Planning for Water:
Statewide Approaches to Watershed Planning and Management

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Abstract

The Clean Water Act (CWA) Amendments of 1987 and subsequent programs of the Environmental Protection Agency have led to a greater emphasis on controlling nonpoint source pollution. Many states have responded with creative programs to implement watershed management strategies. This paper examines the watershed management approaches of North Carolina, Massachusetts, and Oregon. Each of these states represents a distinct response to the policy directive of the CWA and other federal legislation. Through the use of formalized coordination mechanisms, open planning processes, and creative implementation strategies, states can use watershed planning and management to resolve complex water resources issues through a holistic and integrated approach to environmental management. Although evaluation of these programs in achieving long term water quality and habitat enhancements cannot yet be conducted, initial evidence suggests that coordination across jurisdictions and agencies and cooperation among various stakeholders are essential elements of successful watershed planning and management program design.

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Chapter 1: Introduction

> *Society does not have the will to ensure that good land use planning will protect key features of the watershed… If we do not take a very different approach in protecting our streams, they will continue to be victims of our growth dependent socio-economic system… it is the healthy watershed that is the true indicator of a sustainable future and a high quality of life.*
>
> *Otto Langer, cited in Lavigne and Gates, 2000: 205-206*

Langer's assessment of approaches to water quality management is rather dire; but he does offer a hint of hope. The hope lies in the words "take a very different approach." This paper describes that different approach: watershed planning and management. The application of watershed planning and management is becoming increasingly widespread, as policy makers recognize the importance of a "healthy watershed." The underlying goal of watershed planning and management is to achieve water quality that not only meets an established set of standards in surface waters, but also yields a healthy ecosystem overall. It is an effort to balance seemingly conflicting socio-economic goals and environmental goals within the ecosystem context. Ideally, a watershed management framework allows future development to accommodate population growth while minimizing negative impacts of land use activities on surface waters and other environmental assets. This paper explores watershed planning and management as an approach to environmental management that can resolve complex water quality issues, particularly nonpoint source pollution in surface waters.

Regulatory Context

In the United States, water quality became an acute federal concern in the 1940s and 1950s. The side effects of economic development and industrialization along with substantial population growth led to a significant decline in surface water quality in the 19th and 20th centuries. Initially, the federal government assisted states with implementing existing pollution control programs that had been enacted as early as the 1880s. The federal position outlined in the Water Pollution Control Act of 1948 and updated with the Federal Water Pollution Control Act of 1956 essentially encouraged states to continue existing programs, create new ones, and seek federal grant funding for assistance. The Water Quality Act of 1965 shifted water quality management to the federal level and required that states establish water quality standards as stringent as federal ones and develop programs and plans to achieve those standards. The Federal

Water Pollution Control Act of 1972, often referred to as the Clean Water Act, solidified federal control of the nation's water quality by shifting to a regulatory framework (Moreau, 1994).

Initially, the Environmental Protection Agency (EPA), the federal agency charged with implementing the Clean Water Act, strove to meet water quality goals by targeting distinct point source effluent such as industrial discharges or municipal wastewater. Using a regulatory regime often referred to as command and control (John, 1994), the EPA placed tight restrictions and a permitting process on a variety of dischargers. This focus on point sources greatly reduced the threat of dangerous pollution entering streams and rivers. However, diffuse or nonpoint source pollution remained largely unchecked (Brady, 1996; Freeman, 2000) even though Section 208 of the Clean Water Act required that states prepare statewide programs for nonpoint source pollution control (Moreau, 1994). While the fresh waters of the United States are in much better condition than they were several decades ago, much work remains to be done. According to a nation wide report on water quality, approximately 40% of monitored streams and rivers, 45% of lakes and 50% of estuaries are impaired based on one or more of their designated uses (US EPA Office of Water, 2000).

Due partly to the successes of EPA efforts to control point sources, the major cause of stream impairments has shifted significantly to nonpoint source pollution related to land use and development. Viessman and Welty (1985: 13) noted in the early1980s, "The scale of the nonpoint problem is of such magnitude,… further progress in cleaning up watercourses in the United States seems unlikely unless a major effort in controlling diffuse sources is mounted." The federal government recognized this problem and established clearer guidelines for the control of nonpoint source pollution in the Clean Water Act updates of 1982 and 1987 (Moreau, 1994). Nonetheless, nearly two decades after Viessman and Welty's foreshadowing, nonpoint source pollution accounts for nearly three-quarters of all impairments. For rivers, streams, and lakes, agricultural uses were the cause of more than 40% of the assessed impairments while urban runoff, forestry activities, and habitat alterations accounted for more than 30% of assessed impairments (US EPA Office of Water, 2000).

The Clean Water Act Amendments of 1987 recognized the importance of responding to nonpoint source pollution problems by requiring states to develop nonpoint source pollution control programs specifying best management practices for responsible parties (Freeman, 2000: 205). Implementation of the State Nonpoint Source Management Program proved to be impeded

by inadequate funding, monitoring, and enforcement measures. Thus, in 1992, the EPA "Office of Policy, Planning, and Evaluation suggested that EPA…move toward a *watershed protection approach:* one that tailors [nonpoint source] pollution control strategies to fit conditions in particular watersheds and gives state and local governments flexibility" (Ortolano, 1997: 256-257). Beyond standard engineering controls, states could use outreach and education efforts, land use planning, and interagency and interjurisdictional coordination to achieve nonpoint source pollution reductions. The office also encouraged the involvement of "environmental groups and industries within a watershed" in the planning and implementation process (Ortolano, 1997: 256). This approach led to an expansion of ecosystem management into the water quality management arena.

Ecosystem Management

The concept of ecosystem based understandings of the natural environment can be traced back to the 1930s and British ecologist Arthur Tansley (Cortner and Moote, 1999). Interestingly, the Water Quality Act Amendments of 1965 called for water quality management to be related to hydrologic functions of river systems; however, that effort was supplanted by technology based standards forwarded by the 1972 amendments (Viessman and Welty, 1985). As the limitations of regulatory efforts in dealing with nonpoint source pollution become clearer, many agencies are refocusing resources toward the ecosystem approach and watershed management. Randolph (2003: 4-1) offers one of the most comprehensive definitions of ecosystem management:

> Ecosystem Management is an integrative, interdisciplinary, adaptive, and collaborative approach to policymaking, planning, and management, grounded in the best scientific information available, recognizing uncertainties, and the understanding that human activity and ecosystems are inextricably linked. The goal of ecosystem management is to sustain and/or restore ecosystem integrity and biological diversity at all spatial and temporal scales through scientific understanding and collaborative decision-making.

Ecosystem management is thus grounded in science and fashioned through political processes. As Cortner and Moote (1999: x) point out, "science alone—more science, better science, heeded science" is not enough. In their view, political and social changes are equally necessary components of ecosystem management.

Ecosystem management marks a significant paradigm shift in natural resources management (Cortner and Moote: 1999). The natural system is recognized as a complex, ever changing, interrelated system in which scientific information is dynamic and theory and practice

are intertwined. Cortner and Moote (1999: 38) further suggest that planning within the ecosystem framework can be chaotic and imaginative, providing significant opportunities for stakeholder participation in the decision making process to allow for context-specific place-based management. Thus, the ecosystem approach allows managers, planners, and communities to work together to solve complex environmental problems. This approach is contrasted against traditional rational comprehensive approaches to natural resources planning and management that emphasize the role of scientific theory, resource extraction for economic gains, and rigid top-down decision making authority (Cortner and Moote, 1999).

The major challenge of nonpoint source pollution is that diffuse actors are causing environmental damage. Many scientists agree that certain land use practices degrade surface water quality and hydrologic functions. The relative concentration of various land uses near surface waters or within an entire watershed can serve as indicators for surface water quality. Essentially, high concentrations of forests indicate good water quality, whereas high levels of agricultural use or urban development (often measured by impervious surfaces) lead to degradation of surface waters. Yet, within most watersheds land ownership is highly dispersed and tracing nonpoint source pollution to particular sites is both technically and politically problematic. Thus, approaching environmental protection from an ecosystem perspective and integrating communities and governments on a regional scale are seen as essential strategies for resolving nonpoint source pollution problems (Arnold and Gibbons, 1996; Lamy, et al., 2002; Lavigne and Gates, 2000; Michaels, 1999; Moreau, 1994; Schueler and Holland, 2000a; Viessmann, 1998; Wang, 2001; Wickham, et al., 2000).

Organization of the Paper

Watershed management is an offshoot of ecosystem management that identifies the planning area as the land from which waters drain into the specified waterway or water body. Watershed management, like ecosystem management "utiliz[es] a multidisciplinary approach that considers the actions of a greater number of individuals and groups … offer[ing] an alternative to the traditional command and control mechanism of water pollution enforcement" (Anderson, 1999: 341). Because watershed boundaries do not match political boundaries, approaching watershed planning and management on a regional scale is often necessary.

Localities also engage in watershed planning on a very small scale, but without a broader regional focus, local water systems will be impacted by neighboring jurisdictions.

Within the watershed framework, open planning processes, coordination mechanisms, and creative implementation strategies are essential elements of the policy and plan development process. A combination of scientific data and local knowledge inform the planning process. Scientific data collection builds a foundation for planning and is supplemented by stakeholder involvement and collaborative planning processes. Coordination mechanisms are created to ensure public participation and stakeholder involvement, interagency coordination, and interjurisdictional cooperation. Implementation strategies are varied and often involve multiple layers of education, regulation, funding, and voluntary action.

These foundational principles are outlined in Chapter 2 through a review of academic and professional literature on the subject of watershed planning and management. A review of existing plans and policies supplements the scholarly and professional literature. Table 1.1 provides examples of these three literatures (academic, professional, and planning and policy documents). While the scholarly and professional literature provides insightful interpretations of the principles and practice of watershed management, the cutting edge of this area can be found in applications of watershed principles in existing and emerging water quality protection programs. Many regional policies have been developed in the last few decades that guide communities, states, and even the nation toward a watershed based management process. Numerous localities have attempted to integrate watershed management principles into their local planning efforts. Watershed management concepts are continuously evolving based on the insights gained through planning practice. This paper explores this "literature of practice" through analysis of statewide plans to gather insights into how planners integrate watershed planning and management principles into the environmental planning process.

The focus of this project is on statewide watershed programs. Statewide watershed initiatives have the political advantage of being developed and enacted within the jurisdiction of the state government. As envisioned by the EPA Office of Policy, Planning, and Evaluation, statewide programs guide watershed planning and management activities of local governments. Not every state designs a watershed program that relies on top-down approaches to planning and management. On the contrary, some states encourage grassroots community planning as the core of their watershed program while others choose to blend top-down and bottom-up approaches to

planning and management. Invariably, local governments within the state are encouraged to cooperate with state agencies and with each other to achieve watershed water quality goals. This type of regional planning does ignore ecosystem management principles to some degree for watersheds that cross state borders by using state boundaries instead of geologic watershed boundaries to outline planning areas. Nonetheless, statewide initiatives have become increasingly widespread as states have attempted to respond to the policy directive of the Clean Water Act.

Table 1.1: Literature Consulted

Information Source	Examples	Analytical Use
Academic Literature: Environmental Policy & Planning (especially concerning water quality)	Randolph, Cortner & Moote, Moreau, Ortolano, Ostrom, Portney & Stavins, Wondolleck and Yaffee	Identification of historical and current approaches to environmental planning and policy
Academic and Professional Literature: Watershed Planning and Management	Ballweber, Brady, Center for Watershed Protection, EPA, Heathcote, Novotny, Viessman	Identification of key themes and principles of watershed planning and management
Statewide policies, plans, and program websites	North Carolina Basinwide Plans and website, Massachusetts Watershed Initiative Website and Watershed Team Plans, Oregon Plan for Salmon and Watersheds, Oregon Plan updates	Exploring the linkages between watershed planning and management principles and applications in state policies and plans

The state watershed programs of North Carolina, Massachusetts, and Oregon are analyzed in Chapter 3. Each of these states represents a distinct approach to statewide watershed planning and management programs. In the case of North Carolina, a top-down planning approach with minimal public involvement, a lack of formalized coordination, and a reliance on voluntary action characterize the planning and management approach. Massachusetts, on the other hand, responds to the policy directive by transferring authority to locally based Watershed Teams to coordinate among various agencies and local governments as well as engage stakeholders in collaborative planning processes. Locally developed plans emphasize funding, education, and voluntary action for implementation. Finally, Oregon represents the most integrated and holistic approach to the three states. The policy directives of the Clean Water Act *and* the Endangered Species Act guide the Oregon approach and ensure a thorough response.

