river and protect the shoreline; stabilizing the shoreline by planting sea oats; actively seeking grant funds to establish riparian buffers in the Montgomery Sleuth; participating in cooperative ventures and planning; lobbying state and federal agencies to conduct water quality improvement projects; and involving a town in an active environmental education program. In addition county government departments are tracking septic system failure performance, requiring developers to file copies of their state erosion control plans with them for review, undertook a preliminary aquifer sensitivity study, and recommended that county commissioners implement a groundwater study.

Some respondents took personal responsibility for not contributing to the problem. Agricultural and forest landowners interviewed report using best management practices to prevent pollution of streams; one landowner uses a septic tank that channels any overflow onto a drainfield and away from a stream; and one developer has installed a package treatment plant rather than rely on individual septic systems in a new subdivision. A recreational club minimizes their recreational use impacts on the river by using biodegradable cleaning products on their boats, by recycling, and setting an awareness level about the causes of pollution in the river. Some of these organizations and their members encourage support of rules and regulations for operation of recreational equipment and activities. A golf course in the watershed has been certified by a national program that requires a high standard of environmental stewardship. The golf course uses tertiary-treated effluent on some of the greens, and tolerates imperfection of its greens.

Finally, a large number of respondents including beach and upper river residents, community elders, a fishing club, a citizen action group, commercial fishers, and local government officials have written letters and talked to congresspeople and agency officials, and attended public meetings to convey their concerns about the Lockwood Folly River watershed, all in an effort to improve water quality in the Lockwoods Folly River.

RESPONDENTS' RECOMMENDATIONS FOR WATERSHED IMPROVEMENT

Although the respondents interviewed hold strong and often well thought out opinions about how to solve these issues, especially those problems that directly affect them, they differ in their positions on how the problems within the Lockwoods Folly River watershed should be resolved. Some respondents were very confident in their opinions, such as those who suggested to “re-open the channel because what other choices are there”, while others admitted that they did not know how to resolve the problems of the Lockwoods Folly, preferring to leave the solutions to the experts.

The respondents' opinions on how to resolve water quality problems within the Lockwoods Folly River are grouped according to the central issues that were identified. A few respondents only suggested actions that apply to a specific issue, and others suggested solutions for a range of issues. The various respondents gave the following recommendations for improving water quality problems in the Lockwoods Folly River watershed (for detailed information refer to *Appendix D*).

1. Recommendations to Resolve River Circulation Problems

Some suggestions to improve river circulation were general, such as to stabilize the inlet or solve the flushing problem. A few mentioned that improving river circulation alone would not necessarily solve the river's woes, while another respondent stated that dredging the Eastern Channel would not “blow-out” the Hazel inlet. Some suggested more studies, such as researching historical circulation patterns before construction of the Atlantic Intercoastal Waterway; a study on the effects of redirecting feeder river flow near Brown's Landing into the “dog leg”; a study on water circulation patterns in the river, and a study on the effects of dredging the Eastern Channel.

The specific solutions for improving river circulation included:

- a) Dredging the inlet at a 90-degree angle from the shore
- b) Dredging the “dog leg”
- c) Letting the inlet flow without human interference to the northwest
- d) Building a jetty to keep the inlet open
- e) Allowing drainage through Sheep Island
- f) Allowing the inlet close naturally when new inlet is created
- g) Opening feeder rivers to allow flushing
- h) Dredging only the shoaling creeks
- i) Dredging the shoaled mouth of the river
- j) Piping a “flushing” system from the ocean side of Long Beach into the river to increase salinity

- k) Making the inlet deeper and friendlier to recreational boaters
- l) Re-opening the inlet that was opened by Hurricane Hazel in the 1950's
- m) Dredging the Eastern Channel
- n) Allowing Eastern Channel to close naturally

Some respondents raised concerns about dredging the Eastern Channel and the potential that this might reopen the Hazel Inlet as well as increase beach erosion. Along with those concerns is the suggestion that mitigation plans should be in effect if the Eastern Channel is dredged.

2. Recommendations to Resolve Growth/Development Problems in the Watershed

Many respondents were concerned about the effects of rapid growth and development in the watershed. Several respondents suggested that Brunswick County and municipalities should create and implement long-range planning to address sustainable development in the watershed, in particular by recognizing and planning for urban growth. Several offered ideas on how local governments should guide development. These included:

- a) Installing a countywide sewer
- b) Creating sanitary districts
- c) Creating a specific zone for increased lot sizes to accommodate drain fields
- d) Creating riparian buffers
- e) Examining stormwater runoff from development
- f) Determining the carrying capacity for development
- g) Conducting a ground water study
- h) Studying other coastal areas that developed rapidly
- i) Studying various growth scenarios and density implications

Referring to studies, some respondents stressed that science should be used to determine the source of problems before taking action to eliminate them. One respondents said that the state should provide resources to enable county to implement basin-wide management practices if the county is not in the position to do so itself.

Some respondents thought that the government could do a better job of monitoring the permitting process and enforcing current development regulations. A few suggested that the costs of development and infrastructure should be passed on to those who benefit from changes in the landscape. Recommendations for developers on this topic include:

- a) Establish and maintain their own sewer systems and charge a sewage fee
- b) Construct sediment ponds and restraining fences

- c) File erosion control plans with the county
- d) Construct stormwater systems that allow natural processes to degrade pollutants.

3. Recommendations to Resolve Existing Nonpoint Sources of Pollution

Ideas for reducing existing nonpoint sources of pollution included undertaking studies to locate sources of bacteria on the river, and guiding land uses to reduce nonpoint source pollution. Some respondents asked for better monitoring of marinas and farms and imposing harsher penalties for violators. One respondent suggested that government must find a meaningful way to deal with agricultural sources while taking care not to put the blame on any one agricultural use. Another suggested that government provide low interest loans to repair and update older septic systems and prevent failures. More than one respondent wanted golf courses to use proper agronomic practices, use recycled water on greens and fairways, and stop runoff. Some suggested creating or acquiring buffers and wetlands in the watershed, and working with landowners to reestablish trees. Regarding forestry practices, two respondents wanted to continue to allow timber companies to police themselves. Finally, a respondent suggested taking water samples at several locations in the watershed (*specific sites mentioned listed in Appendix D*).

4 . Recommendations to Resolve Problems with Aquatic Resources

Concerns over protection of aquatic resources (finfish and shellfish) prompted only a couple of suggestions that were separate from other water quality recommendations. One respondent recognized that although it may not be possible to prevent some shellfish bed closures that occur naturally after a heavy rain, it should be possible to maintain controls on land disturbances. Another respondent suggested protecting aquatic resources by requiring fishers to alternate between fishing sites, and some respondents suggested that clambers use harvest methods that do not destroy the oyster rocks. One respondent suggested investigating the source of sediments that are suffocating the oyster beds.

5 . Recommendations to Resolve Problems with Erosion

Recommended solutions to beach erosion problems were sometimes intertwined with recommendations to solve river circulation problems. Recommendations included using dredging materials to replenish beaches, managing sand resources nourishing the Long Beach oceanfront, maintaining beaches for storm protection, and continuing the beach nourishment program at Holden Beach.

6. Other Recommendations

Other suggestions for improving the Lockwoods Folly River watershed include research, education, and public participation. As noted earlier, many respondents called for more research, with a focus on basinwide research (for a complete list of research and studies requested, refer to Data section). Education was mentioned several times as a way to reduce residents' and tourists' impacts on the watershed. One respondent suggested gearing an educational format through property managers. More specifically, one stakeholder suggested educating residents about septic tank maintenance. Educating officials as well as residents, and education on boater safety were also recommended. One respondent suggested that attitude changes would need to occur in the area, not just with the tourists but also with the those long time residents who still assume that it is "ok" to dump in the river.

Finally, some of the respondents suggested involving the public, by gathering the various stakeholders together to share information and begin a meaningful dialogue on how to resolve the problems in the Lockwoods Folly River watershed as well as protect the area for the future.

