

Involving Watershed Stakeholders: An Issue-Attribute Approach To Determine Willingness and Need

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Abstract

The development of effective solutions for addressing nonpoint source pollution on a watershed basis often involves watershed stakeholders. However, success in engaging stakeholders in collaborative decision-making processes varies, as watershed managers are faced with the challenges inherent to finding the right process for the decisions needed and in successfully engaging stakeholders in that process. Two characteristics that may provide guidance for determining the appropriateness of applying a collaborative process to a watershed problem are the need to collaborate and the willingness of stakeholders to engage in a collaborative decision-making process. By examining seven attributes of the issues confronted by stakeholders in a collaborative process, the consequences of these attributes on the need for collaboration and stakeholders' willingness to engage can be estimated. The issue attributes include: level of uncertainty, balance of information, risk, time horizon of effects, urgency of decision, distribution of effects, and clarity of problem. The issue attribute model was applied to two different collaborative decision-making processes conducted by the same watershed stakeholder group in a North Carolina coastal watershed. Need and willingness to engage did not coincide for either issue, i.e., stakeholders were more willing to engage on the issue that required less need for their involvement.

Key Words: water policy/regulation/decision making, environmental conflict resolution, water quality, collaborative decision-making, watershed management, watershed stakeholders

Introduction

In recent years, nonpoint source pollution has become a primary focus of water quality management. It is widely accepted that the most successful programs to manage runoff from various land uses are conducted at the watershed level. In a typical watershed there are diverse land uses that contribute to nonpoint source pollution, and their individual and cumulative contributions can have a negative influence on the quality of receiving waters.

Watershed management solutions can and should be developed with the participation of watershed stakeholders. This approach generates watershed solutions by obtaining local support from major stakeholder interests. We define a watershed stakeholder as anyone who can influence, or is influenced by, water quality in the watershed. Some typical watershed stakeholder interests include development, forestry, agriculture, local government, homeowners, and environmental conservation.

Many watershed managers and others report varying degrees of success in engaging stakeholders in collaborative decision-making (Chandler and Beasley, 1996; O'Keefe, 1996; Kenney, et. al., 2000; US EPA, 1997). Managers in the Santa Ynez watershed in California (US EPA, 1997)

found it difficult to bring stakeholders together to resolve a flood control issue, citing insufficient groundwork on the part of the process organizers. Adams and Gray (1996) document two watershed organizations established in the same Washington watershed, one succeeding and one struggling. They cite two procedural characteristics, establishment of ground rules and stakeholder composition as the primary reasons for the differences in success.

Watershed managers seeking to engage stakeholders in a process of developing solutions to water quality management issues are confronted with the challenge of getting appropriate people to the table to explore the issues and make recommendations for solutions. In some cases there might be a water quality crisis, such as large fish kills, or the threat of regulation that will inspire local citizens and officials to partake in such an endeavor. But in many other cases the need for a stakeholder group may be less pronounced and watershed managers face the challenge of getting people to commit time and resources to the task.

The use of collaborative processes to develop solutions for cleaning waters degraded by nonpoint source pollution requires extensive preparation to address inherent challenges that will be faced. One challenge is getting active citizen participation. For example, people may not be inclined to participate in a stakeholder process merely because a state agency has listed a nearby stream as impaired due to high sediment loads or fecal coliform counts. In cases where the impaired waterbody does not serve as a water source or support recreation, impairment may not directly impact citizens. Yet, the Clean Water Act requires that these waters meet minimum water quality standards. And addressing impairment resulting from diverse sources on pollution needs to be approached collaboratively at the watershed level.

Through an in-depth evaluation of a stakeholder group's efforts in a North Carolina watershed, this paper examines factors influencing stakeholder participation in managing nonpoint sources of pollution. This examination sheds light on the question of how to effectively involve representatives of all watershed interests in developing solutions to identified problems. We explore two specific issues - the *need for a collaborative decision-making process* and a stakeholder's *willingness to engage* in a collaborative process.

The Need for and Willingness to Engage in Collaborative Decision-Making

Collaborative problem solving or decision making involves convening a group of stakeholders with the purpose of resolving a problem by sharing their interests, mutually investigating the issue, and developing consensus-based solutions. Participation is voluntary, and a neutral facilitator often assists the group through the process. Cormick, et. al. (1996) describe a consensus process as "one in which all who have a stake in the outcome aim to reach agreement on actions and outcomes that resolve or advance issues related to environmental, social, and economic sustainability." They further indicate that in such processes, while participants may not agree with all aspects of the outcome, consensus is reached when they can all "live with" the total package.