Integrated scientific information, broad communication and collaboration inform the planning process. Watershed Councils, interagency agreements, and intergovernmental accords ensure coordination at all levels of government and among agencies and stakeholders. Implementation builds upon the regulatory structure while relying heavily on funding, education, and voluntary action. Both Oregon and Massachusetts seem to be inducing broad based action and public awareness across their states. Although analysis of outcomes at this stage is limited given the long term time horizon inherent in watershed planning and management strategies, *initial evidence suggests that coordination mechanisms and open planning processes are essential links between high level policy directives and implementation of particular strategies on the ground.*

Chapter 4 summarizes the insights gained through the analysis of the statewide plans and policies and the theoretical literature. Watershed planning and management programs emerge from the Clean Water Act (CWA) policy directive and other related environmental policy directives such as the Safe Drinking Water Act and the Endangered Species Act. The policy directives of the CWA, however, are flexible and allow states to develop approaches to planning, coordination, and implementation that are grounded in their unique contexts. The academic and professional literatures suggest that effective watershed planning and management requires open planning processes and coordination mechanisms that ensure interagency coordination, interjurisdictional cooperation, and stakeholder involvement. Implementation strategies that build on regulation while emphasizing education, funding, and encouraging voluntary action result from these processes and lead to adaptive responses to complex water resources issues that impact myriad users, landowners, and citizens. The three statewide programs presented in this paper demonstrate how these principles can be integrated into distinct program designs for developing and implementing a watershed planning and management agenda. In some statewide watershed programs, the planning approach, coordination mechanisms, and implementation strategies suggested in the literature are thoroughly borne out in the state policies and plans. However, in others, certain planning processes or implementation strategies are emphasized over other options and coordination mechanisms may be limited or pervasive. These discrepancies are further summarized in Chapter 4.

Purpose of the Paper

This paper provides a general overview of statewide watershed planning and management principles. While this overview may be a useful reference guide, many of the lessons for how to integrate watershed principles into planning processes come from practical experience. The three case studies for this paper represent distinct approaches to watershed planning and management. Planners can draw lessons from these cases to gain insights into how their community or region might wish to approach developing watershed planning and management programs.

Ideally, this paper will serve as a reference tool for planners who wish to integrate watershed management principles into their land use planning programs and policies. Standard prescriptions for water quality management are a good place to start pollution mitigation in many cases. However, no two watersheds are the same in either a physical biological sense or in a political sense. As Cortner and Moote (1999: 49) observe:

> …there is no formula or set of prescriptions for adopting an ecosystem approach. The site-specific characteristics of ground-level management are seen as critical elements that respect variations in biophysical, social, and economic characteristics of different geographic areas (Cortner and Moote, 1999: 49).

In order to achieve water quality goals within unique local or regional contexts, planning processes, coordination mechanisms, and implementation strategies must be tailored to the particular conditions that define that locality or region. Assessing watershed conditions includes gathering data on the physical and biological status of the watershed along with developing an understanding of the political, social, cultural, and economic realities of the people who live, work, and play within the watershed. Each of these factors is accounted for in an integrated and holistic watershed planning and management process. The following chapters develop a theoretical framework and explore practical experiences to assist planners in defining watershed planning and management for their own localities and regions.

Chapter 2: Watershed Planning & Management Principles

The foundational principle of ecosystem management is that resources should be managed on an ecologically based unit rather than within specified political jurisdictions. Ecosystem management can be practiced at a variety of scales, from backyard habitats to an entire continent (Randolph, 2003: 4-1). As a result, some ecosystem boundaries fall within only one political jurisdiction. However, often ecosystems extend beyond political boundaries and require some level of cooperation among various governments for effective management. Given that water is central to all life and that land use activities directly affect water quality, many scientists and policy makers suggest that basing ecosystem management on watershed units is an effective way to integrate ecosystem concepts into the land use planning process to achieve environmental protection goals (Heathcote, 1998; Novotny and Krenkel, 1980; Lamy, et al., 2002; Schueler and Holland, 2000a; Viessmann, 1996 and 1998; Wang, 2001). Lavigne and Gates (2000: 203) observe that "Like the veins and arteries connecting the life-giving functions of the heart to the human body, rivers comprise the ecological infrastructure of the continents." Thus, watershed systems are ecologically valuable and planning for watersheds in a holistic manner can help ensure greater water quality protection across ecosystems.

This chapter provides a definition of watersheds as geologic units for planning and then outlines the essential characteristics of watershed planning and management programs. Watershed planning and management has emerged largely in response to the policy directive of the Clean Water Act since the 1987 amendments and the 1992 EPA assessment of state programs (Ortolano, 1997). The ambitious goals outlined by the EPA require creative approaches to water quality management. Implementation strategies do not emerge directly from the policy directive. Instead, local communities and states are empowered to identify localized problems and solutions through the watershed planning and management process (Ortolano, 1997).

The planning and management process does not mesh with the standard approach to governing. Watersheds cross jurisdictional boundaries and are impacted by various agencies and numerous members of the public. Thus, the watershed planning and management paradigm runs counter to the traditional separations of authority and responsibility inherent in the American federalist system of government (Bickers and Williams, 2001). Agencies can no longer work in isolation. Governments can no longer ignore what their neighbors are doing. Stakeholders must be brought into the process to help identify problems, garner support, and ensure successful

implementation of solutions. Open planning processes and formalized coordination mechanisms are needed to ensure this level of cooperation and coordination. Once geologic units are chosen for planning and management, a formalized political and planning process are initiated to handle the complexities inherent in the watershed planning paradigm. From these coordination mechanisms and planning processes, implementation strategies will be identified and can be put into practice by the participants in the planning and management process.

Defining Watersheds

The Massachusetts Watershed Initiative (MA EOEA, n.d.) defines a watershed as "a geographic area of land in which all surface and ground water flows downhill to a common point, such as a river, stream, pond, lake, wetland, or estuary." While each watershed does not always consist of a homogenous ecosystem, the fact that all of the waters that drain into a certain water body can be identified and that land and water relationships are so intricately tied makes the watershed a convenient and integrative unit for planning and management. The term watershed is often applied to a variety of geographic areas as in the Chesapeake Bay Watershed or the Stroubles Creek Watershed. However, there are multiple layers or "nests" to drainage systems. These "nests" are generally categorized along a spectrum ranging from the basin level down to the catchment level with various categories in between including sub-basins, watersheds, and sub-watersheds. See the Appendix for a more detailed description of watershed units. This paper uses the term "watershed" quite loosely, applying it to both regional and local planning efforts. However, when appropriate for clarification, the various watershed "nests" are specified.

Holistic, Integrated Approach

Watershed planning and management takes a holistic and integrated approach to problem identification and resolution. Watershed based planning attempts to balance social, political, and economic objectives with environmental goals within the chosen geographic unit (Brady, 1996; Randolph 2003). These components are not viewed as independent parts of a whole. Instead, the interrelationships of social, political, economic, biological, and physical components of the watershed must be understood within a framework of synthesis (Cortner and Moote, 1999). Natural processes within ecosystems are interconnected through complex linkages. The focus is

on processes and interrelationships within ecosystem boundaries instead of a "classical" approach that breaks the world down into independent parts (Cortner and Moote, 1999). Thus, watershed planning and management emphasizes using an integrated and holistic framework as opposed to responses that separate out component parts of the watershed system.

Given the complex interrelationships within a watershed, the management paradigm is equally multifaceted. Viessman (1996: 2) identifies myriad issues that must be considered within the context of an integrated approach to watershed management:

> Issues of concern include: providing the forums; reshaping planning processes; coordinating land and water resources management; recognizing water source and water quality linkages; establishing protocols for integrated watershed management; addressing institutional challenges; protecting and restoring natural systems; reformulating existing projects; capturing society's views; articulating risk; educating and communicating; uniting technology and public policy; forming partnerships; and emphasizing preventive measures.

This list of concerns provides a structure for guiding the watershed management process. Not only do planners consider standard technical questions, but they also consider how to design and facilitate a reformulated planning process, ensure coordination of management strategies, create forums for collaboration and cooperation among various interests, collaborate with the public and other agencies in policy development, and combine efforts of good science and public policy within a given political context. Imbedded in this framework are several concepts that serve as organizing themes in this section: planning processes, coordination mechanisms, and implementation strategies.

Planning Processes

The planning process in watershed management, not unlike other emergent planning practices, consists of a combination of rational, communicative, collaborative, and adaptive planning modes. The rational model of planning, still imbedded in current practice, has been significantly altered by adaptive management and communicative planning practice (Healey, 1997; Woltjer, 2000). Watershed planning involves a process of information gathering, goal setting, and plan development that is characteristic of comprehensive land use planning practice but focuses on achieving ecosystem goals within a watershed framework. Central to the planning process is an initial assessment of the watershed conditions (Heathcote, 1998). This assessment involves gathering scientific information on water resources in the watershed (rational planning) as well as local knowledge from community members on water resources, social and economic

conditions, and goals of the community (communicative planning). Once this assessment is completed, continuous monitoring requires that planning incorporates changing conditions (adaptive planning). This process is quite complex and involves multiple actors in the plan development.

Randolph (2003) contends that rational planning took hold in planning practice in the 1940s and is still integrated in planning processes today. In describing rational planning, Woltjer (2000: 18) notes: "Characteristics of rational planning include a comprehensive view on reality and decision making, a mechanistic view on control, and an ambition towards technical, scientific logic." Planning in this context is meant to focus on ways to accomplish specific goals by determining which alternative among many is the one that will achieve the best results. This perspective situates the planner in the realm of technical expert who upon gathering all the requisite knowledge will determine the best solution for "society."

While the watershed planner builds a strong scientific foundation before moving forward, the scientific information characteristic of rational planning is tempered by a communicative approach to planning. Public participation began to become more integrated in the planning process in the 1970s, an era that marks the emergence of planning as a communicative process (Randolph, 2003). Public involvement generally achieved the goal of educating citizens and garnering support, but the public also began to guide the process to some degree. In the 1990s, the communicative approach evolved to include collaboration where stakeholders and other interests worked together at the decision making table (Randolph, 2003).

Forester (1989: 107) notes that, "In planning practice, fact and feeling, reason and emotion are often tightly intertwined." This recognition is central to communicative and collaborative planning. He suggests that planning practice should be communicative and argumentative; technical experts cannot solve problems in isolation. Instead, problem solving expands on technical knowledge and information

> by pooling expertise and nonprofessional contributions too; not just for formal procedure, but also by informal consultation and involvement; not predominantly by strict reliance on data bases, but also by careful use of trusted resources, contacts, and friends; not mainly through formally rational management procedures, but through internal and external politics and the development of a working consensus; not by solving an engineering equation, but by complementing technical performance with political sophistication, support-building, liaison work—all this, organizing—and, finally, intuition and luck. Only in the most isolated or most routine cases will future-oriented planning problems be resolved by a technical planner acting alone (Forester, 1989: 152).

Here, Forester emphasizes the complementarities between rational planning and communicative planning. The integration of sound scientific information, collaboration among stakeholders, communication to and participation of a broader public in a holistic planning process is characteristic of watershed planning. Randolph (2003: 2-1) sees this approach as the emergent planning paradigm fueled by the information revolution and an innovative integration of policy, science, and collaboration.

In the context of this open planning process, an underlying expectation is that the planning process will be inherently adaptive and follow a series of planning stages (see the Appendix for a review of stages in the planning process). Conditions within an ecosystem related to social, political, economic, and environmental circumstances are ever changing. Ecosystem management requires "staggering" amounts of information; definitive understandings of complex interrelationships are rare (Cortner and Moote, 1999: 44). Adaptive management allows decision makers to initiate management strategies even when faced with uncertainty (Cortner and Moote, 1999). Monitoring and continuous assessment can identify emerging problems, successful interventions, or ineffective solutions. Watershed management, thus, depends upon adaptive and dynamic planning processes to ensure that changing conditions are integrated into goals, objectives, and strategies. As Heathcote (1998: 12-13) notes:

> … the planning process is dynamic and continuous. Several tasks or steps may be under way simultaneously. Planning direction may change radically if new information comes to light, if political forces change dramatically, or if community consensus is redirected for other reasons. Above all, integrated watershed planning and management must be responsive and adaptive to changing conditions. This means that a good watershed plan is not a single product, such as a document that sits on an agency bookshelf. Instead, it is a framework for continued dialogue about water and the watershed. … Most of all, the watershed management plan must reflect the current societal consensus about the value of water as a resource, about responsibilities and social attitudes, and about the community's vision of an ideal watershed state. Integrated watershed management is, therefore, a journey, not a destination.