DATA

SOURCES OF INFORMATION FOR RESPONDENTS

Respondents have obtained information about the Lockwoods Folly River watershed from the following sources:

- 1989 NC Division of Water Quality Report
- 1992 U.S. Army Corps of Engineers Numerical Report
- 1994 U.S. Army Corps of Engineers Report
- U.S. Army Corps of Engineers officials
- 1996 Holden Beach Erosion Report
- Public meetings
- NC Division of Water Quality Basinwide Plan
- NC Seagrass
- NC Department of Environment and Natural Resources
- NC Division of Coastal Management/ Coastal Area Management Act
- NC Cooperative Extension Service
- NC Division of Marine Fisheries
- Formal education
- Newspapers
- Aerial and other photographs
- Maps
- Historical records and stories
- County officials
- Consultants
- Politicians during election time
- Committee meetings
- Local fishers
- Local citizen action groups
- Individuals from the community including elders & neighbors
- Personal observations-working and living in watershed

RESPONDENTS PERCEPTION OF DATA VALIDITY

Respondents' interviews focused on data availability, use, and perceptions of data validity.

Many respondents received information about the Lockwoods Folly River watershed through the local newspapers and have commented that although newspapers should be read with a critical eye, they are reasonably accurate resources for identifying the main issues. As one individual commented, "The press is anecdotal. After all, anything can happen once so it is probably somewhat accurate but not solid information."

Respondents regarded information they had gathered first hand from residents and local fishers as accurate, although not everyone agreed with the opinions they heard. People considered photographs and maps as accurate data sources. Many respondents were confident about the information received in public meetings, but some were skeptical of decisions that are made based on public meetings since people who attend the meetings may be pushing their own agendas.

Several respondents commented on information they received from the NC Division of Coastal Management (DCM), the NC Division of Water Quality (DWQ), and the US ACE. Two respondents complained that data from the DWQ and the US ACE are not specific enough. One person felt that the DWQ monitoring data were inadequate because the monitoring stations are too thinly spread and sampled too infrequently. This same individual was quite confident in the accuracy of data from the NC Division of Shellfish Sanitation. On the other hand, one respondent questioned the accuracy of the NC Shellfish Sanitation data that is being used to regulate Davis Creek. A respondent also commented that information regarding the baseline of water quality in the river is suspect, as there is no way of knowing what the water was like years ago. One respondent was unsure of whether the county had an accurate count of land uses and management practices being used to address runoff.

Not all respondents had read or heard information provided by the US ACE. Several mentioned that if given access to the reports, they would read them. One local government official commented that very little information concerning the status of the river is available to the public. Although some respondents believed the US ACE data is accurate, others disagreed with some of the data and conclusions in Corps' publications. One person commented that the Corps sometimes does not make conclusions based on the physical evidence on the beach or in the river and does not use local parameters in their research, while another said that any report generated by the Corps would have an inherent bias.

INFORMATION RESPONDENTS WOULD LIKE TO SHARE

Respondents wanted to let others know about the actions they have taken to minimize their own impacts on and improve water quality in the Lockwoods Folly River watershed. Sharing their information would help others to understand why they hold certain opinions about the watershed.

Many respondents would like to share their own personal observations and experiences. Some of them can document these experiences with historical records, photographs, and maps of the area over time. A few have files of information available from previous efforts they have made to improve conditions in the river. County officials noted that county documents, including the county land use plan, septic tank tracking information, and an aquifer sensitivity study, are available for the public to read.

INFORMATION DESIRED BY RESPONDENTS

While some respondents said that no more information was needed (but certainly action was), many respondents believed that gathering more essential information would contribute to resolving the problems in the Lockwoods Folly River watershed. This information can be divided into three categories: (1) education and outreach; (2) historical statistics and information; and (3) proposed research areas.

Education and Outreach

- Provide forum for information exchange between the experts to identify problems in the watershed
- Provide meeting minutes from local committees
- Exchange non-biased information between all the stakeholders
- Provide public outreach concerning the issues affecting Long Beach
- Provide outreach about the activities US ACE activities so public may understand the process and criteria for action, for maintenance, and reaction
- Create educational programs to disseminate information and increase awareness of watershed
- Work with UNC-Wilmington to present forums with professional speakers
- Disseminate knowledge about other beach renourishment projects (Kure and Wrightsville)
- Provide information to public about role of bacteria in shellfish area closures
- Publish updates for the public on activities affecting the Lockwoods Folly River watershed
- Provide public information on the proposed \$5 million management plan for fragile coast area at Long Beach Point

2. **Historical Statistics and Information**

Commercial fleet fishing patterns and industry trends throughout the past 80 years
Recent NC Seagrass studies on development and impacts
1992 US ACE numerical modeling study
Sea tow statistics on the inlet to determine if navigational problems exist
Information about natural migration pattern of inlet between 1857-1924
Impacts of inlet closures on Cape Fear and Lockwoods Folly watersheds from construction of Atlantic Intracoastal Waterway (Mary's inlet and Bacon's inlet)
Previous Coastal Resources Commission studies on the watershed
Holden Beach Erosion report published in 1996 December
UNC-Wilmington water research studies on the area
Statistics and /or info on harvest of shellfish from the early 1900's until now
Statistics and /or info on harvest of finfish from the early 1900's until now
Bureau of Chemistry and Soil 1930 picture and/or map
Historical photographs and personal observations
Historical knowledge about natural migration pattern of inlet
Have DWQ cover trends of area over last 20 years
Disseminate information on actions taken by regulating agencies
Data and conclusions Howe Creek and Futch's Creek studies at UNC-Wilmington

3. **Research Needed**

Conduct valid studies on local areas using local parameters
Provide results of current wetlands study
Information on drainage, rate of flow, etc.
Compare Lockwoods Folly River watershed to Shallotte River watershed
Study salinity, tidal flushing, and river drainage in the Lockwoods Folly River
Study golf course runoff in the Lockwoods Folly River
Analyze fishing tournaments' contributions to local economy, and forecast future economic scenarios where declining water quality in the watershed impacts tournaments
Conduct study of all Brunswick County sewer systems.
Create accurate modeling of real short and long-term effects of opening the channel.
Create an accurate database of management practices, land uses and effects of development issues in basin.

CONCLUSIONS/NEXT STEPS

CONCLUSIONS

Overall, the respondents interviewed recognized that a problem with water quality in the Lockwoods Folly River watershed does exist. Definitions of “water quality” vary by respondent: water quality may be judged by the quantity and quality of the aquatic resources, lack of river circulation, the opportunities available for recreation on the river, the amount of pollutants in the water, the aesthetic qualities of sight and odor of the water, or all of these attributes combined.

As their perceptions of water quality vary, so do their perceptions of causes of the problems and the solutions to the problems. Conflict arises from these differences in perception of the specific problems and solutions. Respondents are aware that information exchange is lacking, and that everybody has to put their “cards on the table.” The overall awareness of a need to share information and open up issues for discussion indicates that a climate exists that is conducive to gathering stakeholders together to share information, deliberate the issues, and develop mutually agreeable solutions.

What happens next?

Since the sponsoring agency has determined its willingness to share control over the process and the resolution of the issues, and an initial scoping interview has determined that respondents are supportive of the process and willing to participate, we recommend the following steps:

1. Secure the necessary support and authority to undertake a collaborative process.
2. Contact stakeholders not previously contacted to determine their willingness to participate in a collaborative process.
3. Clarify any potential obstacles to convening the process (unwilling stakeholders, insufficient time, or resources).
4. Determine who will represent the various stakeholder interests in the issues.
5. Design an effective forum or process to deliberate and resolve the issues.

APPENDICES

APPENDIX A: Stakeholder Interests Identified

To determine whether a collaborative process is an appropriate mechanism for resolving the problem of the Lockwood Folly River watershed and improving water quality, a diverse group of stakeholders was interviewed to determine their needs for participating in a collaborative process. This particular group was identified by first recognizing specific interests in the watershed, such as commercial fishing, tourism, and residential development. Organizations or individuals were matched to those interests and contacted for interviews.

- Commercial fishing
- Recreational fishing
- Shellfishing
- Boating
- Golf Courses
- Real Estate Development
- Landowners
- Homeowners
- Environmentalists
- Timber
- Agriculture
- Tourism
- Local Government
- Land Preservation
- Public Health
- Historical Preservation

APPENDIX B: Initial Lockwood Folly River Scoping Interview

Most interviews were conducted face-to-face at the NC Cooperative Extensions Service Center in Brunswick County. Six interviews were conducted by telephone. Interviews followed a questionnaire designed for this project. Respondents were also encouraged to add additional information. Interviews lasted anywhere from 30 minutes to two hours. *Appendices C and D* contain direct comments from the interviews.