The application of collaborative decision-making processes to environmental issues is well documented. The recent promotion of the "En Libra" principles developed by the Western Governor's Association (1999) highlights the rise in the use of such processes. Yosie and Herbst

(1998) note that the increased use of environmental stakeholder processes is reflective of a societal interest in more interactive forms of decision-making. Many collaborative efforts have been initiated to address various water issues such as flooding, water quality, and water quantity at the watershed level (Crowfoot and Wondellek, 1990).

Although collaborative approaches are becoming more widely used in environmental decision making, not all environmental problems are amenable to concerted stakeholder involvement. Heifetz and Sinder (1990) present a typology of policy situations based on the complexity of the issue. They characterize complex public policy situations – a category in which many nonpoint source water quality decisions belong – as situations where the problem is ill-defined, treatment of the problem is not readily apparent, and many people are potentially affected. Defining and solving complex public problems requires significant political and social learning processes where the various constituencies can sort out their interests, values, and potential tradeoffs.

The need for collaborative processes also has been defined using specific factors related to the issue and the people who have a stake in the outcome of a decision. In the mediation literature, Moore (1986) identifies several criteria that indicate whether an issue is “ripe for negotiation,” (i.e., collaboration). These criteria center on the characteristics of the parties involved in a dispute, and their relationship to the issue. Included in Moore’s criteria are such characteristics as the interdependency of the stakeholders in satisfying their respective interests, a shared motivation to negotiate and settle, and the ability of each party to identify and agree on the issues in dispute. Carlson (1999a) identifies ten criteria related to the characteristics of issues, stakeholders and decisions for use in evaluating whether to engage in a collaborative process. Included in Carlson’s criteria are clarity of the issue, duration of decision deadline, certainty of the decision outcome, level of trust and respect among the stakeholders, level of contention among the stakeholders, history of the issue, political support for resolution, key decision-makers willingness to use the process, and time and resources available to support collaboration.

Literature on willingness to engage in a collaborative problem-solving approach is often framed in terms of the parties’ alternatives to a negotiated outcome (Fisher and Ury, 1991; Susskind and Cruikshank, 1987). If parties see that their interests can be met better by collaboration than through some other alternative, then they will remain engaged. Carpenter (1999) cites factors of trust and amicability as reasons for stakeholders’ willingness to engage, stating that they are more likely to engage if they like or trust other stakeholders. However, little has been found regarding other factors that influence citizens to enter and remain engaged in a collaborative problem-solving process. Certainly, many of the factors that make a process amenable to a collaborative outcome also will influence a stakeholder’s decision to engage. For example, if stakeholders perceive that a decision is extremely urgent and that there is no time for collaboration, then one would expect their willingness to engage would be low. However, it is difficult to judge whether many of the other criteria that influence amenability to a collaborative process might also influence a stakeholder’s willingness to participate.

An Issue Attribute Approach

Another approach to evaluating an issue’s compatibility with a collaborative process and stakeholders’ willingness to engage is to examine the attributes of the issues confronted by

stakeholders in a collaborative process, and their consequences. Yoder, in her work on a contingency framework for decision-making, links decision-making model concepts with issue attributes and a classification of environmental problems to predict optimal approaches to decision-making (Yoder, 1999). She identifies seven attributes of issues derived from the contexts and consequences of the decisions needed and type of problems confronted. Although Yoder doesn't speak to the topics of need or willingness to engage, we found four attributes she described to be particularly useful in examining these dimensions of collaborative processes. In addition, we offer three other attributes based on experience working with the White Oak River Watershed Advisory Board (described later in this paper). The attributes described by Yoder are: (1) level of uncertainty; (2) balance of information; (3) risk; and (4) time horizon of effects. The three attributes that we have added for this analysis are: (1) urgency of the decision; (2) distribution of effect; and (3) clarity of problem.

This typology of decisions and outcomes is useful as a lens from which to view both need for and willingness to engage in collaborative decision-making. It removes the attributes of the stakeholders from the analysis, allowing an evaluation and prediction of the appropriateness of collaborative processes across issues but germane to a given group of stakeholders. In other words, it can provide a method of evaluating whether more than one issue might be amenable to a collaborative process among a constant group of stakeholders. Using our definition of watershed stakeholders as anyone who is affected by or can affect water quality in a watershed, then we can assume that watershed stakeholders will remain constant within a given watershed, barring entry or exit of specific individuals in the watershed.

In the following sections we offer hypotheses about how issue attributes affect the need for a collaborative process and stakeholders' willingness to engage in such a process. We then describe two issues facing the White Oak River Watershed Advisory Board – a watershed stakeholder group – and examine how attribute differences may have contributed to relative differences in willingness of the members to engage in deliberation of the issues. From a review of the literature and our own observations, we also examine differences in the need for stakeholders to engage in each of the two issues explored by this stakeholder group.

Issue Attributes

The seven issue attributes and their relationship to willingness and need to collaborate are described below and summarized in Table 1.