Coordination Mechanisms

In order to support a continuous and integrated planning process, coordination mechanisms are essential. Coordination mechanisms can consist of formal agreements, advisory committees, memorandums of understanding, designated coordinating councils or teams, or any other formalized structure that leads to interagency coordination, interjurisdictional cooperation, and stakeholder collaboration. Institutions such as councils or committees can guide the planning and decision-making processes while ensuring that multiple points of view and knowledge types

are integrated into resulting strategies. Because water quality at any particular point on a waterway depends upon the actions of people upstream in the watershed or basin, interjurisdictional cooperation is crucial. Moreover, within various levels of government, interagency participation in the plan development and implementation allows all of the departments that can affect water quality conditions to add their resources to the process. As Grigg (1998) notes, both horizontal and vertical intergovernmental coordination is necessary for successful water management. Finally, defining the management units on ecological terms instead of within political boundaries necessitates "coordination among local landowners and between private landowners and natural resource management agencies" (Cortner and Moote, 1999: 44). Citizens, interest groups, and stakeholders are included in the planning process to ensure that multiple voices are heard and widespread support for implementation can be gained.

Randolph (2003) lists participants of watershed planning and management at various scales. Table 2.2 is adapted from Randolph's work and provides a framework for understanding how certain mechanisms may be appropriate at some levels of management but not at others. Watershed management requires varying mechanisms for ensuring interjurisdictional cooperation, interagency coordination, and stakeholder involvement and public participation depending upon the watershed scale used for management activities. Nearly every level of watershed management requires interjurisdictional cooperation in order to develop effective strategies. Agencies within jurisdictions and across multiple levels of government can enhance efficiency and effectiveness of watershed protection efforts by coordinating their activities. Only at the sub-watershed and catchment levels are agencies not mentioned. However, even at these levels, local agencies can coordinate to ensure that conflicts are minimized and watershed goals underlie agency activities (Schueler and Holland, 2000a). Finally, stakeholders and interest groups are involved in every level of watershed planning and management throughout the process. In many cases, stakeholders are included on advisory committees or task forces. On local levels, they may participate in watershed associations or community groups. Ideally, they will be involved in the decision making process and be vested in the implementation of plans and policies related to the watershed. Types of coordination mechanisms designed to achieve the interjurisdictional cooperation, interagency coordination, and stakeholder involvement and public participation are discussed in more detail in the appendix.

Table 2.1: Multiple Levels in Watershed Management

(Adapted from Randolph, 2003: 4-23)

Scale	Participants	Roles and Actions	Examples
Region (subnational)	• Federal agencies and committees	• Federal commitment to watershed approach • Interagency agreements • Funding, technical support	• Federal Unified Policy • Regional Teams
Basin (multi-state)	• Federal agencies • Advisory group • Stakeholders and interest groups	• Multi-state commitment • Basin Plan • State/federal financial support	• River Basin Commissions • Great Lakes Comm. • Chesapeake Bay Agreement
Sub-basin (state)	• State agencies • Advisory committee • Task forces • Stakeholders, interest groups	• State statute or administrative directive for watershed mgmt • State-wide plan/regulations • Technical and financial assistance for WS programs	• Oregon Plan for Salmon and Watersheds • Massachusetts Watershed Initiative • NC Basinwide Planning Program
Watershed (sub-state)	• Regional planning agency • Advisory committee • Stakeholders, interest groups	• Interjurisdictional agreements and plans • Guidance, technical, financial support	• Cuyahoga River, OH • San Miguel River, CO
Sub-watershed (local)	• Watershed Association • Local watershed coordinator	• Land use controls • Restoration • Local planning • (limited success without financial & tech support)	• Anacostia Watershed, MD • Matapole River, CA • East Fork, Little River, VA
Catchment (site)	• Watershed Association, Local coordinator • Community groups, landowners, developers	• Stream monitoring & restoration • Site development measures • Land stewardship	• Haskell Slough,WA

Implementation Strategies

Coordination mechanisms and open planning processes guide communities from policy directives to implementation. Through the planning process and within the structure of coordination action among agencies, governments, and stakeholders, participants can begin to identify the strategies needed to achieve goals and objectives outlined in watershed plans. Implementation strategies can consist of tools such as regulation, taxes, and subsidies; programs for education, outreach, and grant funding; or may involve supporting voluntary action by removing policy barriers or assisting citizen groups in their efforts to restore and protect watersheds.

Planners can play a critical role in achieving these myriad goals that depend upon linkages between land and water. Novotny and Krenkel (1980: 15) identify five planning tools for water quality management: zoning control, critical area protection, environmental impact review, property acquisition, and taxation and charges. The Center for Watershed Protection (CWP) identifies a more detailed set of eight major tools that can be implemented to achieve multiple environmental goals within a watershed management framework: watershed land use planning, land conservation, aquatic buffers, better site design, erosion and sediment control, stormwater best management practices, control of non-stormwater discharges, and watershed stewardship programs. The major omission to this list is taxation and charges; however, several of the broader categories may use tax or fee policies to encourage or discourage certain land uses. These eight tools can be adapted to address particular concerns of a watershed depending on what goals are identified within the context of watershed ecosystem conditions. Each tool is discussed in more detail in the appendix.

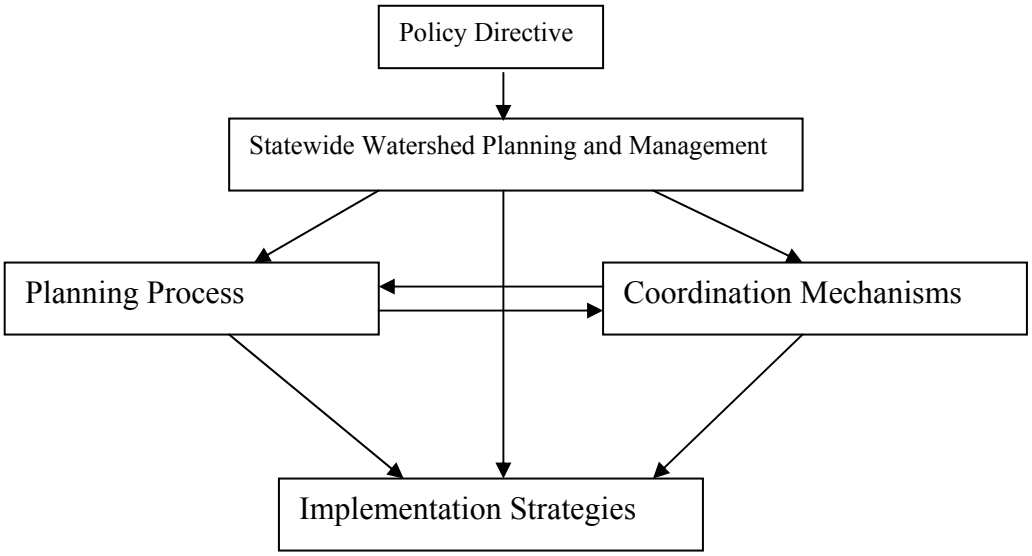
Essentially, the implementation strategies of a watershed planning and management program serve as inducements to change people's behavior relative to watershed systems. Regulatory responses, while characteristic of water resources policy since the 1970s, are often rather minimal in watershed based programs that highlight nonpoint source pollution mitigation. Education and outreach to inform the public of watershed conditions and possible voluntary actions for mitigation tend to be quite prevalent. Moreover, many funding opportunities have been implemented including grant programs for best management practices for farms, forestry, or urban stormwater management. These types of strategies will be explored further through the case studies.

Summary: Watershed Principles in Practice

Watershed planning and management is a complex process. Achieving a holistic and integrated approach involves gathering comprehensive data from multiple sources. Several factors influence how data are gathered and processed including coordination mechanisms that encourage intergovernmental cooperation, interagency coordination, and stakeholder and citizen collaboration as well as a planning process that builds a strong scientific foundation, communicates with the public, collaborates with stakeholders, and is adaptive to changing conditions. Initial assessment, continuous monitoring, information sharing, and a collaborative

decision-making process encourage creative implementation strategies. Clearly, myriad possibilities for how to develop a watershed planning and management program exist. The various possible process flows are depicted in Figure 2.1.

Figure 2.1: From Policy Directives to Implementation



Responding to the policy directive of the Clean Water Act or other related high level policies, many states have attempted to develop statewide watershed programs. As depicted in Figure 2.1, the state can guide planning, coordination, and implementation from the top. Alternatively, state leaders may choose to develop a coordination mechanism that guides the planning process from which implementation strategies emerge. Another option is for the state to determine both the planning process and the coordination mechanism, but allow the coordination body to guide the planning process and develop implementation strategies on their own. A further alternative is for the state to guide the planning process which leads to the emergence of a coordination mechanism. The coordination mechanism may then guide further planning and implementation. Thus, watershed planning and management can take shape in numerous ways at the state level. The examples described here are only a few of the ways that watershed planning and management programs move from high-level policy directives to local implementation.

Building on the foundational principles of watershed planning and management, planners have significant latitude in choosing how to approach planning for water quality in watersheds. In most jurisdictions, land use planning powers have been delegated to localities, either municipalities and/or county level governments. Such a fragmented approach to planning can

undermine efforts to plan within watershed or ecosystem units. Statewide watershed initiatives can break down barriers to successful watershed management through coordination of agencies, local governments, and stakeholders in formalized structures and engaging the public and stakeholders in an open planning process. The next chapter analyzes three statewide watershed planning and management approaches to illustrate how these foundational principles can influence planning and management program design and implementation.

Chapter 3: Statewide Watershed Initiatives

All layers of government interact to form policies and implement laws (Bickers and Williams, 2001). In the watershed context, this governmental interaction is necessary given that water crosses political boundaries. The US EPA has recognized this fact and has worked to promote the watershed concept from the federal level (Brady, 1996). Many states have responded by developing statewide watershed planning and management programs. Statewide initiatives are an effort to plan in a watershed framework within state boundaries. North Carolina, Massachusetts, Oregon, Washington, Minnesota, and many other states have enacted watershed planning and management policies. These statewide policies and plans have varied structures, requirements, and incentives to ensure that localities, industries, farmers, and other citizens will engage in watershed planning and management in local planning jurisdictions. Some of these variations are discussed in more detail in this chapter through an analysis of the statewide initiatives of North Carolina, Massachusetts, and Oregon.

These three states represent distinct approaches in the context of statewide watershed planning initiatives. The North Carolina Basinwide Planning program develops plans through mostly rational planning processes with minimal public involvement. For nonpoint source pollution problems, the basin plans present scientific information and potential strategies for mitigation while relying on local governments to voluntarily adopt goals, objectives, and strategies for implementation. This model uses state level resources to develop scientifically based plans and depends on local governments to act on the information provided in the plan; however, formalized coordination mechanisms are absent from the approach. The Massachusetts example emphasizes communicative and collaborative planning efforts across the state. The initiative establishes Watershed Teams to carry out the work of bringing local communities together to engage in watershed based planning efforts. This model represents a highly fragmented effort with the long-term focus on creating plans that will be implemented on the local level using locally determined implementation strategies. Finally, Oregon represents the most holistic and integrated watershed planning approach among the three states in this analysis. The Oregon planning process integrates scientific information, public participation, and collaborative stakeholder involvement to develop the original plan and subsequent updates. The Oregon approach depends upon the coordination of local, state, and federal governments and

agencies and significant stakeholder involvement through locally based Watershed Councils. Oregon further relies on a variety of implementation strategies to achieve water quality and habitat goals.

North Carolina River Basin Planning

North Carolina began developing regulations for water quality relatively early compared to other states. In 1951, the state enacted a comprehensive pollution control program designed to protect water quality throughout the state. By 1962, the state had classified 81% of the state's waters and had approved 256 projects for industrial and sewage wastewater treatment (Moreau, 1994). As with many of the early state programs, this effort targeted mostly point sources of pollution.