Name:

Date and Location of Interview:

1. What are your opinions about the Lockwood Folly River watershed (LFRW)?
2. Do you see any other problems with the LFRW?
3. What issues are most important to you?
4. In your opinion, how can the problems of the LFRW be resolved?
5. Do you see any other ways the problems in the LFRW can be resolved?
6. Have you ever taken action to resolve the problems of the LFRW?
7. Where are you getting info about the LFRW?
8. In your opinion, how accurate is this information?
9. Have you read any information on the LFRW provided by the Army Corps of Engineers?
10. How accurate, in your opinion, is that information?
11. Do you have information about the LFRW that you might want to share with others?
12. What other information do you feel is needed on the LFRW?
13. The Army Corps of Engineers wants to bring together individuals, groups, and agencies with interests in the LFRW to help identify resource concerns, potential solutions, and to develop a coordinated plan of action. Would you be interested in serving on such a committee?

14. You have identified “issue X” to be the most important problem affecting the LFRW. Would you be willing to work with people who have other points of view?

15. Are there other people or organizations that I should be contacting about the LFRW?

Address of Interviewee:

Telephone number of Interviewee:

Representing:

Yes, I would like a copy of my personal interview,

Yes, I would like a copy of the US ACE Scoping Report mailed to me.

APPENDIX C: Respondent's Comments on Central Issues

Listing of comments is not meant to indicate how many people support certain actions. For example, even if many people may have mentioned a certain option for resolving an issue, that comment was only listed once. The listing represents the diversity of individual comments received.

1. River Circulation: Eastern Channel, River Mouth, The Point, & AIWW

- Eastern Channel dredge may be a solution for some residents but not for all. Fear in the Long Beach area is that dredging may “blow-out” the old Hazel inlet and leave Long Beach an island.
- Lockwoods Folly River needs ability to flush in timely manner & prevent Lockwood Folly River watershed from becoming a “Myrtle Beach” model.
- Concern that dredging the Eastern Channel will reopen the “Hazel inlet” at the Blue Water Point Marina. River shoaling as result of poor flushing.
- Dredging the Eastern Channel is not in everyone’s interests and research and further discussion amongst all the involved parties could serve to point this out. Dredging could benefit some and hamper others. Has potential to blow out the old Hazel inlet. In addition, proposed restraining walls could serve to direct force of current of eroded east end of Holden.
- Not being able to flush. Corps changed original inlet course with AIWW. Flow is diverted with all the disturb soils, graded land.
- If dredge eastern channel would need to put hardened structure a Blue Water Point Marina since pressure of flushing would reopen the Hazel inlet. Also dredging of eastern channel could create erosion lost on Long Beach Point and east end of Holden Beach.
- Cape Fear inlet drains dirty water and various particles from its inlet down to Holden Beach. Just beyond west Holden Beach into Ocean Isle, start to see feet in water. Believe these particles suspend themselves over the oyster beds and are contributing to the quality issues regarding the oysters. Believe that these particles are the suspended materials that enter the Lockwoods Folly River watershed area and are in the slow moving water system.
- Concern about improper flushing and its affects on water quality.
- Concerned about the proposal to dredge the Eastern Channel. Dredging the channel may redirect flow of water in such a manner that the Long Beach Point experiences enormous erosion.
- In addition, this may blowout the Hazel inlet and Long Beach would be an island. How would residents access the mainland?
- Mouth of river is the rectum of the inlet. Inlet use to be open but closed with silt. Poor navigation.
- Sand bar development on right side of the Blue Water Point Marina. Hazard to boats and believe pollution builds there. Entire watershed and other areas use to have other outlets but

gone (such as Corn Cape Inlet). Now AIWW can only drain at a few specific locations like the Cape Fear inlet, the Lockwoods Folly Inlet, and the Shallotte. Think the Lockwoods Folly River is acting like rectum for the AIWW and it is in the middle and receiving run-off from various locations. Feeder creeks contribute to problem from Southport: when tidal river falls down, pollution/run-off (below Oak Island bridge) goes down into AIWW toward inlet. Island on little Davis Creek surrounded with silt. US ACE dropping maintenance of the inlet so there is back up and stagnation. They do not think dilution is the solution.

- Channel Choked, basin not flushing itself. AIWW is a good thing but do not think the design took into account the dynamics of redirecting rivers and basin/feeder river water flows. The mouth of the Lockwoods Folly River is shallow and may be source of poor flushing. Mouth is plugged up.
- Maintain inlet for reasonable passage for recreational and commercial interests.
- Altered nature's patterns too much and created weak links in the process. Inlet flow not natural: no flushing.
- Concerned about proposal to dredge Eastern Channel and the long-term affects of that project of NE section of Holden Beach. Think dogleg is actually more direct route for Lockwoods Folly River to flush than reopening the Eastern Channel. (Hindsight: thought that the 1954 Hazel inlet was a golden opportunity for adequate flushing).
- AIWW cut through Galloway Flats (major oyster bed garden) and cut off the feeder rivers that use to drain from the basin over what is now Sheep Island, into the inlet. No drainage on Sheep Island. System not able to flush itself. Shoaling of Eastern Channel mouth. US ACE sidecaster is dredging sand from mouth of Lockwoods Folly Inlet and depositing remains in mouth of eastern channel as well as on Long Beach. Major problem is lack of flushing. Even if other contributing factors are corrected in this are, until system flushes, it will not matter.
- Before 1970 not as many problems but after 1970 is when problems began. Made mistake in closing Hazel inlet, as this seemed a direct flushing route. Need to dredge up river.
- Lack of navigation at low tide.
- Coagula of sand/shell restricts natural flushing process (acts like a jetty and restrains the currents 4x/day...6 hours in, 6 hours out, twice a day).
- Lack of flushing. River acts improperly since more water goes up than can come back. Drop object in mouth of river and rising tide will carry object further up river than falling tide takes it down. Only heavy rain will flush area. Lack of flushing accounts for most, if not all of the down and up river problems. Believe tidal river moves bacteria up river and not down.
- Little flushing. Do not get the friction that we use to because of the AIWW. That there is too much land distance between the Lockwoods Folly River inlet and the Cape Fear inlet. As a result of growth in both areas, their ability to relieve themselves of the contributions that go into both areas is compromised and the AIWW and reduction in tidal pressures has contributed to this.

- River is not flushing. Present inlet (dogtail) changed the course of the drainage in the 1933-35. Eastern navigational channel use to serve commerce up to town of Supply. Past history, states that channel ran 8ft deep at hightide and now at low tide can WALK area. Worse thing that happen to area was new inlet, which changed drainage, pattern and contributed to river shoaling. Davies creek is contributing to shoaling of the river.
- Construction of AIWW was a big cause of problems/less oysters, as it cut the outflow of streams to the ocean.
- Hazel's inlet moved salt water back up river a mile, and oysters grew well. Current situation moves sand and sediment into inlet. After Hazel, Corps closed the inlet that Hazel created, as the new inlet was cutting sand out very quickly. This was done with Civil Defense money (emergency money- the point was they moved quickly). Inlets have tendency to cut away the east side of Holden Beach. Holden beach has lost a lot of beachfront due to natural causes.
- When the corps dredged the inlet straight out, it caused erosion on Long Beach. It is difficult to maintain depth of water when inlet kept straight. If inlet is left flowing natural (moving closer to Long Beach like lately), erosion is reduced on Long Beach, the depth is easier to maintain at consistent depth. Thinks tying the Eastern Channel to the Lockwoods Folly Inlet and opening, it up will help. At least it will allow the water to move in and out.
- The primary purpose of the inlet is access to the ocean inlet, which services 3 fishing populations.
- Opening the channel would cause problems with Long Beach. The Corps should address this. Problems could be:
 1. Routing of maritime traffic to the inlet
 2. Loss of land at end of King's Lynn on Long Beach
 3. At the portion of narrow beachfront on Long Beach, in a storm event, should the river fill with storm surge, it will cut an opening. There should be a mitigation plan established before a plan for the Eastern Channel is in place.
- Biggest problem is the shifting sands, erosion of the inlet itself. There are a lot of suggestions- it will probably take lots of state and federal money to solve. Erosion is a problem at the East End of Holden Beach. The erosion affects the water quality in the basin. Not familiar with specific techniques they would use to solve erosion problem.
- There are strong feelings about the inlet and dredging. It may be a contributing factor and is worthy of study. If the location of the inlet were changed it would probably be of marginal benefit if there are other upriver sources of pollution. Concern with the inlet is the impact of increased boat traffic that could result if channel is deepened, results in more marinas and boating access.
- Water quality in watershed is important because river outflows east of the island. Lack of flushing may cause problems. Old time residents say it's caused by a lack of flushing since AIWW constructions- this may or may not be true. His opinion it is a little bit of both, the silting of river and septic tanks.