Table 1 – Issue attributes and Hypothesized Relationship to Need for Collaboration and Willingness of Stakeholders to Engage in a Collaborative Process.

Attributes and Direction of Relationship	Need for Collaboration	Willingness to Engage
1. Level of Uncertainty (low to high)	Need increases with uncertainty	Decreases with uncertainty
2. Balance of Information (symmetrical to asymmetrical)	Increases as asymmetry increases	Weak correlation
3. Risk (low – high)	Increases as perception of risk increases	Increases as perception of risk increases
4. Time horizon of Effects (short – long)	Weak correlation	Decreases as time horizon increases
5. Urgency of Decision (strong – weak)	Nonlinear correlation: low when urgency is very high or very low and high otherwise	Nonlinear correlation: low when urgency is very high or very low and high otherwise
6. Distribution of Effect (discrete – dispersed)	Increases with dispersion	Weak correlation
7. Clarity of Problem (unclear – clear)	decreases with clarity	Increases with clarity

Level of Uncertainty

Uncertainty implies that the relationship between variables in a given system, say water quality and land use, is probabilistic and exhibits a high degree of variance, or is unknown. The greater the amount of variance, or the greater the number of unknowns, the higher the level of uncertainty. We hypothesize that the level of uncertainty has a positive relationship with the need for collaborative processes. Heifetz and Sinder (1990) describe this relationship in their classification of policy situations in terms of what is known about the problem and its solution. They point out that complex public policy situations are characterized by uncertainty both in the definition of the problem and identification of solutions, and demand the work and responsibility of citizens. Hence, the need for collaboration rises with decision uncertainty.

While high uncertainty may drive the need for collaboration, stakeholders may be less willing to engage in collaborative decision processes as the level of uncertainty rises. Stakeholder assessments conducted prior to convening collaborative processes around complex water quality issues have revealed that the existence of scientific uncertainty leads some individuals to believe that they have little to contribute to the discussion, or lack confidence that a solution can be reached (M. L. Addor, C.A. Perrin, and L.S. Smutko, *Lockwoods Folly Watershed Public Participation Process Scoping Report*, NC State University, 1998; L.S. Smutko, M.L. Addor, and E.C. Poncelet, *Catawba River Basin Riparian Buffer Issue Assessment*, NC State University, 2000). With little confidence that a solution can be found, they were less willing to put forth the necessary effort to sort through the problem and identify solutions.

Balance of Information

The level of knowledge of the substantive issues, and the information that can be brought to the group by the participants can vary significantly among stakeholders. This attribute, also called information asymmetry, describes discrepancies between information accessible to and used by the various decision stakeholders, i.e., some people with a stake in the decision have greater understanding of the issue than others. We postulate that the balance of information among involved stakeholders affects the need for collaboration. In situations where the balance of information is asymmetrical, collaboration that fosters information sharing becomes more important. During a collaborative effort, stakeholders take time to engage in a joint search for information and achieve a common level of understanding. Daniels and Walker (2001) state clearly and persuasively that social learning is fundamental to good policy decisions, and that well designed collaborative processes are very good ways of achieving this objective.

While information balance affects the need for engagement, we hypothesize that it has little effect on willingness to participate. The assessments cited earlier revealed that stakeholders who are unfamiliar with collaborative processes generally do not value knowledge and information that others can bring to a process, particularly information held by “the other side”. If stakeholders perceive information held by others is biased, incomplete, or not valid, then are not likely to be motivated to participate. Stakeholder assessments conducted in North Carolina watersheds reveal a willingness to engage in a stakeholder process regardless of whether some stakeholders have more information or not (Addor, Perrin and Smutko, 1998 *ob cit.*; S.H. Klimek and C.A. Perrin, *Goose Creek Watershed Issue Assessment*, NC State University, 2000).

Risk

Risk, as defined here, is the likelihood that some adverse consequence will materialize from a policy decision. It differs from uncertainty in that people perceive some negative event or circumstance associated with the known or unknown relationship between causal variables. In the context of this paper, risk is interpreted as perceived risk versus actual risk. Individuals’ unique experience of risk and their perception of it influence their actions. If people believe that a particular issue is a threat to their livelihood, health or quality of life, their interest in the issue is heightened, and their desire to identify a solution is greater. Hence, we hypothesize that people are more willing to engage in a solution-oriented process that addresses an issue where perceived risk is high.

Similar to situations characterized by high levels of uncertainty as described by Heifetz and Sinder (1990), in cases of high perceived risk, the primary locus of decision making should rest with the citizens. The need for citizen input in policy decision-making becomes more important as the level of interest and concern increases – concern that is often driven by a perception of risk.