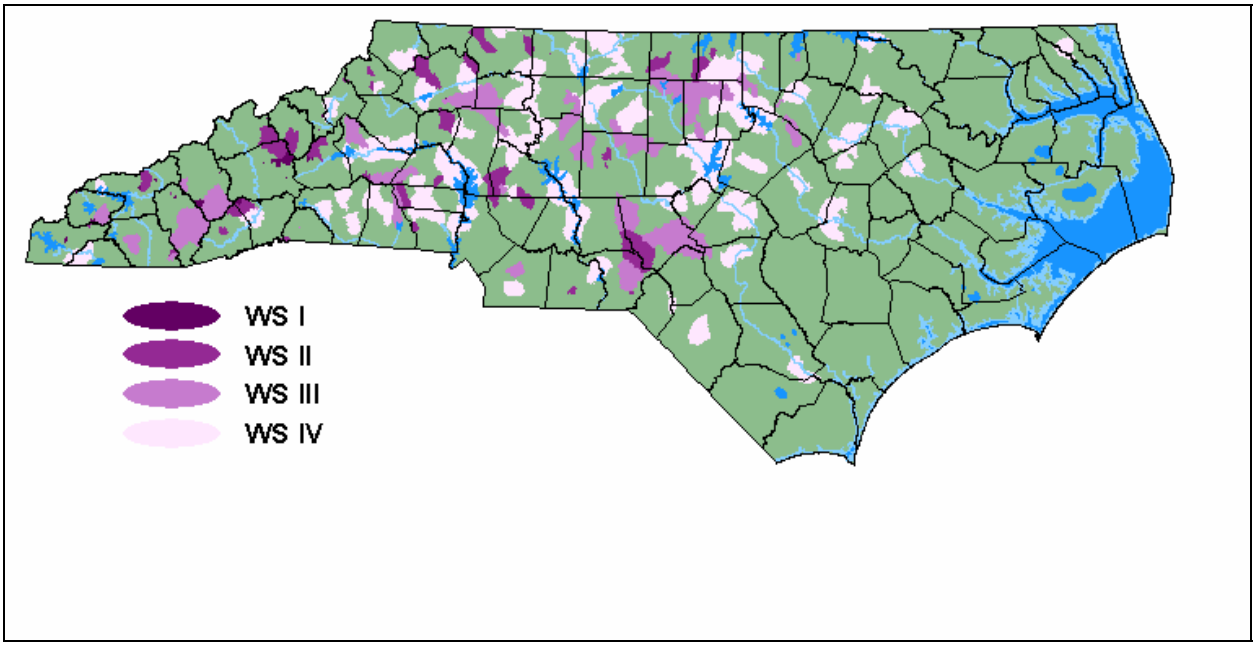
North Carolina's development of a watershed protection approach to water quality began in 1986 with a voluntary program administered by the Environmental Management Commission. Rather quickly, state officials recognized the need for minimum standards across the state, "especially where multiple local governments had land use jurisdiction within a single water supply watershed" (NCDENR Division of Water Quality, February 2001). The state enacted the Water Supply Watershed Protection Act in 1989. The law required that local governments with land use planning jurisdiction within water supply watersheds adopt management plans and ordinances to protect the watersheds. Water supplies are any waters used for "drinking, culinary, or food processing purposes" (NCDENR Division of Water Quality, February 2001).

The Environmental Management Commission (EMC) developed the Water Supply Watershed Protection Rules in 1992 in order to implement the Act's provisions specifying management requirements and watershed protection standards. The state attempts to coordinate interjurisdictional efforts within each watershed to ensure that multiple localities will meet the watershed standards. The EMC reviews and approves of all local ordinances established under the mandate of the Act. Moreover, ordinances must be consistent with minimum statewide standards (Stoner et al., 1994; NCDENR Division of Water, February 2001). As of February 2001, all of the local governments required to design management plans and ordinances had submitted the necessary documentation; but, the EMC had not yet reviewed all of the plans and ordinances (NCDENR Division of Water Quality, February 2001).

This first step in North Carolina's watershed initiatives was clearly based on an anthropocentric perspective. The sole stated purpose of the act was to protect water resources

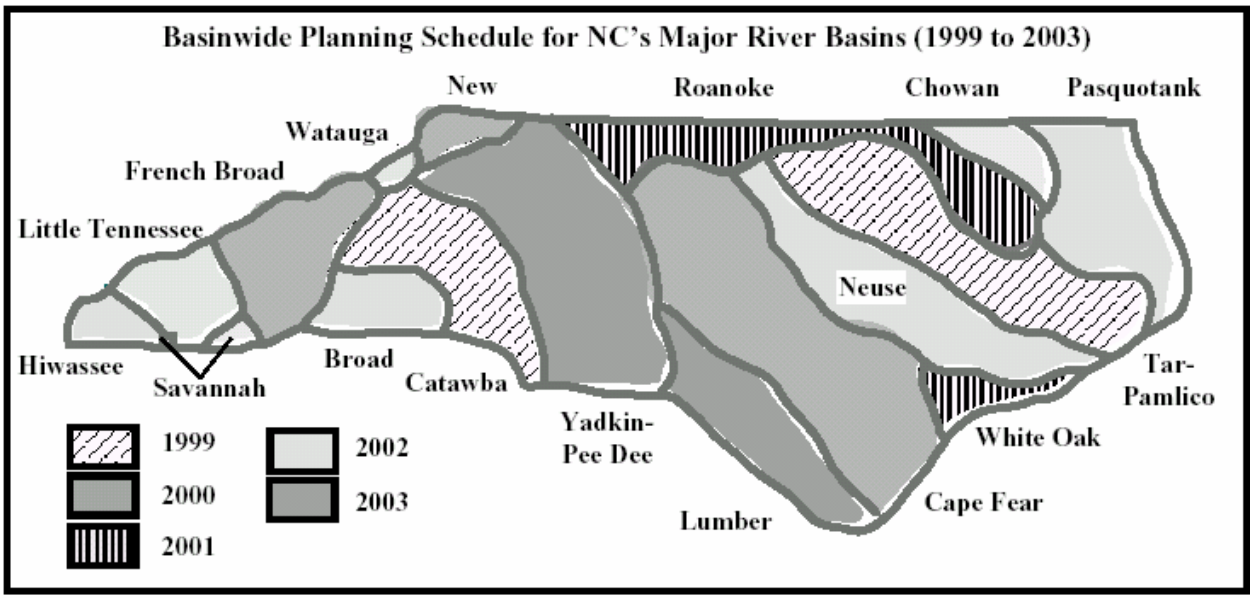
used as water supplies for human needs. In North Carolina, 208 surface water bodies in the state supply 83% of the water needs for the state (NCDENR Division of Water Quality, February 2001). The Act strives to encourage watershed wide planning and management efforts, not simply stringent rules around a particular point on a waterway. Nonetheless, the covered areas for the Water Supply Watershed Protection program are surprisingly limited (Figure 3.1). The classification system on the map progresses from WS-I, the most protected areas usually surrounded by undeveloped public lands, to WS-IV, the least protected areas often surrounded by urbanized land (NCDENR Division of Water Quality, May 2001).

Figure 3.1: NC Water Supply Watershed Protection Areas
(Adapted from NCDENR DWQ, n.d.)



Recognizing that other issues besides water supply quality need to be considered in watershed management, the state introduced the Basinwide Water Quality Planning Program and completed the first set of plans for all of the state's river basins in 1998. The Division of Water Quality develops a Basinwide Water Quality Plan for each of the state's watersheds over a five-year period. Figure 3.2 is a map of the state's river basins and a basinwide planning schedule for plan update completion in each basin. The North Carolina program is nonregulatory and thus depends upon the voluntary adoption and implementation of plan goals, objectives, and strategies by local governments throughout the state.

Figure 3.2: NC Basin Map & Basinwide Planning Schedule
(NCDENR DWQ, n.d.)



The Division of Water Quality (NC DENR DWQ, July 2001) sets forth the following goals for the basinwide plans:

- identify water quality problems and restore full use to impaired waters;
- identify and protect high value resource waters;
- protect unimpaired waters while allowing for reasonable economic growth;
- develop appropriate management strategies to protect and restore water quality;
- assure equitable distribution of waste assimilative capacity for dischargers; and
- improve public awareness and involvement in the management of the state's surface waters.

Clearly, the focus of the basinwide plans is on environmental and water quality protection. The goals also identify economic growth and public awareness and involvement as desired outcomes from the process. This hints at a more holistic approach as prescribed in watershed planning and management literature.

On the other hand, the planning processes, coordination mechanisms, and implementation strategies of the program lack the level of complexity prescribed in the scholarly and professional literature. The planning process builds on rational and communicative approaches but offers no opportunities for integrated stakeholder collaboration. The focus of the planning program is on gathering and disseminating scientific information about the river basins and involves the public on a little more than perfunctory level. The state recognizes that "implementation and the protection of water quality entails the coordinated efforts of many agencies, local governments and stakeholder groups in the state" (NCDENR DWQ, July 2001).

The plans identify various agencies and organizations that may play a role in achieving plan goals. However, formalized coordination mechanisms to ensure cooperation, coordination, and collaboration are lacking. Finally, the plans suggest a variety of implementation strategies for an integrated management approach using generalized approaches, but developing localized strategies of restoration and protection is not incorporated into the planning program.

Planning Process

The five year planning process is designed to coordinate data collection, identify goals and concerns, guide data analysis, engage the public, and gain approval for the plan itself. The process is separated into time periods of one to three years with activities identified for each period as summarized in Table 3.1.

Table 3.1: North Carolina Basinwide Planning Process
(NCDENR DWQ, n.d.)

Years 1-2 **Water Quality Data Collection and Identification of Goals and Issues**	• Identify sampling needs • Conduct biological monitoring activities • Conduct special studies and other water quality sampling activities • Coordinate with local stakeholders and other agencies to continue to implement goals within current basinwide plan
Years 2-3 **Data Analysis and Public Workshops**	• Gather and analyze data from sampling activities • Develop use support ratings • Conduct special studies and other water quality sampling activities • Conduct public workshops to establish goals and objectives and identify and prioritize issues for the next basin cycle • Develop preliminary pollution control strategies • Coordinate with local stakeholders and other agencies
Years 3-5 **Preparation of Draft Basinwide Plan, Public Review, Approval of Plan, Issue NPDES Permits and Begin Implementation of Plan**	• Develop draft basinwide plan based on water quality data, use support ratings, and recommended pollution control strategies • Circulate draft basinwide plan for review and present draft plan at public meetings • Revise plan after public review period • Submit plan to Environmental Management Commission for approval • Issue NPDES permits • Coordinate with other agencies and local interest groups to prioritize implementation actions • Conduct special studies and other water quality sampling activities

The planning process establishes a foundation in scientific information and data collection by technical experts in the field. The primary focus of the data collection is on water quality indicators and does not include gathering information on social and economic conditions within the various basins.

The public and stakeholders are involved in the second phase of the process as they begin to develop goals and priority issues and again in the third phase when plans are finalized. The Division of Water Quality (DWQ) identifies three ways the public can be involved in the process:

- **Public Workshops:** Held prior to writing the basinwide plans. DWQ staff present information about basinwide planning and the water quality of the basin. Participants then break into smaller groups where they can ask questions, share their concerns, and discuss potential solutions to water quality issues in the basin.
- **Public Meetings:** Held after the draft basinwide plan has been approved by the Water Quality Committee of the Environmental Management Commission. DWQ staff present more detailed information about the draft basinwide plan and its major recommendations. Then, the public is invited to comment and ask questions.
- **Public Comment Period:** Held after the draft plan has been approved by the Water Quality Committee of the Environmental Management Commission. The comment period is at least thirty days in length from the date of the first public meeting (NCDENR DWQ, n.d.).

The effort to involve the public seems to be focused on delivering information to interested parties more than engaging in information sharing and communicative learning. The planning process does not formalize stakeholder involvement in the decision making process. Moreover, public participation depends upon communication and timing of meetings and workshops. This method limits the certainty of the involvement of interested parties.

While this process cannot be labeled collaborative planning, members of the public are provided opportunities to participate at some level. In the Roanoke River Basin, three public workshops were held before the plan was finalized. The plan reports that 77 citizens and stakeholders were present at the three workshops including industry, landowners, agricultural interests, environmental organizations, local government representatives, and natural resources agency staff. The groups with the highest level of representation were the natural resources agency staff (44%) and industry/consulting groups (21%). DWQ and local staff presented on statewide initiatives, water quality in the basin, and local efforts to ameliorate water quality problems. Then, participants divided into small groups and answered questions about water quality threats, problem areas, recommended solutions, and agencies or organizations that should be involved on the local level (NCDENR DWQ, July 2001). While the information gathered at

these meetings was incorporated into the planning document as DWQ staff saw fit, participation at the decision making table was limited at best.

Coordination Mechanisms

As indicated in the introduction to the Roanoke River Basinwide Plan (NCDENR DWQ, July 2001), implementation depends upon interjurisdictional cooperation, interagency coordination, and stakeholder involvement. The planning process outlined in Table 3.1 identifies coordination among stakeholders and agencies as a task in every year. However, the North Carolina program does little to develop the coordination mechanisms necessary to ensure cooperation and coordination across agencies and jurisdictions. Moreover, as alluded to above, stakeholders are involved more in a perfunctory manner than in a collaborative decision making process.