- Erosion is another concern. Dr. Bill Cleary, UNC-W, and Tom Jarrett, US ACE, said that inlet orientation plays a significant role in transport of sand. The inlet flows to the SE. If straightened out it would possibly slow or stop erosion. Too early to know, Corps must study and examine the effects.
- East end of Holden Beach is disappearing- problem for homeowners. Sand is washed into tributaries, onto shellfishing areas. With the old way before the AIWW, the river flowed through the Eastern Channel. Currently the Corps spends a ½million to keep inlet open- enough money has been spent on the existing inlet. You can catch catfish at landings on the river, as there is no saltwater there.
- Biggest concern seen as sediment building up at mouth of river- water does not flow out. Not enough flow to keep sediment from building up. All of the tributaries at mouth may gradually fill up, except for main areas where Corps is dredging. If they cleaned out channel, it might help flow. Essential issue is the water flow. Floundering occurs in Sunset Harbor, as it is shallow.
- A major problem is a lack of flushing. Flushing gets rid of silt and bacteria. Annual dredging cuts out inlet for 60 days. Holden Beach has been circulating sand to the channel for years. Calls it “swapping sand”. The Corps cannot accept that their dredging (of inlet) brings sand into the channel. Dredging helps the boys in shrimpers for a little while, but problem is still there.
- Silt has clogged upper river. Davis Creek stays polluted –it is just a dead end.
- Corps has been creative in avoiding re-dredging. The Eastern Channel is filling with sand.
- The fastest and best route to improve circulation is through the inlet opened by Hazel.
- In the last 25 years, a sidecaster called Merrit has been pumping dredge material directly in the water. They work by the clock and not by the tide. If tide is rising, silt moves up the river. This is primary reason why silt is on the river.
- Comparing watershed in the 30’s to watershed today is comparing apples and oranges. Can’t put the channel back in old place and expect to have the same situation as before.

2. Growth/Development in Watershed:

- Concerned with amount of development allowed to build near water. Believe this may be contributing to degraded water quality.
- Concern about over-development of the NW Long Beach natural area. Shoreline that is developed cannot be used for docking recreational boats.
- Not adjusting impacts of development and tourism.
- Lack of access to Long Beach area.
- Developers need to take care of run-off to reduce impact to river.
- That any new subdivision ordinances to improve area may be opposed by environ groups as it may be perceived as assisting development and not protecting area.

- Very valuable resource area. Balance economic development and. Environmental concerns. Do not think that pollution is a direct result of development. Although could be one source, think there are other sources.
- Development not the issue.
- Distressed at lack of clarity on development stresses and need to cope (identify or recognize the problem).
- Planning process is focused on rural development and not on what we are actually developing into which is an urban area. Plan to maintain water quality from urban standpoint.
- Coastal Area Management Act (CAMA) focuses on developers (scapegoat) as source of water problems. CAMA takes a narrow view and is not open to other possible sources (point and non) of water quality problems.
- Lacking review on golf courses and what their developmental and establishment impacts are on water quality.
- Do not have a resource conservation plan for area.
- Golf course and possibility of nutrient dumping in the Lockwoods Folly River watershed.
- Discussion on building second bridge across Middleton Avenue and up to Hwy 211, or across from Oak Island to Sunset Harbor. Considered a second evacuation route but what is developmental impact on watershed that this additional access will bring to area?
- Concern that town of Long Beach spending taxpayer's money (1.5 million) to purchase land on the Point for recreational purposes when proposed solutions to address the Lockwoods Folly River watershed may erode that area, and the value of the homes nearby.
- Progress people are contributing to reduction in water quality, especially in upper river.
- Need a sustainable growth program in area.
- Concerns with development on the upper river and the potential for storm water run off.
- Concerned about pollution in river watershed from addition of impervious surfaces, septic systems, and uncontrolled development.
- Beavers are backing up water on the upper feeder rivers (for example Clark's Branch). Cannot flush.
- More non-pervious surface in county like I-40 (lots of surface and storm water runoff from out-of-state and local traffic).
- Development is concentrated near mouth of river. With the exception of Winding River development, the upper river consists of several scattered home sites and the vast majority of the river basin is not suitable for development. There are no public landings once you leave Varnamtown. Problem is occurring downriver. That said, while growth can have problem effect on water quality, it might not have an effect on water flow or the river's ability to flush itself.
- Most significant growth occurs in major developments where they build their own sewer treatment plants. Septic tanks not the problem.
- Unfair finger pointing at commercial development, likely for political reasons.

- Even if entire area was impervious surfaces, it still could not cause all the problems in the inlet.
- County must have sewer system- Oak Island is beginning to be developed, and a sewer system is a necessity.
- Most of the development is south of 17 (contrast to RE)
- The golf course neighbors are very appreciative of the river and are trying to prevent runoff.
- Brunswick County is growing too quickly to effectively manage the growth. Growth can occur if its by-products are managed properly. Needs a commitment by community and developers.
- Golf courses are required by environmental laws to use application rates, but individuals are not. Not sure how to address lawn runoff.
- Winding River will be the largest development affecting the basin, with potential for 2,000 homes. Holden Beach is facing a lot of infield growth.
- Stormwater runoff and finding ways to control it is important issue. Planning dept. trying to identify ways to help control it in developments- they will propose a new subdivision ordinance with more stringent runoff rules than the state's. Do not know if it will be approved.
- The planned unit developments in the county tend to be built as golf course communities. The state stormwater control rules require retention ponds in this kind of area for stormwater control, and this condition makes it suitable for golf course developments.
- Wants countywide sewer system.
- There has been extensive development in area, with golf course development, and the upper reaches of watershed are under fairly dense development pressure.
- Concerned about septic systems from development. Water quality problems close to ocean particularly may have been caused by proliferation of septic tanks. Does not know root cause, may be golf course development on the river, but flushing could be contributing.
- Golf courses are big problem. River will soon be surrounded by 2-3 courses. Do not see options for dealing with development- the zoning laws are already in place to accommodate development.
- Health Dept. puts emphasis on development, seepage, runoff, industry, and golf courses. Agrees that growth is a problem.
- Recognize that some would like to confer Outstanding Resource Waters (ORW) status on the river and this could affect land value for waterfront properties. Future discussion need to include the land use conflicts that exist in the area.
- The county has grown, Long Beach has a lot of people. Davis Creek is filled with houses. Increase will continue.
- Golf course developer/mgmt: they are not part of problem, do not contribute runoff: see options section. Adhere to higher standard of environmental stewardship than most other golf courses. Follow CAMA rules when developing new courses. Only have ½ acre contiguous to river, will add another acre later in a separate area.

- Another impact is that Winding River has some bulkheads.
- Sewer plant may bring in more people, and may cause cross words with neighbors.
- If you compare long-term costs of proposed Corps dredging project to installing sewer system, you could put sewers up and down the coast.

3. Existing Sources of Pollution (Septic Tanks, Landfill, Agriculture, Recreational Activities, Golf Course, and Forestry).

- No county wide sewer system: reliance is on septic systems and this is not good judgement as fairly unregulated and seldom updated and cannot maintain themselves.
- Inadequate septic system is being compounded by inadequate flushing.
- No mechanisms for monitoring septic system failures.
- Run-off is going into the river (storm-water, golf courses and fertilizers, agric run-off: run-off-ditches-estuaries-river-inlet-ocean).
- Septic system could be and probably would be a future problem due to high failure rate. Also, think there is a contribution of animal waste run-off since area is abundant with it.
- Concern from residents that moving to sewer districts will increase density (because sewer districts can handle an increased population).
- Septic systems and their propensity for failure once installed. Many under incorrect assumption that septic systems maintain themselves and this is not correct as one must clean out every so often. In addition, public not educated on what damages these systems such as dumping grease into them. Therefore, lack of education about this inherent hazard is not dealt with. In addition, only way to judge if septic system has failed is smell so of those reported how MANY go unreported.
- Run-off from agric and golf courses, Septic system areas: have high failure rates.
- In Holden Beach, septic tanks and wells are sometimes located on the same 50 ft. lot and nobody gets sick- has not seen any evidence that septic tanks are a major source of pollution in river.
- Poor permitting process of the septic system: when land won't perk, you put 2 feet of sand and really sign.
- Man-made waste in watershed. Overall, poor septic performance.
- Over run with fecal coliforms so focus problems on commercial areas, in particular the older sections of Varnamtown, Holden Beach, Sunset Harbor. In addition, cumulating effect of various sources (fecal coliforms, golf course run-off, shoaling of river).
- Poor septic systems may contribute to water quality and lack of shellfish and lack of recreational opportunities.
- Concerned about pollution in river watershed from addition of impervious surfaces, septic systems, and uncontrolled development.
- Density factor of septic systems and their possible failure.