Time Horizon of Effects

The time horizon of effects is a measure of elapsed time from decision making to decision effect. Decisions have short- and long-term consequences that can be described as acute, chronic, and synergistic/cumulative (Lein, 1997). An acute decision consequence immediately materializes, while a chronic effect is one with an extended time horizon. Synergistic/cumulative effects may

not materialize until broader social, political, or environmental changes occur. We include in this definition the time that elapses between decision making and decision application. In some cases, administrative requirements and political dealing can add months or years to the time horizon.

We find no evidence of a relationship between time horizon of effect and the need for collaboration. Whether a decision has immediate or longer-term consequences has little bearing on the need for direct citizen involvement. With respect to willingness to engage, decisions that are seen to have immediate impact versus those that show results later are more conducive to collaborative efforts. People are more likely to associate their involvement and effort in a problem-solving process with identifiable results if the decision consequence is acute. In such cases the work tends to be more satisfying and meaningful. Whether participants in collaborative processes are as satisfied with immediate application of decisions versus immediate effect, is not clear however. A stakeholder assessment of a groundwater allocation issue in eastern North Carolina revealed that some respondents were willing to participate only if the regulatory agency planned to quickly execute the decisions reached through the collaborative process. It was generally accepted by all respondents that any effect that their decisions had on the conditions of the aquifer would not be realized for many years (L. S. Smutko, *Central Coastal Plain Capacity Use Area Negotiation – Issue Assessment*, NC State University, 2000).

Urgency of Decision

Urgency of decision refers to a measure of how quickly a decision must be made to resolve an issue. It is distinct from the time horizon of effects described previously, and is a determinant of the amount of time that can be given to a collaborative process. Urgency can be influenced by factors such as imminence of threat to the resource, political agendas, and administrative calendars. This attribute has a nonlinear relationship with both the need for and willingness to engage in a collaborative process. When the urgency of a decision is either very high or very low, we hypothesize that need for and willingness to engage in a collaborative process are both low.

When conditions are urgent and require a quick decision, a collaborative process may not be a good method for decision-making, and other processes may be more desirable. Collaborative processes require time, and the more complex the issue and the larger the stakeholder group, the more time is required. Having sufficient time to undertake a collaborative process is a criterion for success cited by many practitioners (Carlson, 2000b; Manring, et al. 1990; Susskind and Cruikshank, 1987). However, a stakeholder process that is not time limited has little promise of reaching closure, or parties can prematurely decide that sufficient work has been done (Manring, et al. 1990).

If not given the time that stakeholders consider to be sufficient for making effective decisions, some may refuse to participate, particularly those stakeholders with prior experience in collaborative processes who are able to judge appropriate time requirements. Exit interviews of participants engaged in stakeholder process to develop riparian buffer rules in a North Carolina watershed cited lack of time as the primary insufficiency of the collaborative process in which they were engaged. On the other hand, stakeholders may refuse to participate if they detect that

the process has no identified end point. Somewhere in between these extremes there is enough energy for need and willingness without sacrificing the effectiveness of the process.

Distribution of Effect

Distribution of effect is related to the number of people or organizations that are influenced by the outcome (or potential outcome) of the collaborative process, and the spatial distribution of that outcome. For example, the application of strict stormwater management techniques to one site that hosts an endangered species is discrete (or more localized) as opposed to the application of similar requirements for all projects in a large watershed. We hypothesize that the need for collaboration increases as the dispersion of effect increases. Using a social justice criterion (Dukes, 1996), as more people are affected by the outcome of a policy decision, processes that enable citizens to have input into the decision become more critical. Even though more people may be willing to collaborate given a greater distribution of effect, this characteristic may have no bearing on any single individual's willingness to engage in a collaborative process. We have found no evidence in the literature to support or refute this relationship.

Clarity of Problem

Clarity of the problem influences both need for and willingness to engage in a collaborative process. Problems that are easily understood and defined demand less of people than problems that are difficult to define and resolve. The easily understood problem requires less sorting out of values and interests and less of an investment in social and political learning is. Hence, the correlation between problem clarity and need for collaboration is negative.

On the other hand, as clarity of the issue increases, so does peoples' willingness to engage in a discussion about the solution to the problem. Potential stakeholders are more likely to believe they have something to contribute to a conversation about a problem, or offer a solution to resolve it.

The White Oak River Watershed Advisory Board

This section describes the stakeholder group that is the focus of this analysis, and the issues they examined.

Background of the White Oak River Watershed Advisory Board Collaborative Effort

In late 1996 the North Carolina Cooperative Extension Service initiated a project called Watershed Education for Communities and Local Officials (WECO). This was accomplished through a grant from the USDA Cooperative State Research, Education and Extension Service. WECO employs a science based, stakeholder-driven, consensus process to generate viable watershed management solutions. It has three main objectives: 1) delivering technical information and educational material on water quality issues; 2) improving decision-making by facilitating collaborative, policymaking partnerships at the watershed level between communities, local officials and state and federal agencies; and 3) empowering local stakeholders through the development of policy recommendations for the entire watershed to improve water quality.