In terms of interjurisdictional cooperation, the North Carolina program offers little more than rhetorical support. The Roanoke River Basin crosses part or all of 15 counties and 42 municipalities (NCDENR DWQ, July 2001). The 2001 plan identifies the local governments and suggests that they should be working together. However, formal coordination mechanisms for local government cooperation are not identified in the plan. The implication is that by naming the governments, citizen groups and interested parties, governmental units will voluntarily work to ensure cooperation across jurisdictions.

Interagency coordination is encouraged in much the same fashion in the basinwide plans. Section C of the Roanoke River Basin Plan lists current and future initiatives at the federal, state, and local level that impact water quality in the basin. The plan lists agencies and non-profit organizations that are involved in the basin, but offers few suggestions as to how the groups can work together. Again, the implication is that groups should be working together, but there is no coordination mechanism in place to ensure that they do collaborate.

Finally, stakeholder collaboration is limited in the planning and management process. Public meetings and workshops are used as educational tools. As stated in the opening pages of the Roanoke River Basin Plan, “The basinwide plans are an educational tool for increasing public involvement and awareness of water quality issues” (NCDENR DWQ, July 2001: 4). However, there seems to be little in the way of public participation at the decision making table. As outlined above, the Roanoke River Basin meetings and workshops consisted of some

information sharing, but mostly they served as opportunities to communicate information to the public instead of gain input from the public. The lack of a coordination mechanism that ensures public involvement and stakeholder collaboration likely limits North Carolina's ability to integrate the kind of citizen input suggested by watershed management and planning literature.

Implementation Strategies

Implementation in the North Carolina Basinwide Plans depends upon policies already in place such as National Pollution Discharge Elimination System (NPDES) permitting programs, Water Supply Watershed Protection ordinances, and other provisions of state and local law regulating land use, agriculture and silviculture practices, and point source pollution controls. Plans encourage the use of best management practices (BMPs) for agriculture and silviculture as outlined in state statutes, but depends upon voluntary implementation. Also, in sub-basins where population growth is leading to urbanization and development, the plan suggests the use of soil and water conservation BMPs on new development sites (NCDENR DWQ, July 2001).

For the most part, the plans serve as educational tools that provide thorough scientific data on water quality, land use, and habitat conditions throughout each basin and sub-basin. Each plan also provides information on locating funding sources that localities and interest groups can pursue for financial assistance in implementation of BMPs and other programs. Suggestions for action tend to be relatively limited and emphasize non-regulatory, voluntary initiatives. By educating the public, local government agencies, and interest groups about water quality conditions and concerns, the basinwide planning program uses increased awareness as a tool to induce action. As stated in the future water quality initiatives chapter of the Roanoke River Basin Plan, "The basinwide planning process can be used by other programs as a means of identifying and prioritizing waterbodies in need of restoration or protection efforts and provides a means of disseminating this information to other water quality protection programs" (NCDENR DWQ, July 2001). This highlights the purpose of the basinwide planning program as an educational tool more than a regulatory document.

The future of the North Carolina Basinwide Planning Program may depend on regulatory approaches as outlined in the Roanoke River Basin Plan of 2001. The DWQ is working on a series of mandatory requirements to be implemented sometime after 2003. The Use Restoration Waters program will offer local governments the opportunity to implement site specific measures

in compliance with Environmental Management Commission (EMC) recommendations. The EMC may intervene if it is dissatisfied with local efforts. As the program is being developed, DWQ suggests that requirements may be applied throughout the state instead of being applied only to impaired streams. If this policy is implemented statewide, it would represent a significant shift toward statewide water quality planning and management guided by a state level institution. Those interested in statewide watershed planning and management should keep an eye on developments in North Carolina and the basinwide program.

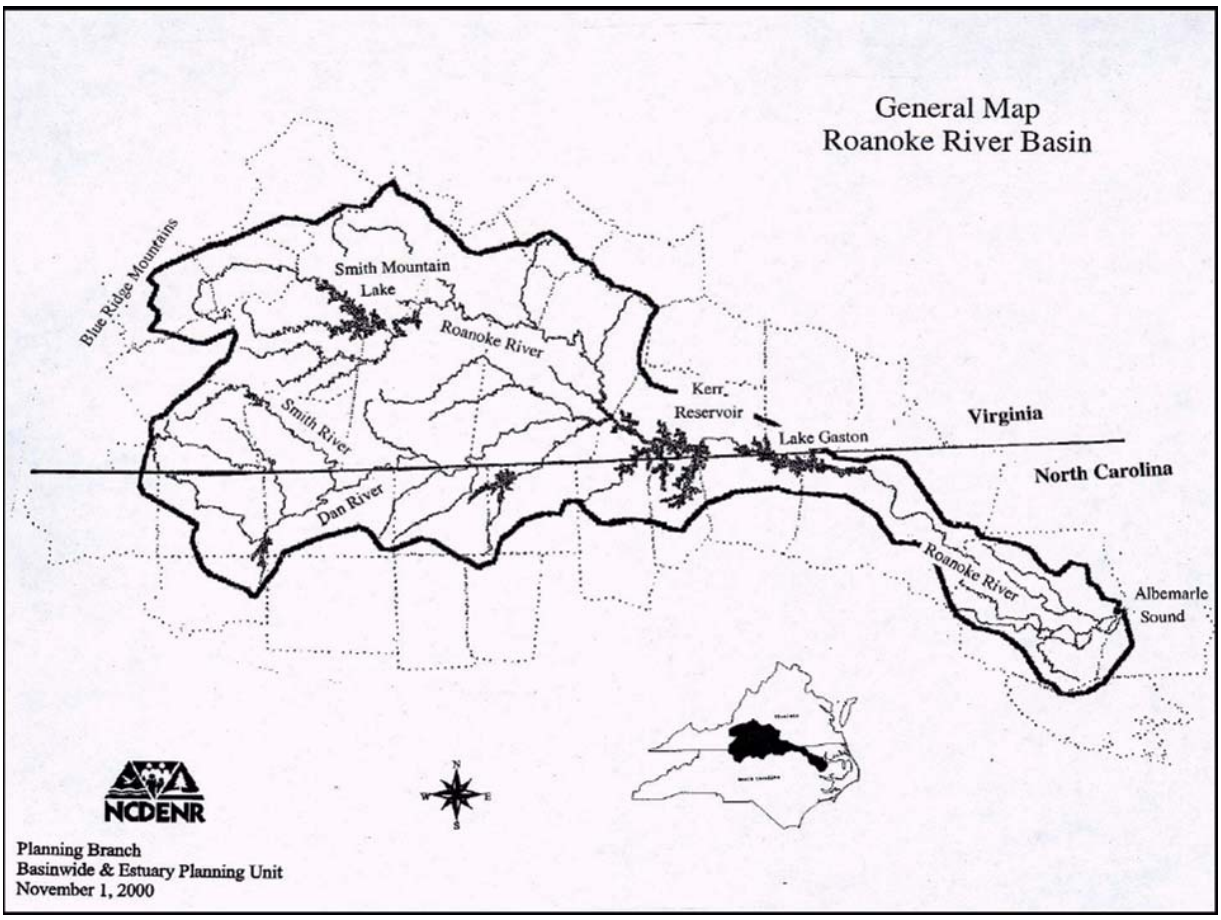
Discussion

The North Carolina Basinwide Water Quality Planning Program is built on the foundations of watershed management. However, the planning processes, coordination mechanisms, and implementation strategies of the program only apply watershed planning and management principles on a limited basis. Moreover, as with the other statewide initiatives, the North Carolina program is bounded by political borders. In the case of the Roanoke River, well over half of the watershed is in Virginia as shown on Figure 3.3. Without cooperation between the two states, a holistic watershed management approach cannot be achieved. In some portions of the Roanoke River Basin Plan, there is mention of working with Virginia agencies along the border with North Carolina to ensure compliance with Virginia laws and point source pollution permits. However, there is no mention of a formal cooperative relationship with Virginia in planning for water quality in the basins that cross state boundaries. As a result, the North Carolina effort to promote a regional approach to watershed planning is inherently flawed by not fully engaging neighboring states.

In terms of the planning process, it appears that the emphasis of the North Carolina Basinwide Plans is on rational and scientific planning. A significant amount of time and energy is spent gathering data on water quality. Adaptive management is clearly at play. Each plan has to be updated every five years. The 2001 Roanoke River Basin Plan is the second for that basin. The 1996 plan is decidedly less informative, does not divide the basin into sub-basins to increase local accessibility and applicability, and lacks significant detail that is included in the 2001 update. The public is involved on a perfunctory level more than in the holistic manner that academic and professional literature on watershed planning and management suggests. Communicative planning is not emphasized in the process. This approach seems to match what

Duram and Brown (1999: 456) call the "regulatory/bureaucratic approach" in which "local public participation is secondary" in the decision-making process.

Figure 3.3: Roanoke River Basin Map
(NCDENR DWQ, July 2001: 9)

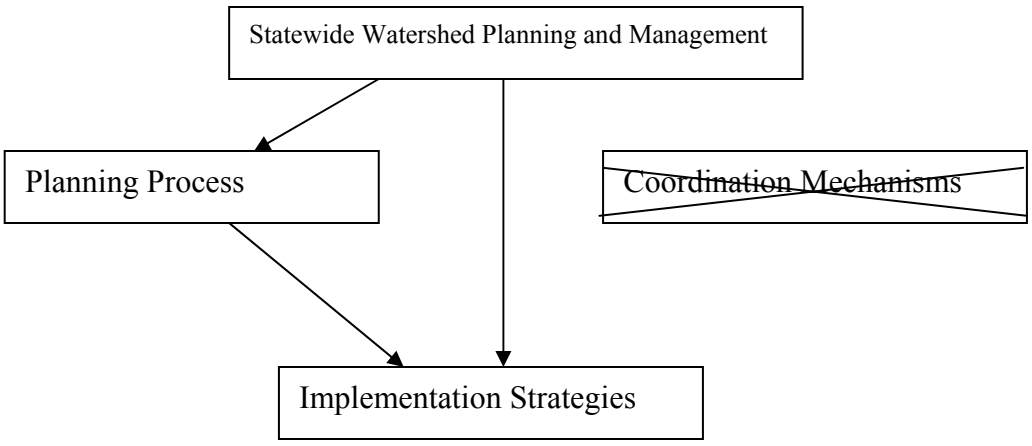


Coordination mechanisms to ensure interjurisdictional and interagency cooperation and coordination seem to be nonexistent. Planning seems to take place in the Division of Water Quality offices for the most part. The plans include rhetoric encouraging cooperation and coordination while few suggestions emerge for how working together across agencies and jurisdictions might be formalized. Of course, casting judgment on either the planning process or coordination mechanisms after a review of the resulting plans may not be a fair assessment. It is distinctly possible that a more comprehensive consideration of coordination mechanisms is underway in multiple North Carolina agencies. However, the planning documents reveal little evidence of such a conversation taking place.

Finally, while the implementation strategies suggested in the Roanoke River Basinwide Plan (2001) are quite varied, the policies for nonpoint source pollution control are merely suggestions. Other than existing programs for point sources and stormwater controls, the North Carolina Basinwide Planning Program is situated firmly in the voluntary realm. Perhaps this explains why so much time and energy is spent gathering scientific data. The program may be more an effort to educate the public and local planners and encourage voluntary action on their parts than an attempt to formulate policy decisions.

In the end, the North Carolina approach maintains nearly total control at the state level. In response to the Safe Drinking Water Act, the state developed the Water Supply Watershed Protection Act, requiring local communities to meet certain standards in watersheds that supply municipalities. This approach is controlled at the state level and involves a regulatory mandate to local governments. The state's response to the Clean Water Act policy directive follows a similar process although using a nonregulatory approach. The state environmental agency guides the planning process, creates the plans, and develops the implementation strategies as illustrated in Figure 3.4. Coordination, while rhetorically supported, is not institutionalized through formal coordination mechanisms. Therefore, there is a general lack of agency and local governmental coordination and implementation of strategies outlined in the plans.

Figure 3.4: The North Carolina Approach



This is not to say that the North Carolina Basinwide Planning program has no merit. On the contrary, it is a step toward introducing watershed management principles to the entire state. While the Water Supply Watershed Protection ordinances ensure watershed based planning in

certain areas of the state, the voluntary basinwide planning program covers the entire state. The basinwide plans identify funding opportunities and incentives to encourage voluntary action and education of the public. By dividing each river basin into sub-basins, localities can identify issues that are relevant to their particular needs and resources that are available for local assistance. The basinwide planning program is an effort to ensure that every river basin in the state is part of a planning process. Thus, the North Carolina basinwide planning program serves as a model for comprehensive watershed planning for the purposes of information dissemination, education, and encouraging voluntary action.