- Not regulating point source polluters are at least making example of them (in the 70's, Brunswick Hospital was a major polluter but it was initially blamed on a hog farmer who went out-of-business as result of this backlash. Story not advertised.).
- County landfill backs up to branch that feeds into river.
- Older septic systems. Undetermined source of waste matter (animal, bird, or human).
- Cumulating effect of various sources (fecal coliforms, golf course run-off, shoaling of river) Over run with fecal coliforms so focus problems on commercial areas, in particular the older sections of Varnamtown, Holden Beach, Sunset Harbor Lack of flushing accounts for most, if not all of the down and up river problems. Believe tidal river moves bacteria up river and not down. Up river, water quality looks poor and is especially off color during the summer months. Dissolved oxygen content appears low and pH levels show the water is excessively acid.
- Concern with the numerous septic systems (suggest countywide septic system).

4. Aquatic Resources (Shellfish and Saltwater Fish, Freshwater Fish, & Other Aquatic Resources)

- Important to maintain aquatic resources.
- Closures of shellfish are more common now and last longer.
- Reduction in recreational shellfishing.
- Lacking quality and a quantity of shellfish nurseries.
- Lack of shellfish in the months with "R"s (September-December).
- Effect of problems in the Lockwoods Folly River watershed on traditional livelihoods.
- Concerned about oyster beds and their lack of ability to "cleanse" themselves properly. Typically these filter feeders can suck in infections and pass them through but if these shellfish are harvested during an infection, they could possibility transfer Hepatitis A, a fecal-oral disease.
- Shellfish beds are deteriorating: stay closed, water stinks (smells like sewage), and different algae are growing. Locations of beds are near Varnamtown, Sheep Island and lower watershed area.
- Source of food (shellfish) destroyed. Sand has destroyed most of the oyster gardens.
- Water quality (pollutants have hurt traditional forms of fishing/shellfishing. Coagula of sand/shell restricts natural flushing process (acts like a jetty and restrains the currents 4x/day...6 hours in, 6 hours out, twice a day) Fine material drains every year and builds up on shallow sound.
- Shellfish and saltwater fish are in serious decline. Shellfish due to contamination and sand covering the oyster beds.
- Think reduction of shellfish is partially resulting from improper commercial fishing practices, not fecal coliform and the resulting closures. Closures or no closures, the amount of shellfish

is still there, just not available to harvest. In addition, think that fisherman go in and salvage oysters during the oyster harvest months of Oct-Mar, and in the meanwhile, pull off clams and allow to waste (clams available year around). Need to take clams off top to get at oysters. In addition, the Cape Fear inlet drains dirty water and various particles from its inlet down to Holden Beach, just beyond west Holden Beach into Ocean Isle, then one starts to see their feet in water. Believe these particles suspend themselves over the oyster beds and are contributing to the quality issues regarding the oysters. Believe that these particles are the suspended materials that enter the Lockwoods Folly River watershed area and are in the slow moving water system. In addition, think fishers are disturbing the clamming areas themselves. Walking over this area allows for places for suspended materials to sink into and then suffocate beds.

- Over fishing is a problem-people since people are shellfishing with rakes and hoes.
- Shellfishing is one of the limited options for supporting people in Brunswick. It is a source of employment for a significant segment of the population. The lower portion of the mouth is the most productive shellfishing area- it is an important resource to the state and local people making a living.
- Fishing is not as good as in the past.
- People work hard in the river to make a living. For everybody's concern (tourism, fishing), there will be a negative impact if nothing is done about flushing. They are closing waters that provide living for lots of people.
- Quality of sea life (shellfish and fish) is less. Not as many fish as there used to be. Is seafood out of river safe to eat?
- Two miles in Davis Creek is most productive shellfish area, which is closed due to no flushing. No current there, no way to flush.
- Twenty years ago the state program re-seeded oysters in March, and by October they would be abundant. Now, you can hardly see any growth in oysters. Something is causing growth problems. Around here, even when the beds are open, oysters are not growing well. Cold temperatures help oysters grow- climate change may have had a big part in growth problems.
- Noticed in 96 that it rained frequently for 5-6 weeks, and the oysters grew well. Brunswick County has the best tasting oysters.
- Knows there are closures due to heavy rains.
- Want oystermen to thrive. Not sure if the only problem is water quality- is also over fishing.
- Local fisherman have lost livelihood since oyster beds are being destroyed

Freshwater Finfish:

- Freshwater finfish are in serious decline. Before 1930s, had a healthy run of river herring and stripped bass. Bass are small and scattered, bluegill, nearly non-existent, redbreast bream and

chain pickerel are in limited numbers only in the upper swamps. Pumpkinseed bream have apparently disappeared.

Other Aquatic Resources:

- Lack of aquatic resources indicates there are problems in the river. For example, water lilies that were once numerous are now seldom seen and in poor shape. Abundance in algae blooms which discolors the water and affects fish population as it depletes the oxygen.
- Not maintaining environs for the developing nurseries and other aquatic resources.

5. General Water Quality

- Lack of appropriate riparian buffers.
- Concerned about conferring Outstanding Resource Waters status on the river. If this happens, water-front properties will lose their value since only certain activities can occur so far from the waterfront.
- Developers need to take care of run-off to reduce impact to river. Water quality concerns regarding shellfish closures. Some folks have gone to drinking bottle water as they think the drinking water is tainted.
- Fearful that there is an accident waiting to happen like “pfiesteria”. Poor water quality.
- Cape Fear inlet drains dirty water and various particles from its inlet down to Holden Beach. Just beyond west Holden Beach into Ocean Isle, start to see feet in water. Believe these particles suspend themselves over the oyster beds and are contributing to the quality issues regarding the oysters. Believe that these particles are the suspended materials that enter the Lockwoods Folly River area and are in the slow moving water system.
- Cannot compare previous years water quality standards with now since accuracy of technology measurements has changed. Lack of information and awareness on what water quality issues are and the local problems.
- Fear that there is an accident, like pfiesteria waiting to happen. One river over, the Cape Fear is now experiencing fish kills. Will that happen to us down the road.
- Need to improve water quality in area.
- Water quality conditions are poor: more so in last 15 years.
- Polluted water does not have capability to clean itself Water is dirty and discolored.
- Building too many non-pervious surfaces.
- Concerns with development on the upper river and the potential for storm water run off.
- Concerned about pollution in river watershed from addition of impervious surfaces, septic systems, and uncontrolled development.
- Water quality (pollutants have hurt traditional forms of fishing/shellfishing). Economic viability (poor water quality has affects on local economy in areas of tourism and general welfare of residents).

- Beavers are backing up water on the upper feeder rivers (for example Clark's Branch). Cannot flush. Also, more non-previous surface in county like I-40 (lots of surface and storm water runoff from out-of-state and local traffic).
- Caution about comparing old data with new data. Older parameters and measuring instrument may not have captured the specifics that are being captured today. In any comparison must recognize that sampling technologies have changed. Use local observation and history to assist in determining relevancy of older info.
- Up river, water quality looks poor and is especially off color during the summer months. Dissolved oxygen content appears low and pH levels show the water is excessively acid. Throughout history of development on Brunswick County, we have been adding ditches and canals for various reasons. These additions are depositing nutrient rich water in to the Lockwoods Folly River.
- There is now more pressure on wetlands. Property owners feel like the land has been confiscated. He can't afford to pay taxes on land left in natural state. There will be a breaking point when they (local govt.) decide that they have to find other ways to raise money. He has to sell his land he inherited because of taxes.
- The river cannot stand so much growth and farming- it will die. If the river doesn't flush itself, it will die. It is a very important part of the region.
- Cumulative effects of basin causes pollution in basin and the golf courses, planned community on developments on the river banks.
- Wants better water quality.
- The standards that apply to Outstanding Resource Waters(ORW) are applies to Lockwoods Folly. However, areas that are classified as ORW are still being closed to shellfishing, so the safeguards of ORW may be inadequate to protect the areas. Example is Howe Creek, which is now biologically impaired and closed to shellfishing, regardless of its earlier classification as ORW. The one factor driving degradation in Howe Creek was impervious cover. The same things could apply to Lockwoods Folly.
- Watershed is in bad conditions- deteriorated to point where marsh areas/estuaries have pollution from creeks, farm run-off, and golf course runoff. Build up of sand and silt in estuaries, river, and marshes.
- Doesn't know if there is Pfiesteria in the area.
- Most people have wells in their communities. Concerned about the quality of well water since it is close to the river. Some residents are drinking bottled water.
- In 4.5 years of living on the river, in winter there is a lot of green algae- was not there upon arrival. In a drought, the water is relatively clear. After a rain, the watercolor is darker, cloudy.
- Lockwoods Folly is not ORW (pristine) but one level lower. Maybe because of this classification it gets more attention.