The WECO approach was first applied in the White Oak River Watershed in coastal North Carolina. The White Oak River watershed encompasses 320 mi² area and contains portions of three counties--Jones, Onslow, and Carteret. The river itself is 48 miles long and begins in freshwater creeks and swamps of Jones County. The majority of the river is classified by the North Carolina Department of Environment and Natural Resources as SA, or saltwater suitable for commercial shellfish harvesting. The White Oak River watershed has six major land cover/land use classes with wetlands encompassing the largest single type (52%). Forests are the second largest land cover type constituting the majority of the headwaters in the Croatan National and Hoffman State Forests (22%). A very small portion of the watershed is urban (2%) and agricultural (11%) (NC DENR, 1997).

Based on local interest in and concern for the White Oak River as a resource, the WECO team convened a citizen stakeholder group called the White Oak River Watershed Advisory Board. Table 2 provides a description of the interests represented across the three counties that the watershed covers.

Table 2. Advisory Board Stakeholder Composition by County

Stakeholder Groups	Carteret	Jones	Onslow	At Large	Total
Fishing, Commercial	4				4
Fishing, Recreational			1		1
Real Estate or Development	1				1
Environment/ Conservation	1				1
Farming, Crop	1	1			2
Farming, Livestock			1		1
Forestry, Private			1		1
Business & Industry	1	2			3
Local Government	2	1			3
Academia/ Public Schools	2		2		4
NC Shellfish Sanitation				1	1
Soil & Water Cons.		1			1
Public Forestry				2	2
Totals	12	5	5	3	25

Once the group was convened, participants were facilitated through a process to help them identify issues in the watershed about which they were concerned, and to rank those issues for action. The highest priority issue was the planned expansion of a causeway that spans the mouth of the river. The issue identified next in priority was the increase in shellfish harvest restrictions resulting from fecal coliform contamination in the river.

Issues Explored by the White Oak River Watershed Advisory Board

1) Causeway Expansion

When the group was initially convened they were eager to discuss the expansion of a highway that crosses the mouth of the White Oak River at Swansboro, North Carolina. At the time, the

NC Department of Transportation (N.C. DOT) was proposing to expand the existing two-lane highway to four lanes, with construction starting within two years. The highway was originally built in the 1930's and part of the mouth of the river was filled in to create the causeway. Many Board members were concerned that construction of the causeway in the 1930s affected flow in the river resulting in a decline in water quality, and that the expansion would exacerbate the problem. The group met actively and often over the course of a year to understand the issue and develop a plan of action. Attendance and enthusiasm was very high during this effort.

The Board developed specific management recommendations to address their concerns about the expansion of the causeway and its influence on water movement in the river. The management recommendations were presented to all three counties' commission boards in the watershed. This resulted in a cooperative, multi-county policy resolution supporting the Advisory Board's recommendations. This local support provided the appropriate justification for relevant state and federal agencies to take action to address the Board's concerns (White and Danielson, 1999). Ultimately, N.C. DOT redesigned the stormwater management systems in the vicinity of the causeway to treat stormwater and direct it to the downstream side of the causeway where there is greater dilution from tidal flushing. In addition, the Board was able to work with the Army Corps of Engineers and their congressional representative to authorize language in the 1999 Water Resources Development Act to conduct a hydrologic flow study.

2) Increasing Shellfish Closures

Once their goals related to the causeway issue were accomplished, the Board set their sights on their next issue of concern – the fact that bacterial concentrations in the river were increasing and causing the state's Division of Environmental Health to close the waters to shellfish harvesting. Despite the low level of urbanization in the watershed, the North Carolina Division of Water Quality's basinwide management plan notes an increase in shellfish closures in the river (NC DENR, 1997). This trend is continuing as evidenced by further closures that were made in 1999 (NC DEH, 1999). The Board spent over a year exploring the activities that contribute to coastal bacterial contamination, state agency actions being taken to address those activities, and types of best management practices that are effective at preventing runoff and treating bacteria in runoff. Once the Board completed this phase of exploring the issue, a document summarizing their findings was prepared. The findings document identified seven potential sources of bacteria to the river. These were urban stormwater runoff, on-site wastewater (or septic systems), point sources, agricultural land use, forest land use, livestock production and wildlife. The stakeholders were asked to prioritize these potential pollution sources in the order of importance for their action. Urban stormwater runoff was the overwhelming choice of the members for their attention.