What remains unclear is whether this type of comprehensive basinwide planning is having an impact on local planning activities. Voluntary action by local governments, stakeholder groups, or other entities is essential to each plan's success. However, by developing plans in relative isolation at the state level and limiting the participation of local governments and interest groups, the potential implementers of plan provisions are largely left out of the process. The updates to the plans refer only minimally to ongoing success stories and projects that implement strategies outlined in the plans. Moreover, anecdotal evidence through informal conversations with a few planners and watershed association members in the Roanoke River Basin suggests that many of the potential actors in watershed planning are not even aware of the basinwide planning program. A more formal assessment of other areas of the state is needed to verify these assertions; however, it is reasonable to infer from these conversations and from the lack of success stories in the plan updates that many of the people who have the power, expertise, and interest to implement the plans on a local level are not being reached by the planning process and outreach efforts of the program.

Massachusetts Watershed Initiative[1]

Launched in 1993, the Massachusetts Watershed Initiative (MWI) represents an approach to watershed management initiated and supported on the state level, but which operates within a collaborative structure that empowers grassroots community action and public participation in planning for water quality. The logo for the MWI features the slogan "Communities Connected

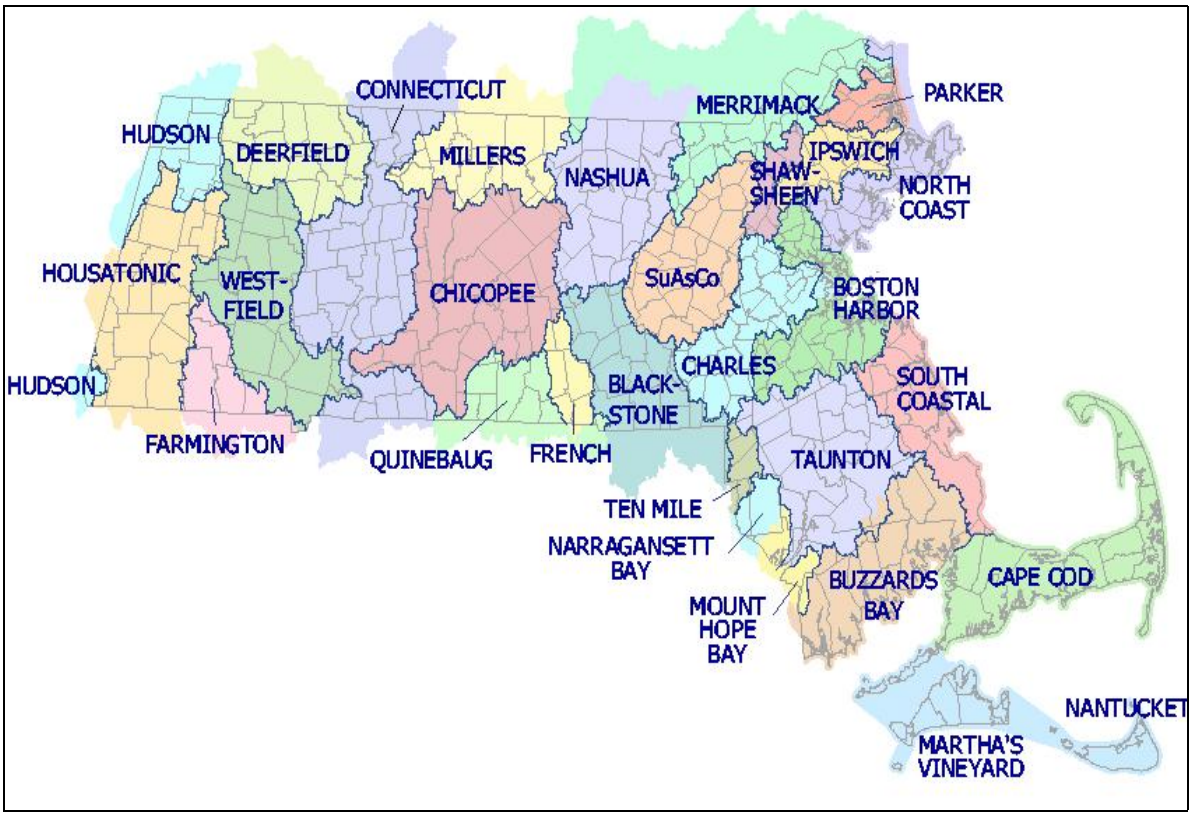
[1] Most of the information for this section was obtained via the Massachusetts Watershed Initiative website maintained by the EOEA: http://www.state.ma.us/envir/mwi/watersheds.htm. Links to each watershed with descriptions, basic facts, priorities, and recent successes can be found here. Moreover, some of the watersheds have watershed plans online accessible through this website. Plan analyses were conducted using available plans.

by Water" (MA EOEA, n.d.). This motto contains the essence of the Massachusetts approach to watershed planning and management. State and federal agencies are involved in the program, but the focus is on local communities solving local problems through collaboration and cooperation. The Executive Office of Environmental Affairs (EOEA) website contends that the initiative is a "broad partnership of state and federal agencies, conservation organizations, businesses, municipal officials and individuals." The overarching goal of the program is to protect and restore "natural resources and ecosystems on a watershed basis" (MA EOEA, n.d.). The principle strategies of the initiative involve finding pollution sources and mitigating them through cooperative action, working to educate groups and communities to restore local waters, increase communication through partnerships, enhance government agency coordination, and channel funding to critical needs areas first.

The Massachusetts approach is founded on watershed planning and management principles. The implementation of the program represents a significantly different approach from the North Carolina Basinwide program. Instead of relying on minimal participation of local community members and stakeholders, the Massachusetts Watershed Initiative depends entirely on community involvement to achieve success. Scott Anderson (1999: 338) aptly notes that "the MWI promises to redefine environmental resource protection by involving local stakeholders in setting priorities for protecting local resources." Like other watershed based approaches, Massachusetts focuses on watersheds as the "environmental entity" while offering "an alternative to traditional statutory attempts to control nonpoint source pollution" through the limited use of "command and control regulation" (Anderson, 1999: 338).

To achieve water quality, recreation, and habitat goals, the state relies on Watershed Teams, one in each of the 27 watersheds across the state as shown in the map of Figure 3.5. These teams include governmental agency representatives and "community partners" who come from local business leaders, municipal boards, and interested non-profit organizations. Each team is assigned a team leader connected to the EOEA. Team leaders work to guide communities through iterative responses to priority concerns by supporting long term implementation of watershed management plans. These teams are not given a directive from the state to implement previously determined prescriptions for mitigation of water quality concerns in the specified watershed. Instead, teams have significant latitude in identifying concerns and proposing creative solutions through locally developed watershed management plans.

Figure 3.5: Massachusetts Watersheds Map
(MA EOEA, n.d.)



Planning Process

Because of the self-governing attributes of each Watershed Team, one can imagine significant variation in the planning processes that lead to locally developed plans. However, in general, Watershed Team leaders are motivated to guide local communities through a collaborative and communicative planning process instead of attempting to persuade communities to trust their scientific expertise and allow them to produce a rationally conceived science based management plan. Still, each Watershed Team approaches the process slightly differently within this underlying context of communicative and collaborative planning.

The Merrimack Watershed Team used collaborative and communicative planning principles to develop their 5-year plan for the Merrimack River. The Watershed Team itself included representatives from multiple agencies, communities, and interests. The team worked with a core of 18 members to develop the mission statement and initial goals of the plan. They developed programs to gain stakeholder input through municipal and business outreach strategies

and "team constituency building through identification and involvement of stakeholder issues and groups" (MWT, 2002: 11). The current list of active members now consists of fifty-one representatives from state and federal agencies, public works officials, municipal governments, water treatment facilities staff, community planning offices, and several watershed associations.

The Ten Mile River Watershed Team (2002) developed a 5-Year Action Plan as well. The team consists of 25 representatives from six state agencies, two federal agencies, the regional planning agency, three municipalities, and two major watershed associations. The planning process included significant public participation. Initial stages included educational and informational meetings followed by open public forums in various municipalities. These open forums were followed by meetings with municipal decision making bodies after which a draft plan was developed. The draft plan was put online with email notices sent to community members, agency partners and stakeholders while draft plans and mail notices were also sent to partners. The draft plan was reviewed and then two more open forums concluded the planning public participation phase. The public was solicited for input on scientific information as well as proposed recommendations over the year and a half process.

The Parker River Watershed Team relied on the scientific and technical expertise of the team leader to initiate their planning process and develop an assessment report. There is little evidence that local knowledge was included in the assessment report although Tomczyk (2002: 1) does note that the report was developed from "information provided by a number of organizations, agencies, and partners that have an interest in the Parker River Watershed." The resulting report is highly technical in nature and includes scientific measures of water quality and detailed maps of various land uses, regulated areas designations (zones for wellhead or surface water protection, NPDES permit holders, fisheries permit areas, etc.), and conservation and recreation information. The maps are an excellent informational tool for identifying areas of concern for local communities. Tomczyk (2002) presents salient scientific information on environmental conditions for the purpose of developing an action plan. It is likely in the action plan development, a greater level of community input will be sought.

The Ipswich Watershed Team (2002) has developed a 378 page assessment report of the watershed consisting of a detailed outline of biological and chemical conditions of the waterways within the watershed, land uses and other human activities in the watershed, trends and recommendations for problem resolution, and a list of funding sources that may be useful in the

process. This detailed assessment is the most extensive document available online and contains exceptional maps and scientific data and information. It also offers numerous strategies to decision makers for mitigating environmental problems. What is interesting about this assessment report is that there is little evidence that anyone beyond the members of the Watershed Team and various participating agency officials was involved in the development of the assessment report.

In sum, Watershed Teams are at various stages within the watershed planning process and will use different planning processes at different phases. The Parker River team has completed the assessment phase and has likely begun the planning phase. Merrimack and Ten Mile teams have completed their five year plans and are in the monitoring and updating phases. It appears that in the assessment phases, Watershed Teams may operate on a model similar to rational planning where the focus is on scientific information gathering and communicating results to members of the public. Nonetheless, the Watershed Teams themselves generally represent various stakeholders, thus stakeholder involvement is still part of the assessment process. Moreover, to develop the action plans, the teams tend to emphasize a collaborative and communicative approach to planning.

Coordination Mechanisms

The principal mechanism that guides the planning and management process within the MWI are Watershed Teams. The teams include agency representatives, local governmental officials, community members, citizen interest group representatives, local business leaders, and other stakeholders. It is difficult to discern specific membership on every team; however most if not all teams follow this general model. The Merrimack Watershed Team consists of fifty-one people "from state and federal agencies, regional planning organizations, watershed groups, local communities and individual citizens" (Merrimack Watershed Team, 2002: 2). The membership of the Ipswich, Parker, and Ten Mile teams are equally holistic in their representation. Watershed Teams are designed to encourage "coordination among local, state and federal agencies, conservation commissions, watershed associations and volunteer citizen groups" (Ipswich Watershed Team, 2002: 7). The representation of public officials, agency employees, and community interest groups on these teams ensures information sharing, collaboration, and coordination at every phase of planning and implementation. Although the teams represent a

single coordination mechanism, numerous success stories in newsletters and on the website (EOEA, n.d.) demonstrate that working across local government boundaries, utilizing resources from various agencies, and engaging multiple stakeholders in project implementation is taking place. Thus, the Watershed Teams successfully support interjursdictional cooperation, interagency coordination, and stakeholder collaboration.

Through significant citizen involvement, the primary coordination mechanism of the MWI, Watershed Teams, clearly supports public participation and stakeholder involvement in the planning process. These same mechanisms support interagency coordination and interjurisdictional cooperation as well. By involving stakeholders, agency representatives, and local governments on the Watershed Teams directly, MWI ensures that needed coordination mechanisms are in place for integrated and coordinated watershed management.

Implementation Strategies

Implementation strategies for mitigation are perhaps the most varied component of the MWI. Each locality identifies priority concerns and then works to mitigate those concerns via appropriate strategies. As Michaels (1999) points out, the focus on collaborative management has emerged within the context of a desire to improve environmental quality while also limiting the scope of government. The decentralized character of the MWI is a testament that the role of government should be rather minimal in dealing with watershed management concerns in Massachusetts (Michaels, 1999). As noted in the Ipswich River Watershed Assessment Report (2002: 7), "The Initiative encourages non-traditional strategies to address watershed problems…" As such, the implementation strategies that emerge from this process tend to rely more on voluntary measures, community education programs, and involving non-governmental actors in land conservation or other programs.