6. CORPS

Have you read any information on the LFRW provided by the Army Corps of Engineers? In addition, accurate is it?

- Yes: public meetings, permit basis, beach renourishment & protection, sea turtle habitat restoration, and other maintenance activities. Appears very accurate and objective but may not be complete.
- No. Even if numerical circulation study suggests that dredging the Eastern Channel would not improve river circulation, still think the Corps is pushing to dredge the Eastern Channel (see Morning Star article, 2/5/98 titled “Lockwood Inlet Plan Gains Powerful Ally”). Article suggests that plan to dredge is “a done-deal” and a dike will be built. Why is this “stakeholder” process being initiated if some members of the General Assembly have already determined what they are going to do? In addition, Head of Corps in DC is politically associated with locals in favor of dredging so believe this process is flawed and an agenda has been created and is being driven by these politically motivated forces. In fact, this “stakeholder” process is made to seem like public input has been received but in reality has not. As Rush Limbaugh says, “follow the trail of money”. Suspicious of this scoping process especially since the Corps has funded it. Process minimizes input. What will happen is errors will be noticed in the recent numerical modeling studies and then a new study with enough financial resources will get supported and then the new study will determine that the “river circulation” can be resolved by dredging the Eastern Channel.
- Corps should look into previous work they have accomplished such as at the Shallote inlet and the amount of land lost on Goat Island as a result of dredging channels. Corps makes changes but is not responsible for the negative outcomes.
- Corps is looking for more work so is creating these dredging projects to keep itself in existence. Further, when projects are being designed, Corps has a tendency to ignore the impacts their projects have on others. Also not equitable with other mitigating affects. For example, a timber company is donating Sheep Island to the Corps to offset impacts from another project they have in the area.
- Yes, numerical study .How accurate, in your opinion, is that information? Not accurate. Only took 2 days to draft and mock up does not include all the LFWR variables and parameters such as wind, water flow...ACE deceived locals with data since it was contrived in an effort to protect ACE in building the AIWW, and therefore mitigating the negative AIWW impacts on the area, for which the ACE would be deemed responsible.
- Yes. How accurate, in your opinion, is that information? Suspect. ACE denies that they are contributing to build up of sand in channel. Believe that sidecaster exacerbates the situation by depositing sand in mouth of Eastern Channel.
- Yes. Information packet. Old newspaper article. How accurate, in your opinion, is that information? “Iffy” ...government agency not always operating in the interest of the public the way the public wants to be

- Yes, the numerical studies. How accurate, in your opinion, is that information? Probably not accurate and somewhat misleading. Did not use local parameters. See page 7 of the 1992 Corps Numerical Study: hydrodynamic model validation is not a representative sample of the Lockwoods Folly River.
- Yes. 1992 Numerical study. How accurate, in your opinion, is that information? Not very. Did not use Lockwoods Folly River as the model. Public not like results. Besides, why continue to study? When will implementation begin? When will we resolve problems? We have studied this situation for a long time, for many years...In addition, CORPS denies that sidecaster is depositing sand in mouth of Eastern Channel so credibility shot.
- Yes, what they say in newspapers. How accurate, in your opinion, is that information? CORPS “alleged” that if open eastern channel, would have limited impact on water quality. Do not agree.
- Do not understand CORPS opportunity for efficiency and why not taking it. They give appearance of milking situation. Perhaps it is because “locals” are not aware of their processes and the pace they move in. Should educate public to all the hoops they go through. In addition, should be willing to look into local information and find opportunities to collaborate with local communities.
- Have you read any information on the Lockwoods Folly River watershed provided by the Army Corps of Engineers? No.
- No, and if something is available, would like to see it. How accurate, in your opinion, is that information? Would be concerned that any CORPS info is outdated since population has grown so in the area.
- Yes: 1992 Numerical Study .How accurate, in your opinion, is that information? Getting there. CORPS is a very reasonable agency. Issue has been going on for a long time. Why is CORPS holding back on resolving issue? Perhaps they don’t know how to resolve or they know how but cannot get funds to do so since issues seems very complex?
- Yes. How accurate, in your opinion, is that information? Fairly accurate: very helpful with information.
- Yes. How accurate, in your opinion, is that information? Fairly accurate.
- (About Corp’s background sheet). Statements regarding growth in Brunswick County may be misleading that majority of growth occurs in Lockwoods Folly Basin, but growth is not only there.
- The process is dragging it out more- more studies have been made.
- Corps sometimes does not align itself with physical evidence on beach or in river. There is a reluctance to accept responsibility for damage being done as result of construction of the AIWW. However, Corps recognizes a problem. May not be priority enough- has minor budget appropriations.
- There isn’t anybody as concerned about the Lockwoods Folly as the Wilmington Branch of the CORPS. But they are being pulled in many directions.
- The Corps are under the misconception about the good it does to maintain existing inlet from

the taxpayer's standpoint as opposed to doing a new, permanent inlet that would naturally flow. They need to take into account the sand hauling at Holden Beach, (a need that is caused by maintaining the Lockwoods Folly inlet) economically.

- The Corps said that a jetty would change the nature of the water. The Corps has their answers- these should be questioned them. Information from Corps is not accurate.
- They waste money dredging inlet over the years. They also waste money on research, when common sense tells you what is happening by the closings and local residents' experience. Research takes too long. Disagree with Corp's findings regarding dredging channel.
- Over the years the Corps has done projects that weren't beneficial
- Some of Corps information is very accurate. They do a lot of positive things but there are opportunities for political twist.
- In the past, the Corps has justified their existence by creating jobs. It is an institutional problem.

7. Boating: (Commercial and Recreational)

- Lack of stabilization with inlet for commercial and recreational fishermen. Only time inlet is stable is when it is dredge.
- Maintain inlet for reasonable passage for recreational and commercial interests
- Lack of navigation at low tide.
- Safety concerns for recreational events and vehicles with regards to the shallow, narrow and often treacherous inlet. Strong currents NOT safe for swimming. Breakers step up and are not safe for boats. Sailboats have no place to anchor within channel, cannot use inlet as they lack motorized power to navigate channel, and channel not deep enough. Blue Water Point Marina lacks docking spots since area surrounding Blue Water Marina is very shallow.
- Wants accessibility.
- A lot of boating activity results in props stirring up sediment, and pollution from discharging of sewage from boats. Increased boating traffic may cause water quality problems.
- Big boats cannot use the Lockwoods Folly inlet to get to the AIWW, but must go to Southport.

8. Recreation

- Important to maintain recreational resources and the wide open space, in particular the upper river areas.
- Reduction in recreational shellfishing.
- Holden Beach Erosion (affects local economy and tourism).
- Economic viability (poor water quality has affects on local economy in areas of tourism and general welfare of residents).
- Not adjusting impacts of development and tourism.

- Safety concerns for recreational events and vehicles with regards to the shallow, narrow and often treacherous inlet. Strong currents NOT safe for swimming. Breakers step up and are not safe for boats.

9. EROSION:

- Losing beachfront property (shore receded prior to AIWW). Blame CORPS for changing river current, which allowed lost of beachfront property.
- Dredging of eastern channel could create erosion lost on Long Beach Point and east end of Holden Beach.
- Eroded beaches.
- Fear that dredging Eastern Channel will create erosion problems for Long Beach Point.