The group was presented with a list of tools available to them to address urban stormwater issues in the watershed. These included local policy initiatives, educational activities and specific projects to reduce existing sources of runoff. The group decided to pursue educational activities and projects. With the support of project staff, a slide presentation for homeowners was developed to highlight actions individuals can take to reduce stormwater runoff from their property. This presentation has been delivered to local community groups, homeowner associations and garden clubs. In addition, again with the help of project staff, a grant to implement stormwater best management practices in two specific areas of the watershed was

awarded. Attendance was fair to low throughout this effort although numerous actions were taken to encourage attendance (for example, phone calls to remind participants about upcoming meetings).

Differences between the Two Efforts

The effort to identify solutions to the problems posed by the planned causeway sparked a great deal of interest and effort among the Advisory Board. The group was willing to work with the county governments in the area as well as their congressional representative to gain support of their recommendations. There was a sense of urgency about the issue in that they had a brief window of opportunity to get their comments to N.C. DOT for consideration.

Although the shellfish closure issue was identified as being the second priority facing Advisory Board members, attendance at Advisory Board meetings was not as consistently high as when the group was discussing the causeway issue. Members indicated that they considered the issue to be important, yet a number of people resigned from the Board during this time. And even though more shellfish beds were closed to harvesting while they were deliberating the issue, they never expressed a clear sense of urgency about it. Moreover, the stakeholders were reluctant to address local policies related to urban stormwater management and opted to undertake the easier (yet important) avenues of public education and mitigation/restoration projects.

Representation of the Issue Attributes

We observed a significant difference in the Advisory Board's focus and willingness to engage between the causeway and shellfish closure issues. Willingness to engage, as measured by attendance and participation in stakeholder meetings, dropped sharply from the causeway issue to the shellfish closure issue. We applied the issue attributes model to this problem to try to understand differences in stakeholders' willingness to engage in the two issues. Using stakeholder feedback provided through formal process evaluations, conversations with stakeholders, and comments made by stakeholders during the project scoping phase, we identify how the attributes are represented for each issue and draw conclusions about willingness to engage in collaboration. We also compare the willingness to engage measures with what the literature says about the need for engagement (including our own observations) to explore whether there were differentials between need and willingness to engage on the same issue. In other words, we were interested in learning whether there might be a low willingness to engage in an issue where the need to collaborate was relatively high, or if the reverse applied. The representation of each attribute for the two issues is summarized in Table 3.

Table 3. Relationship between Issue attributes, Issues, and Need For and Willingness to Engage in a Collaborative Process

Issue attributes, Direction of Relationship and Correlation with Need and Willingness	Representation of Attribute for Each Issue		Need (N) for Collaboration and Willingness (W) to Engage	
	Causeway	Shellfish	Causeway	Shellfish
1) Level of Uncertainty (low, moderate, high) (Need +; Willingness -)	Moderate level of uncertainty	High level of uncertainty	N = moderate W = moderate	N = high W = low
2) Balance of Information (symmetrical, asymmetrical) (Need +; Willingness ~)	Balance of information was symmetrical	Balance of information was asymmetrical	N = low W = no effect	N = high W = no effect
3) Perceived Risk (low, moderate, high) (Need +; Willingness +)	Perceived risk was moderate	Perceived risk was low	N = moderate W = moderate	N = low W = low
4) Time horizon of Effects (short, moderate, long) (Need ~; Willingness -)	Short time horizon	Long time horizon	N = no effect W = high	N = no effect W = low
5) Urgency of Decision (strong, moderate, weak) (Need +; Willingness +)	Strong – decision was urgent	Weak – decision was not urgent	N = high W = high	N = low W = low
6) Distribution of Effect (discrete, dispersed) (Need +; Willingness ~)	Distribution of effect was discrete to moderately dispersed	Distribution of effect was dispersed	N = moderate W = no effect	N = high W = no effect
7) Clarity of Problem (unclear, clear) (Need -; Willingness +)	Problem was clear	Problem was unclear	N = low W = high	N = high W = low

+ = positive correlation; - = negative correlation; ~ = weak correlation or no effect

Level of Uncertainty

Many on the Advisory Board believed that the expansion of the causeway would exacerbate water quality problems at the mouth of the river. Primarily, they were concerned that the expansion would alter tidal flows and increase stormwater inputs into the river. With assistance from project staff, they reviewed scientific and historic literature on river hydrology and heard presentations from a variety of experts. Based on this information, the Board was able to conclude that hydraulic alterations attributable to the construction of the causeway had altered the river's physical processes – circulation patterns, sediment movement, and salinity regimes – resulting in a negative impact on fish populations, shellfish habitat, and water quality in the estuary and river. Following considerable review and discussion of various mitigation strategies, the Board developed a set of recommendations for their local elected officials.