Watershed Teams in Massachusetts have attempted various combinations of implementation strategies in their efforts to deal with a variety of priority concerns. Priority concerns include such issues as preventing loss of open-space habitat and monitoring low flow problems in the Blackstone River Watershed to ensuring drinking water quality and improving communication, outreach, and education among citizens and watershed partners in the Cape Cod Watershed. Most of the Watershed Teams have identified some type of development or growth as a concern within their watershed and many tie these concerns to water quantity or low flow

issues. Nearly all have identified some water quality concerns, often related to nonpoint source pollution. Yet each Watershed Team identifies certain concerns that are unique to that region. Sometimes teams identify subwatersheds that represent specific areas of concern within the broader watershed region. The Boston Harbor Watershed Team lists the restoration of sensitive habitat through fish passages around dams, wetland restoration, and aquatic plant invasive species control identifying both a concern and a proposed set of remedies. The Chicopee Watershed Team refers to a previous planning document, the "Regional Open Space Plan," suggesting that the team should implement the priority projects identified in that plan.

These examples point out that each watershed is unique. Recognizing this fact, the Massachusetts Watershed Initiative places the power in the hands of local communities who must work together to achieve common goals across relatively sizeable watersheds. As such, each team develops strategies to address priority concerns through collaborative processes. Given that the strategies are developed at a local level, efforts tend to depend on collaborative outreach and involvement, voluntary action, and education in the watershed. The lists of recent successes by Watershed Teams, some of which are summarized in Table 3.2, highlight this fact. Clearly education, voluntary agreements, local collaboration, grassroots involvement, advocacy, and sharing of resources tend to be highlighted. A review of the recent successes in all of the watersheds indicates that collaboration with stakeholders, interest groups, state and local agencies, and local community governments is a strategy for developing partnerships for restoration and mitigation in nearly every watershed area. The types of projects are quite varied and respond to particular concerns of each watershed. Nonetheless, overall, the strategies tend to depend on voluntary action, education and outreach, and local collaborative arrangements.

This is not to say, however, that all Watershed Teams reject regulation as an option. On the contrary, the MWI relies on the continuation and enforcement of existing regulatory policies to deal with point source pollution as well as other regulated concerns in the watersheds such as wetlands loss, water supply water quality protection, and endangered species habitat protection. Both the Parker (Tomcyzk, 2002) and Ipswich (2002) assessment reports make this point clear as NPDES permit holders are specified, land uses and zoning are clearly mapped, wetlands protection areas are identified, and water supply protection areas are highlighted.

Table 3.2: Recent Successes as Implementation Strategies in Massachusetts

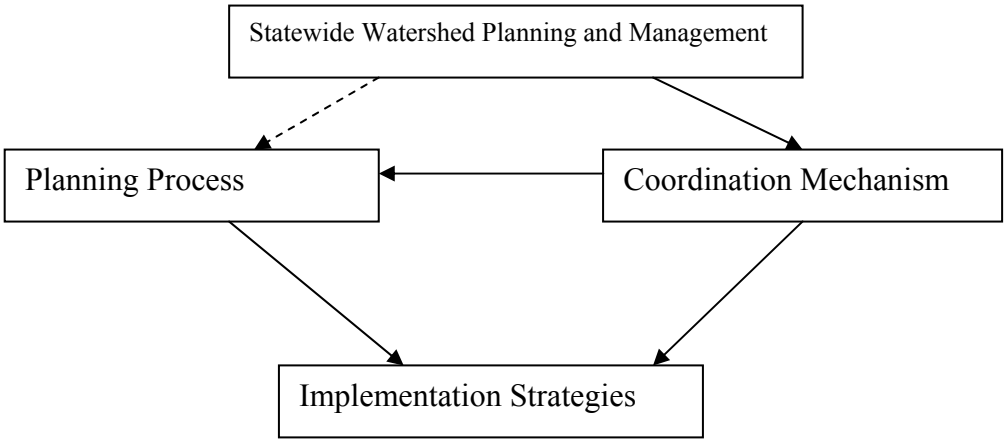
Watershed	Implementation Strategy	Recent Success
Blackstone River	Collaborative voluntary agreements	Stream Flow Taskforce working with hydropower produces to find ways to minimize river flow fluctuations leading to some adjustments by participating interests.
Ipswich River	Education, advocacy, and voluntary action	Developed educational materials (outdoor water-use awareness, print media notices, water conservation portfolio) and distributed to water supply managers in the watershed.
Shawsheen River	Education, local monitoring, and voluntary action	Trained 20 stream teams to conduct river-walk surveys and water quality sampling. Clean up of pollution hotspots has led to likelihood of removal of the river from impaired water lists.
Millers River	Local mapping and voluntary action through collaboration & resource sharing	Cooperation of a land trust, regional planning commission, council of local governments and local communities much of the watershed has been mapped for the purpose of forwarding land protection efforts.
SuAsCo	Voluntary local action and restoration	Established stream teams for grassroots organizing and restored populations of alewife herring to the Concord River. Spawning of this species has occurred here for the first time since the 19th century
Boston Harbor	Funding and collaboration	Created a Corporate Wetlands Restoration Partnership receiving nearly $1 million in the first year from corporate donors for the purpose of wetlands restoration projects.
Buzzards Bay	Education and outreach	Created and distributed an educational video highlighting environmental issues and recent successes throughout the watershed.
Deerfield River	Restoration, funding, collaboration, and voluntary action	Using state grant funding, the team has worked with local landowners, the local chapter of Trout Unlimited, and a county agency to implement agricultural BMPs along the river.

Discussion

The Massachusetts Watershed Initiative (MWI) is thoroughly grounded in what Dewitt John (1994) entitles "civic environmentalism." Governmental oversight relies little on regulatory protocols, but depends instead on developing partnerships with local communities, business leaders, state agencies, and citizen groups to initiate creative solutions to complex environmental problems. Yet, John (1994) also notes that the command and control regulation of the past has

led to great improvements in environmental quality. The civic environmental model is the next step in environmental policy, building upon the shoulders of regulatory regimes of the past. This new approach focuses on collaborative community-based approaches to environmental problem solving. Massachusetts relinquishes state level control of the program by designating Watershed Teams and team leaders and then turning over the responsibility of coordination, planning, and implementation to the teams as illustrated in Figure 3.6. The state does suggest a communicative and collaborative planning approach, but does not maintain control over planning processes. Watershed Teams, both through the formalized planning process involving broad public support and through their ongoing meetings, develop implementation strategies.

Figure 3.6: The Massachusetts Approach



Through the use of Watershed Teams made up of various stakeholders to guide a communicative planning process, the Massachusetts method clearly represents an effort to develop a statewide civic environmental approach to water resources management. The MWI is characterized as a decentralized and collaborative approach to environmental problem solving (Michaels, 2001). By working from the ground up, the state relies on local communities to identify and solve place-based environmental problems. By organizing communities into watersheds, the boundaries of the project do not coincide with existing political boundaries. Thus, cooperation across jurisdictions and among various agencies is ensured through the involvement of agency officials, local governments, and other stakeholders on the Watershed Teams, the primary coordination mechanism of the program. The planning process and structures

of the Watershed Teams influence the types of policies forwarded for implementation. Creative, non-traditional policies result. Most teams focus efforts on education, outreach, and voluntary action supported by funding from grant programs, fundraising in communities themselves, and state and local government supported funds. This approach has resulted in specific and broad reaching action across the state to mitigate particular water resource problems that communities face in their watersheds. Such results attest to the effectiveness of involving citizens and agencies in collaborative planning models.

Like the North Carolina Basinwide Planning program, the greatest weakness of the Massachusetts Watershed Initiative is that it does not formally involve neighboring states in the planning and implementation processes. However, the program clearly recognizes that watersheds cross state boundaries as the watershed map in Figure 3.5 (page 37) indicates. Moreover, given the amount of leverage offered to Watershed Teams, a certain level of responsibility rests on teams to initiate cooperative arrangements with neighboring communities in bordering states. The Merrimack River Watershed Team (2002) recognized this need and devoted a short section to Interstate Coordination in the action plan. The team has communicated with the State of New Hampshire's Department of Environmental Services and the agency responded by funding a full-time coordinator to respond to concerns in the southern portion of the Merrimack Watershed in the state. While few of the Watershed Teams seem to have formally developed partnerships like the one between the Merrimack Team and New Hampshire, chances are good that other teams will follow this example given the nature of shared information and collaboration inherent in the Massachusetts approach.

Oregon Plan for Salmon and Watersheds

Oregon developed a watershed program not only in response to the Clean Water Act's call for statewide approaches to dealing with nonpoint source pollution, but also in response to the policy directive of the Endangered Species Act. The Oregon Plan for Salmon and Watersheds was developed after two Coho Coastal Salmon species were included on the Endangered Species Act list of threatened species in 1995 (OCSRI, June 2001). The final plan, passed in March of 1997, initiated a statewide watershed planning process designed to coordinate local and regional efforts to enhance water quality and habitat for the Salmon. The plan represented a shift from habitat recovery plans replete with regulatory mechanisms to voluntary and cooperative

approaches characteristic of a more holistic and integrated watershed management approach. As stated in the executive summary of the plan:

> In contrast to many endangered species recovery plans that rely primarily on regulatory approaches, this plan represents a new way of restoring natural systems... the "Oregon Approach." This approach meshes scientifically sound actions with local watershed- based public support. It relies on teamwork among the various levels of government and is dependent on monitoring and accountability for results. Strong enforcement of existing laws and regulations are a foundation upon which voluntary and cooperative actions can be built. We believe that this is the only approach--one that will generate the support and commitment across all sectors, from landowners and industry to government agencies--to restore salmon and their natural systems. This plan will require an unprecedented level of cooperation and coordination among local, state, and federal agencies. It represents the commitment of all Oregonians to the fish, the watersheds, and our children. (OCSRI, 1997: 2)

The Oregon Plan is clearly built upon the watershed planning and management framework and serves as the broadest application of watershed principles in the three state plans under review in this paper. It incorporates rational, adaptive, communicative, and collaborative planning processes; develops coordination mechanisms necessary to ensure public involvement, stakeholder collaboration, interjurisdicational cooperation, and interagency coordination; and depends upon a variety of implementation strategies to achieve proposed goals.

Planning Process

Sound scientific information developed by state and federal agencies is paramount to the Oregon approach and pervasive throughout the plan. A focus on gathering accurate scientific information is to be expected in any watershed planning process. Thus, a certain element of rational planning processes will inform the resulting plan. In Oregon's case, the use of sound scientific information is even more important than for most watershed plans: the Oregon Plan must satisfy the extensive and complex requirements of the Endangered Species Act and be submitted to the National Marine Fisheries Service for review and approval. Thus, the impetus for the plan requires significant levels of scientific information gathering. The original plan established a Salmon Strategy Team, Outreach and Education Team, Science Team, and Agency Planning and Implementation Team (OCSRI, 1997). Each of the teams have representation from major agencies that focus on scientific information gathering and inputs from agencies such as the Department of Fish and Wildlife, Department of Environmental Quality, Department of Forestry, Department of Agriculture, among others. All of the teams rely on scientific information to inform their activities. Further underscoring the importance of scientific

information is the Independent Scientific Assessment Team, a group of 4-5 salmonid experts who audit the plan's strategies and adaptive processes. Much of the work of the scientific information gathering was initiated before the planning process started and was included in the 1996 draft plan (OCSRI, 1997). Continuous monitoring, assessment, and changes to scientific knowledge are integrated into plan updates.

While a comprehensive rational planning process was part of the foundation of the Oregon Plan, communicative planning elements completed the first plan and are thoroughly borne out in ongoing planning processes. The first draft of the Oregon Plan was released in 1996. It was amended following eight community briefings held throughout western Oregon and a peer scientific review. The plan states that the public, stakeholders, local agencies, key partners, and the state legislature will be involved in continuous regular updates and improvements to the plan and its implementation (OCSRI, 1997).