10. Conservation and Preservation:

- Creating problems that our grand children will not be able to correct.
- No recycling program in Brunswick County (not considered economic viable!).
- Concern about losing the pristine area, the Galloway Flats.
- It is a pristine area that should be maintained.
- Important to protect it

11. Other Issues:

- Quality of life issue is declining in the watershed.
- Lack of political follow through: issue has been addressed by several congressional reps and governors throughout this century but we continue to deal with it. Was in Jonathan Howe's hands last and he dropped it. We continue to waste financial and labor resources, and identify problem but do not attempt to resolve it.
- Local apathy and cynicism: locals resent lack of political and federal follow through. Disillusioned with the democratic process.
- Experts deliver and distribute their solutions and it may not agree with what is believed and felt in the local area. Think there are barriers with this governing process that do not make experts aware of the local situations nor allow the experts to listen. Locals not treated as equals by experts and locals feel like they are waiting to be dictated to. Experts need to understand the local dynamics and the observations these locals can contribute to defining the problem.
- What experts should the county use? Their solutions and even identification of the problems do not agree. Get into "problem space" for determining "solution space".
- Concern about automatically implementing solutions regardless of impacts on others.
- Do something...been talking about this issue for a long time
- Currently looking into introducing a program to inoculate high-risk groups (immune system

compromised individuals and the older population that is increasing in numbers as a result of this large retirement community). Need to explore any potential hazards to public health.

- Concern that public participation process has not been conducted objectively since it wasn't advertised publicly. May be used this process as guise to portray good public relations.

APPENDIX D: Respondent's Recommendations for Improving Water Quality

Listing of comments is not meant to indicate how many people support certain actions. For example, even if many people may have mentioned a certain option for resolving an issue, that comment was only listed once. The listing represents the diversity of individual comments received.

Local Actions Taken To Improve Water Quality :

River Circulation:

- Passed resolution.
- A local group of concerned citizens was founded and acted for many years to restore flushing to area that would restore the area's shellfish and protect the livelihood of local people.
- Adopted resolutions (resolution in support of HR 1905).
- Write letters to CORPS and Congressional reps.
- Contacted state and local congressional reps.
- Meetings with CORPS.
- Responded to CORPS Scoping letter.

Growth/Development:

- Long Beach participates in coop ventures and planning.
- Discuss issues.
- Have on-site development sewer system. Can share knowledge about why we chose to have on-site system, and the benefits to having this system.
- Lobbying for countywide sewer system.
- Follows regulations and plans for low-density development. Does not disturb vegetation.
- Proactive stance on lack of access issues to Long Beach. Have supported the building of the second bridge to island.

Existing Sources of Nonpoint Source Pollution:

- They have sufficient buffers and setbacks to eliminate/prevent runoff. Are certified by Audubon Cooperative Sanctuary Program, which has a 5-step program for certification. They adhere to a higher standard of environmental stewardship. They use minimal and slow release chemicals, and tolerate imperfection.
- As a landowner, use septic tank that allows spillage to go into separate tract of land and not into stream.
- Keep livestock within fencing and out of stream.
- Have begun tracking septic systems such as failure rate, # of systems in county, etc.

- As an individual aware of what I can do to eliminate unnecessary waste on the area (recycle).
- Use biodegradable cleaners.
- Use appropriate boating paint.
- Considering having a written and posted list of regulations and rules and what to be aware of for the area.
- Also manage/educate marina to recycle fuels and oils and provide proper maintenance of pumps.

General Water Quality:

- Trying to acquire grants for improvement of water quality
- Actively seeking grant funds to establish riparian buffers in the Montgomery Sleuth to improve water quality (Eastern Channel)

Erosion:

- Advisor on local action group for beach renourishment.
- Stabilizing the end of the Point by planting sea oats.
- Resolution No. 98-07 (Resolution for the implementation of beach erosion control and hurricane wave protection project)

Education:

- Set an awareness level within fishing club about what polluting is such as not throwing things in the water
- Contribute to community projects and would like to start an educational project for the area
- Town posts safety concerns when possible such as “no swimming” areas.
- Have involved town in active Environmental Ed Program
- Contacted Corps for information.
- Spoke with scientists at UNC-W.
- Has tried to find information.

Recommendations to Improve Water Quality:

Recommendations to Resolve River Circulation:

- Buy out properties and re-cut inlet opened by Hazel, close the current inlet. Benefits of opening new inlet would be great. If somebody can show a better way, that is ok. Getting the river better is a priority.
- Dredging channel or building a jetty would help. Opening channel could bring in more seafood, provide better recreation.
- Block the inlet and re-create the old inlet. They won't know until they try it and run tests.
- Recognize that closing of Eastern Channel is natural. The Blue Water Point Marina acts as a hardened structure, diverts direction.
- Try opening mouth of river, first. Dredge this plug first.
- Opening up Eastern Channel seems like the way. There could be a better exchange at high and low tide.
- Reopen the Eastern Channel, build a jetty. Murrell's Inlet was jetted, now they don't see any problems. Are there any other choices? Public meetings are not helpful- just controversial.
- Believe that if the Eastern Channel is open, then the Davis Creek will flush itself. The Eastern Channel acts as a shut so that incoming tide cannot compete with the AIWW and the new inlet cut.
- Restrict waterflow passing through the north end of the present ocean access channel between the west end of Sheep Island and the northeast point of Holden Beach. About 25% of the present flow should pass through this area: the main force of the river water should be directed through the Old Eastern Navigation Channel. This is the only way to reduce the sand traveling around the west end of Sheep island where the rising tidal currents transfer the sand to the oysters in the Galloway Flats and other parts of the river. Ocean access should begin in the AIWW at east end of Sheep Island.
- Increase depth of the inlet. Added volume of water exchange with each tide would greatly improve inlet circulation and provide the necessary mixing of the stagnant water drawn from the marshes and rivers with fresh ocean water. In addition, expand the west channel and create an equally wide and deep channel on the eastern bank. This dual channel solution would allow increased flushing of marsh and channel water from both sides.
- AIWW meeting the eastern moving water (on ebb tide) may be preventing Lockwoods River from eroding NE tip of Holden Beach (but may be eroding the NW tip of Sheep Island). Put inlet at 90-degree angle so it shoots straight out. This would align sandbars and realign, widen and deepen channel. Current angle of inlet is favorable to NW Point of Long Beach (but if inlet 90-degreed align, probably would not be).
- Dredge Eastern Channel to deliver proper flushing to area and then this will assist in recapturing proper water quality.

- Dredging Eastern Channel may cause problems for Blue Water Point Marina. Since the inlet shifts, need to be sure of affects on whatever solution is proposed to correct LFRWQ problems.
- Monitor mouth of inlet to se direction of tidal movement and the shunting action.
- Closed down part of the artificial channel (dogleg).
- Solve flushing problem.
- We had one solution, the Hazel inlet but was filled in with landfill materials.
- Dredge only shoaling creeks and areas, and the mouth area of the river.
- Spread out the dead shells/sand that act like bulk heads over mud flats.
- Also could pipe a “flushing” system from the ocean side of Blue Water Point Marina and into the river to increase the saline factor.
- Understand that this river is a slow moving system as it covers a wide watershed over lot hydrologic soil, is a slow black water system (the tannic acid is a natural color occurrence of this black-water system) Do not think dredging Eastern Channel will blowout the 1954 Hazel inlet. Believe that BWMarina is higher than when Hazel blew it out in 1954 with all the fill-in items put in that deep inlet in 1958 (note: items used to fill in this inlet were done so prior to environ regs that now govern coast). However, the Point may need some beach replenishment.
- Study question: did Lockwoods Folly have flushing problem before AIWW?
- Open the inlet feeder on left side of Brown’s Landing. Seems the most direct route. Look into alternative route around Brown’s Landing.
- Discussion focuses on dredging the eastern channel but there is no focus on restoring the feeder rivers that the AIWW cut off.
- Study dynamics of dogleg. Is this possible source of a more direct outlet?
- Look at process of drainage in the area. Overall, appears to be a naturally slow process.
- Hindsight (should have left 1954 Hazel Inlet open).
- If it were possible to open the Hazel inlet, think this would create flow needed to flush. Since this may be unrealistic, so consider opening Feeder River on leftside of Brown’s landing. Believe issue with this solution is it runs through protected area of Galloway Flats.
- Improve Eastern Channel (major impact on erosion)
- Do what needs to be done to have a more direct flushing by the Atlantic Ocean and not so much the AIWW.
- Redirect flow from Feeder River into “dog leg”.
- Channel may have negative impact or effect, and if this is determined, it should be corrected.
- Study impacts of dredging prior to creating negative impacts for some residents and taxpayers as a whole.
- Open inlet like it use to be: may not be a cure all but should get flushing going.
- Recognize that closing of Eastern Channel is natural. The Blue Water Point Marina acts as a hardened structure, diverts direction.
- Increase Flushing? Thought is that it is not the main solution.