Shellfish closures posed a more vexing problem for the Advisory Board. Again, the Board embarked on a collaborative learning process. They reviewed scientific literature, heard presentations from experts, toured the watershed and shared their own experiences and local knowledge. They identified seven potential problem sources in the watershed, but were unable to identify any single source as the primary bacterial agent. Uncertainty about the particular pollution sources that were causing excessive bacterial counts in the river made it difficult for them to recommend specific mitigation measures and pollution prevention policies.

Balance of Information

Although information symmetry or asymmetry has little effect on stakeholders' willingness to participate, it greatly informs the need for collaboration. The balance of information was markedly different between the two issues. Information about the hydrologic and ecological impacts of the causeway and its planned expansion was not easily accessible to the general public. The level of understanding about cause and effect was relatively low and was uniform among the participants (symmetrical). Although many believed that the causeway was in some way responsible for a decline in water quality, none of the White Oak River Advisory Board members came to the table sufficiently informed to share their knowledge, understanding and experience within the group. Information transfer essentially flowed one way, from project scientists to watershed stakeholders. Mutual education and information sharing among the stakeholders was not critical to a better understanding of this issue.

In contrast with the causeway issue, knowledge about localized water quality issues, shellfish habitat, and shellfish closures varied greatly among the White Oak stakeholders. For example, the local environmental health official had very detailed knowledge about wastewater treatment plant operations and discharges. The commercial fishermen had observed changes in shellfish habitat and water quality over many years and knew of specific locations in the watershed where changes were most pronounced. Stakeholders provided and shared important local knowledge about water quality and stormwater impacts up and down the river. Information flow was multi-way. Local information was shared between stakeholders and was integrated with other data provided by state and university scientists to gain a better understanding of water quality. Although in the end, the amount and quality of the data were insufficient to reduce uncertainty about the sources of bacterial infestation, collaborative learning played an important role in stakeholders' understanding of this issue.

Perceived Risk

Perceptions of risk among the stakeholders varied somewhat between the two issues. During the scoping phase of the project, when the Advisory Board began to prioritize water quality issues upon which to focus their efforts, it was clear that citizens were highly concerned about the causeway expansion. An important element shaping risk perceptions is the level of control individuals have over decisions that affect them (Hance, et al. 1990). Initially, stakeholders were doubtful that N.C. DOT would consider their needs before moving forward with the causeway expansion, and that the consequences of the transportation department's actions would be negative. Perceived risk was not high enough, however, to drive stakeholders to take other, more drastic measures – civil protest or court action – and force N.C. DOT to curtail their plans. Hence, we identified the level of perceived risk to be moderate on this issue.

We identified the perceived risk of shellfish closures to stakeholders in the White Oak watershed to be low. Although shellfish closures are an indicator of declining water quality, the river was still in relatively good shape with no alarming signs of deterioration such as fish kills. Closure of shellfish beds had occurred intermittently over many years, and although the number of closures was increasing, the trend was gradual enough to not cause general alarm. Although during the project scoping phase the stakeholders ranked this issue as a high priority, none had expressed a strong sentiment that could be interpreted as a high perceived risk with respect to this issue.

Time Horizon of Effects

The Advisory Board felt that if they could develop recommendations on methods to reduce the hydrological and ecological impacts of the causeway expansion, those recommendations could be put into effect immediately upon construction. Design changes and mitigation strategies would affect the amount and extent of stormwater discharges to the river and immediately reduce the impacts of the expansion. Hence, the time frame from recommendation, to action, to effect was quite short.

In addressing the shellfish closure issue, the Advisory Board investigated a number of policy options and mitigation actions that could potentially reduce bacterial counts in the estuary. The options available to them were long-term solutions that would take substantial time and effort to implement. For some options, public education for example, the ultimate impacts on the shellfish resource were potentially years away.

Urgency of Decision

At the time the White Oak Board was convened N.C. DOT was in the process of finalizing plans for expansion of the causeway. The window of opportunity in which the Advisory Board could affect the causeway expansion was rapidly closing. There was a heightened sense of urgency about formalizing a set of recommendation to provide to N.C. DOT to change the design of the project. In contrast, there was no time limit or other condition such as a state-ordered mandate that was driving the shellfish issue. The Advisory Board felt no pressure to move quickly toward a set of recommendations. Although this afforded them the luxury to thoroughly investigate the issue, many Board members felt that the group was taking far too long in getting from problem definition to problem resolution. A mid-process evaluation revealed frustration on the part of some group members that they were not as action-oriented as they had been.

Distribution of Effect

In the case of the causeway expansion, recommendations to change the design of the project resulted in effects that were spatially limited to the mouth of the river where the causeway crossed it. Benefits from protecting water quality and aquatic habitat would be most concentrated at the mouth of the river, and enjoyed by those who interact the resource at this location.

In contrast, recommendations to reduce bacterial pollution would not only potentially impact residents along the river, but would affect a much larger area of the watershed. Options to control stormwater runoff from urban, agricultural and forestry activities would involve many people up and down the watershed. The effects on water quality would also be wide-ranging, from tributaries to the mouth of the river.