- There should be a mitigation plan established before a plan for the E. Channel is in place.
- Address the Merrit dredge- it needs to be maintained with consideration of the estuarine environment..

Recommendations to Resolve Growth/Development:

- Suggest countywide septic system.
- Government monitor development permitting process better since this reduces docking stations available for recreational vehicles.
- Monitor development.
- Use science to determine source of problems, then take next step to eliminate problems. County will help by bringing water and sewer to most new developments. There will be no septic systems at this development by 2000.
- Be aware of impacts from development.
- Look into stormwater run-off from development. A greater density area needs networks of drainage.
- Be proactive and not reactive: long-range plan.
- Conduct serious studies on impact of golf courses communities because of concentrated nutrient run-off and what process is used to divert. May be a link with closures and development. Also look into agric and modern farming which may be introducing new chemicals that might contribute to poor water quality.
- Look into other areas that developed to fast (Bald Head Island had no fish).
- Create pervious cover of 30-50 feet buffer unless an area is water-dependent.
- Create sanitary districts then spray tertiary over golf courses.
- Create a long-range plan for Brunswick County that addresses sustainable development. Any impacts from current development are exacerbated by lack of flushing.
- Have developers form run-off water management plan where run-off goes into swell system, then wetland, and then flows into sandy creek natural drain area.
- Look at every aspect and recognize that everyone has an attitude change that needs to occur to create plan for sustainable development.
- Look into stormwater run-off from development. A greater density area needs networks of drainage
- Require golf courses to be managed using proper golf “agronomic”.
- Require all developers to establish and maintain their own sewer system.
- Develop long-range planning regarding development and infrastructure that puts burden and consequences on individual that benefit from change landscape.
- Nation and state should recognize coastal areas’ importance as natural and economic resource.
- Monitor developments, marinas, agriculture, & farmers.
- Develop masterplan and put in infrastructure.

- Consider use of sediment ponds, restraining fences, and enforcing current regs regarding development.
- Move from septic system to countywide sewer districts.
- Zone for increased lot size to accommodate drain fields.
- Determine “carrying capacity” for development.
- Develop long range plans to look into “what if” scenarios and density implications.
- Recognize type of growth that is occurring (urban) and plan for it.
- Have developers deliver on-site sewer systems. Cost (burden) passed onto homeowner for right (benefit) to live near area.
- Look at every aspect and recognize that everyone has an attitude change that needs to occur to create plan for sustainable development.
- Sewer system on the beaches should be first step.

Recommendations to Resolve Existing Nonpoint Sources of Pollution:

- Need to develop a plan about improper discharge.
- Create buffers on Lockwoods Folly River watershed.
- Prevent future increases in pollution off the land
- Cut down on current sources by looking at land uses and looking at nonpoint sources.
- Require sewer treatment systems versus septic since septic can fail and sludge is not treated.
- Sewer treatment plant needed, stop runoff from golf communities.
- Minimize or eliminate man-made pollution.
- Government agencies need to be up front with public with their proposals and their findings, and look at big picture.
- Make sure there is no overflow of animal waste, bilges (from boats).
- Repair, update rotting older septic structures. Provide low-interests loans.
- Continue to allow timber companies to police themselves and those industries that are not complying with voluntary BMP’s.
- The whole county needs a sewer system.
- Need harsher penalties for violators.
- Need for golfers to put water quality first not fertilizing green grass.

Recommendations to Resolve General Water Quality:

- A preliminary aquifer sensitivity study was undertaken. A groundwater study was recommended (planning dept. asked commissioners to implement one).
- Look for opportunities to acquire buffers and wetlands with money that is available from Clean Water Trust Fund, try to restore natural hydrology. Work with landowners to re-establish trees.
- Create a formal monitoring system on how nutrients get into stream.

- State should make resources available for implementation of best management practices on basinwide basis if county is not in position to implement basinwide approach.
- Not versed enough in other activities in basin to suggest resolutions. Suggests bringing group together to look at river. They use Best Management Practices (BMP)s to prevent sedimentation and keep forestry practices in mind to reduce runoff.
- Should be standard to monitor water quality in the river.
- In past, worked with state agencies to get Lockwoods Folly designated as special status. (ORW standards).

Recommendations to Resolve Aquatic Resources:

- On shellfish closures: may not be able to prevent some closures that occur naturally as result of a hard rain/deluge of water but should maintain controls on land disturbances.
- Have fisherman alternate between fishing sites.
- Recognize that Cape Fear inlet drains dirty water and various particles from its inlet down to Holden Beach. Just beyond west Holden Beach into Ocean Isle, start to see feet in water. Believe these particles suspend themselves over the oyster beds and are killing them.

Recommendations to Resolve Issues with CORPS:

- Develop partnerships between affected parties to focus on sustainable development. Include extreme positions so these parties can workout a compromise with each other. Also, develop a partnership to reduce the “we-they” focus that may have developed throughout the history of the developing issues and one that reduces indifference and cynicism. Parties NEED to take time to participate.
- CORPS needs to let public know how they work, what time constraints they work with, why it takes so long to accomplish something, and why they have not addressed this situation.

Recommendations to Resolve Boating Issues:

- Education of all boaters about local safety issues (unclear how since contact points with boaters is typically only at the ramps. Also boaters not reading available info on nautical charts).
- Make inlet friendlier to recreational and small boaters, especially those users who have little local knowledge on how to maneuver this treacherous channel.

Recommendations to Resolve Recreational & Tourism Issues:

- Look at impacts of tourism and then how to educate folks about appropriate behavior to reduce their impact, if any. Encourage them to want to come back to the environs they left. Gear educational format through the property managers.

Recommendations to Resolve Erosion:

- Use dredging materials to replenish beaches.
- Manage sand resources (make sand available for Long Beach oceanfront, maintain beach for storm protection).
- Beach Nourishment Program at Holden Beach seems to help.
- Developers file copies of their erosion control plans with them.

Recommendations to Encourage Conservation and Preservation:

- Design educational program on what public can do to protect area.
- Recognize that the resource has to come first.
- Educate on overall ways to be environmentally sensitive.
- Look at other areas and how natural processes work and how we can clean up and what other processes are available.
- Nation and state should recognize coastal areas' importance as natural and economic resource.

Other Recommendations to Resolve Issues:

EDUCATION AND OUTREACH:

- Education vs. regulation (cannot enforce).
- Educate the public about the changes that have happened that causes pollution
- Develop a semi-formal coalition to disseminate info, correct misinformation, and look at how misinformation has created disagreements and led to poor decision-making.
- Educate public on proper septic systems and how to maintain them.
- Recognizing that there no easy way out from this complex problem.
- Get public involved and educate them so they can contribute to solutions.
- Deal with issues with a holistic approach (focus on big picture).
- Establish informational link between all the stakeholders so they can share information about their concerns and suggestions and then establish watershed priorities. Need an open and honest dialogue, not a staged event.
- Continue to meet all of the interests.

RESEARCH OPTIONS:

- Locate source of bacteria at the river mouth.
- Doesn't know how to approach study, approach will determine the results of study. New approach is needed with open minds.
- Experts should know (how the problems could be resolved).
- Ask question and look into answering question: do rights of one group outweigh another? Where is the financial impact the greatest?
- Do a water quality and flow study (NCSU) and consider the whole river on water quality issues.
- Review model parameters used in 1991, 1992, and 1994. Minor parameter adjustments can change results significantly. A separate localized study with accurate parameters may be necessary. Conduct a model study of area after on site data collected. Use local parameters not general ones to do a numerical study.
- Take water samples at the following locations: Gilbert Road, Midway Road, Hwy17 at Piney Grove and Supply, Hwy221 at Lockwoods Folly and Royal Oak bridges, Doe Creek at Stone Chimney Road, Mill Branch at Sunset Harbor Road, and selected down stream sites extending to Winding River Plantation.
- Answer question how long it takes upper river to move downstream. Appears that upper waters are at a holding pattern and are not or very slowly moving downstream
- Look at other areas that are experiencing or have experienced similar problems and see what they did. For example: Futch's Creek (Bald Head Island experiences flushing problems and simple solution was to open mouth of river. Also, look into Figure 8 Island).