Clarity of Problem

To White Oak River watershed stakeholders, expanding the causeway was a specific, easily understood issue. Investigation of the issue yielded the identification of potential impacts that were specific and easily understood: the new structure would increase freshwater inputs to the estuary and have deleterious on water quality. A clear understanding of the problem enabled the

group to focus on specific recommendations for improvement. Their actions were deliberate and decisive.

On the face of it, bacterial pollution in the estuary seemed to be a clear-cut issue, but further investigation by the Advisory Board found that the problem was far more complex. People knew that closures were increasing but did not clearly understand the cause. Questions arose over the contribution of bacterial inputs from point and nonpoint sources, various types of land uses, and upstream and downstream impacts. Little was known about the relative contribution of fecal coliform bacteria from the various sources. Unable to clearly grasp the root of the problem, the group was unable to find a solution that would “fix” the problem. This required significantly more work on their part to build incremental, adaptive solutions that would yield uncertain outcomes.

Need for Collaboration and Willingness to Engage on Issues in the White Oak River Watershed

The representation of the seven issue attributes with respect to the causeway and shellfish issues provides a vehicle for us to evaluate stakeholders’ willingness and need to engage in a collaborative process on each issue. Table 3 summarizes the issue attributes, their respective representation in the causeway and shellfish issues, and the effect of the attributes on willingness and need to engage.

For the causeway issue, five attributes that characterize this issue translated into a moderate or high willingness to engage. In a relatively short time the Advisory Board was able to reduce the level of uncertainty surrounding the impacts of the causeway expansion project and take action to reduce those impacts. A clearly defined problem, a sense of urgency, a moderate level of perceived risk, and a foreseeable and tangible result provided the motivation to work together over a 12-month period and seek solutions to the potential problems associated with the construction project.

By contrast, five out of seven of the attributes translated into a low willingness to engage in the shellfish issue. The fact-finding and analysis phase of the shellfish closure issue spanned 14 months and did not lead to a clear understanding of the sources and causes of high bacteria counts. Scientific uncertainty surrounding a highly complex problem, together with unspecified deadlines, low perceived risk, and a long-term time horizon of effect, we believe, contributed to a decrease in interest among Board members and a drop-off in attendance to Board meetings and functions.

Although the willingness to engage in the shellfish closure issue tended to decline over time, the need for stakeholders to stay involved and develop a collaborative solution remained high. The need for collaboration increases with uncertainty. Developing solutions to complex problems characterized by scientific uncertainty, information asymmetry, and dispersed and widespread impacts requires solutions that are heuristic, adaptive and collaborative. Excluding the attributes with no effect, representation of four of six attributes point to a high need for collaboration on the shellfish issue. Conversely, three attributes of the causeway issue indicate low need, two indicate a moderate need and only one indicates a high need for collaboration. This leads us to

believe that while collaboration on this issue was useful, it may not have been absolutely necessary to arrive at a balanced and effective solution.

Conclusions

It is interesting to note that in the case of the shellfish issue, the need for collaboration was generally high while the willingness to engage in it was generally low. We believe that this condition is reflective of what watershed managers face as they work to address impacts from nonpoint source pollution in specific watersheds. This is especially applicable to situations where the motivation is protection of existing water quality as opposed to cleaning up already degraded waters. In the former case the sense of urgency is usually low. Collaboration will be important to generate viable solutions, but getting the right people to participate will be a challenge.

This analysis has not evaluated the relative influence exerted by each of the seven attributes, but it is important to note that they may or may not carry the same weight in their effect on willingness and need. For example, attributes such as time horizon of effects and urgency of decision probably have a stronger bearing on whether or not people will be willing to engage in a collaborative effort. Additional research on this subject might involve ranking these attributes according to their influence on need and willingness, and determining how that affects outcome.

It is important for watershed managers to understand the dynamics of the issues involved in order to determine if it will be possible to engage in an effective collaborative process. If conditions do not appear conducive to such a process, but it is believed that collaboration among stakeholders is necessary for the development of viable watershed solutions, methods to influence factors that increase stakeholders' willingness to engage should be considered. For example, it might be important to enhance the understanding of perceived risk in the community or the extent of the uncertainty with respect to the issue in order to get people to actively engage in a process. This might mean that an educational effort to communicate the need for proactive watershed management is necessary before proceeding with a collaborative effort.

The results of this examination also provide an argument for matching the problem with the process. Clearly not all issues will be conducive to a collaborative process as defined in this paper. Before convening a collaborative process, conducting an issue assessment that looks at the issue attributes presented in this paper and their effect on need for and willingness to engage in such a process will help watershed managers make more informed decisions about how they should proceed.

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