The Willamette Restoration Initiative's (WRI) "Restoring a River of Life" (2001) was added to the Oregon Plan for Salmon and Watersheds as a supplemental chapter in 1998. The WRI is a citizen based initiative that provides a more detailed plan for one of the major river valleys in Oregon. It builds upon the Oregon Plan and tailors planning and management efforts to a specific regional ecosystem. The planning process for this addition to the plan clearly follows the spirit of the planning process promoted by the Oregon Plan overall. The WRI Board of Directors was selected to represent multiple organizations, jurisdictions, and geographic areas. During the plan development phases initiated by the WRI, the public and stakeholders were highly involved. As specified in the preface to the report, hundreds of Oregonians participated in the collaborative process leading to the plan. The WRI is charged with engaging communities in a consensus based collaborative planning process. It convenes meetings of "citizens and citizen groups, planners, program managers, and researchers to interact and inform each other…" (WRI, 2001: Section 3-4). This citizen based organization thus embodies a process that leads to communicative and collaborative planning processes within the Oregon Plan framework.

In terms of adaptive planning, yearly updates attest to the fact that continuous monitoring and evaluation are built into the planning process. Updates are primarily educational and advocacy tools for the Oregon Plan. Much of the information contained within the updates presents current scientific data and a synopsis of ongoing programs. However, updates also suggest iterative adjustments to policy approaches and implementation strategies. The updates do

not tend to communicate a significant shift in policy directions, but they do build on current programs and policies to enhance effectiveness (OCSRI, 1998; OCSRI, 2000).

Thus, the Oregon Plan is built on a combination of rational, communicative, adaptive, and collaborative planning processes that exemplify the type of planning that Randolph (2003) suggests is emerging in the environmental planning arena. Scientists and state environmental agencies developed a strong and clear scientific foundation for the plan before the public became thoroughly involved in the planning and implementation processes. However, once this phase underway, the state initiated public meetings to garner public support and input in the planning process. Moreover, the implementation of the plan rests on the shoulders of regionally based Watershed Councils who rely on stakeholder involvement and public participation. It is the work of these councils through communicative processes and collaboration that leads to updates to the statewide watershed plan and implementation strategies in local watersheds.

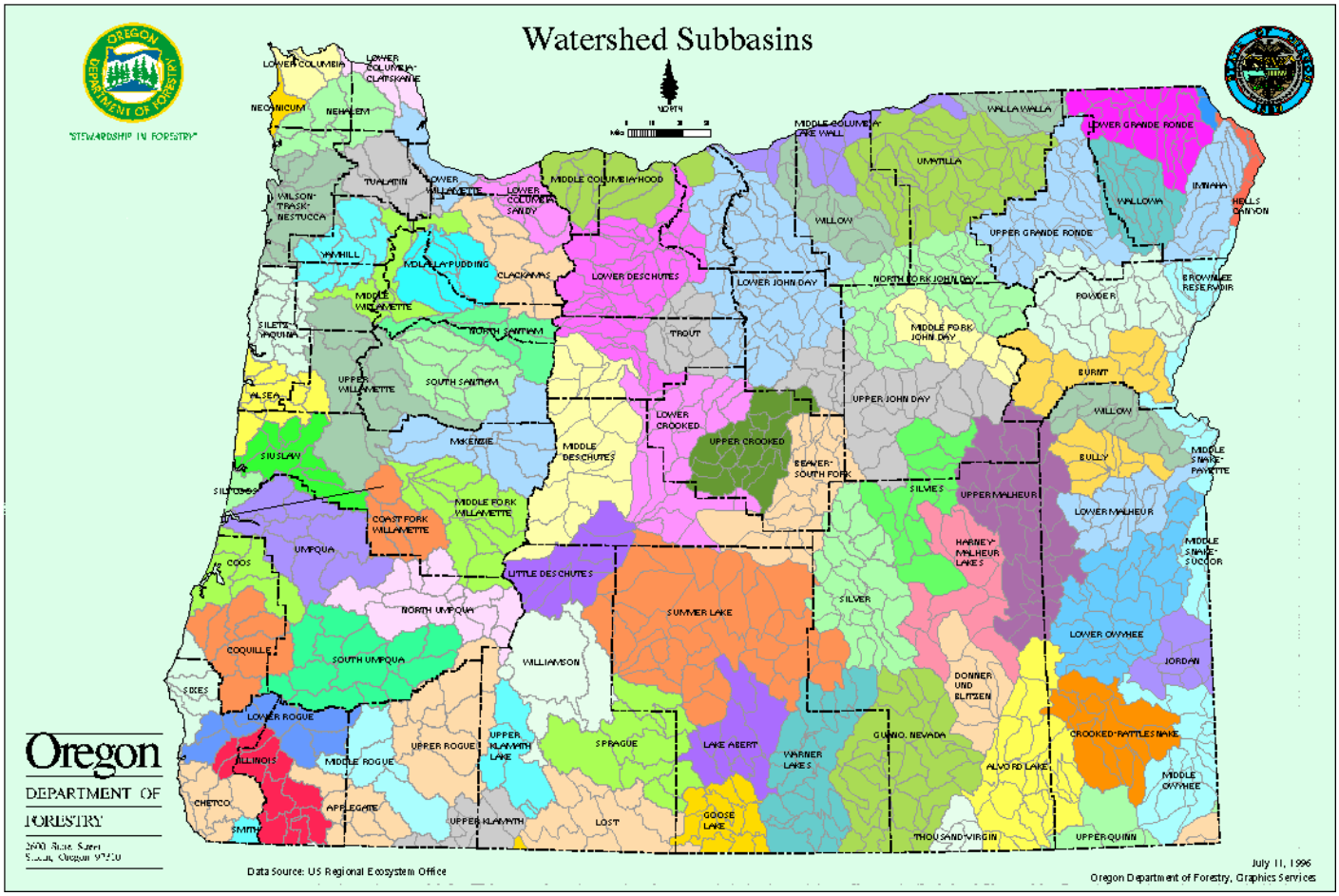
Coordination Mechanisms

Early in the 1997 plan, the Oregon Coastal Salmon Restoration Initiative (OCSRI) denotes that institutional barriers will pose a significant challenge in achieving the goals of the plan.

> Many state, federal and local governments involved in natural resource management have a history of not communicating or fully cooperating with each other on salmon conservation. Time, public support, and continued leadership is needed to eliminate these institutional barriers (OCSRI, 1997: 5).

One of the ways that the Oregon Plan proposes to break down these institutional barriers is through carefully designed agreements and structures that ensure cooperation and coordination. Federal and state agencies that play a role in the process have assisted in the development of the plan and have agreed to coordinate their activities. Through the use of existing and new Watershed Councils structures in many of the state's watersheds as shown in Figure 3.7, local government actions are coordinated across jurisdictions. Moreover, council membership ensures that stakeholders and citizen groups are involved in every phase of the process. A variety of implementation strategies ensure that local planning efforts and the statewide watershed plan are aligned and progressing toward water quality and habitat goals.

Figure 3.7: Oregon Watersheds Map
http://www.efn.org/~cfwwc/mapstatesubbasin.htm



Federal agencies are bound by a Memorandum of Agreement signed by the White House Office of Environmental Policy, EPA, and the Departments of Interior, Army, Energy and Agriculture. The agreement established the Pacific Salmon Coordinating Committee and requires that federal agencies work with non-federal stakeholders to assist in the development and implementation of restoration and conservation plans. Multiple federal agency heads and the State of Oregon also signed a Memorandum of Understanding in which agencies agreed to support local efforts in the watershed planning initiative and to work together to eliminate institutional barriers that might hinder community-based watershed efforts (OCSRI, 1997: Chapter 17D). The establishment of the coordinating committee and formal agreements among numerous federal and state agencies demonstrates a commitment to intergovernmental and interagency cooperation and coordination in the Oregon Plan. Chapter 17D of the 1997 plan identifies multiple planning projects already underway throughout the state that demonstrate that

coordination mechanisms have been developed to ensure cooperation across multiple agencies and governmental levels. The Pacific Salmon Coordinating Committee will serve to ensure that interagency cooperation continues in the ongoing planning and implementation phases.

The work of coordinating agency efforts at the state level has been underway from the beginning of the Oregon Plan: "The measures, workplans, and proposed budget packages have been developed cooperatively across agency boundaries. This was necessary to prevent duplication and promote interagency partnering" (OCSRI, 1997: 10). To ensure that state agency actions are coordinated, the Oregon Plan outlines "workplans" for the 12 agencies that represent the most significant players in the planning and implementation process (OCSRI, 1997: Chapter 17C). Each workplan consists of specific objectives and tasks for agency personnel in each basin within the state as well as overarching objectives and tasks to implement throughout the state. This section assures that each agency understands specific duties that will lead to achieving the stated goals of the Oregon Plan. Coordination of distinct tasks for each agency avoids repetitive work, allows for information sharing, and coordinates state resources to maximize effectiveness and efficiency of state functions.

Coordinating local agency efforts can be a much more complex endeavor. Alignment of local planning efforts with state goals depends mainly on previously established Watershed Councils and the Statewide Planning Program. The Statewide Planning Program was initiated in 1973. The program established Statewide Planning Goals that are used to guide local land use planning efforts. The Land Conservation and Development Commission ensures that local plans are in compliance with state goals (OCSRI, 1997: Chapter 17I). While the Oregon Plan focuses mainly on specific Statewide Planning Goals that are designed to improve water quality (especially the Coastal Nonpoint Pollution Program), there is another aspect of the Statewide Planning Program that is important. This coordination mechanism has allowed state and local officials to coordinate land use planning efforts for thirty years now. Few states have had such a long history with statewide standards to guide local land use planning efforts. Implementing the Oregon Plan for Salmon and Watersheds will fit nicely into this already established framework.

Watershed Councils were established more recently than statewide land use planning, however they are another coordination mechanism that was already in place when the Oregon Plan was approved. In 1993, Oregon initiated a comprehensive watershed planning program, the Watershed Health Program, in an effort to address complex natural resource issues facing the

state. A significant outcome of the initiative was the establishment of locally based Watershed Councils. Over 60 Watershed Councils were established between 1993 and the approval of the 1997 plan. By 2001, 154 councils were meeting throughout the state (Smith and Gilden, 2002).

Watershed Councils are "a locally organized, voluntary, non-regulatory group established to assess the condition of their watershed and build a work plan to implement enhancement and protection activities within their watershed" (OCSRI, 1997: Chapter 17A). Watershed Councils serve as the connection between local agencies, interest groups, industries, and citizens who develop partnerships through the council to respond to water quality concerns in the watershed. They provide an opportunity for local residents to become involved in the decision making process to achieve watershed based goals. As stated in the 1997 plan:

> These councils have brought together diverse interests within a watershed, including timber, agriculture, mining, conservation, recreation and business interests with representatives from all levels of government, in partnerships that are working toward a common goal of restoring watershed health and the species dependent on healthy watersheds. Stakeholder groups and individual landowners representing all landownerships in each watershed have made commitments of their own time and resources to match public resources in an effort to address watershed issues in a more holistic manner (OCSRI, 1997: Chapter 17A).

The councils thus represent a coordination mechanism designed to break down institutional barriers at the local and state level. Not only do they encourage interagency and intergovernmental cooperation and coordination, they also ensure that public participation and stakeholder involvement are central components of the planning and implementation processes.

The major tasks of the Watershed Councils include assessing conditions in the watershed and developing a watershed action plan to respond to specific issues identified in the assessment process. The evaluation of the work of Watershed Councils provided in the 1997 plan demonstrates broad successes achieved in multiple regions throughout the state with assessments and action plans completed by most councils. The Watershed Health Program outlines specific rules for developing the assessment and planning documents including multiple statements concerning public, stakeholder, and interest group involvement as well as interagency coordination and cooperation. The data gathered by these locally based groups and their initial watershed plans will serve as the cornerstone for implementing OCSRI's Oregon Plan (OCSRI, 1997).

The coordination mechanisms of the Oregon Plan are designed to ensure local, state, and federal level cooperation, interagency coordination, and substantial public participation and stakeholder involvement at every level of the planning and implementation processes. By

ensuring that federal agencies are on board and will cooperate through an oversight committee and that state agencies clearly understand their assigned tasks, high level government actions are well coordinated. "Restoring a River of Life" (WRI, 1998) takes interagency coordination even a step further by integrating ongoing and future agency programs into the framework of the planning document itself with the assistance of state and federal agency officials involved in the plan's creation. Using Watershed Councils for local coordination allows localities to continue watershed planning efforts within established and proven mechanisms that encourage interagency coordination, interjurisdictional cooperation, and stakeholder involvement. Although OCSRI (1997) points out that institutional barriers will hinder progress, the Oregon Plan establishes a variety of structures to address multi-level political concerns.

Implementation Strategies

The Oregon Plan employs a variety of strategies to enhance water quality throughout the state. To achieve policy goals, the Oregon Plan initiates strategies to encourage voluntary action, education and outreach, and new funding incentives for watershed protection. In terms of regulatory approaches, Oregon depends upon existing regulatory efforts: "The Plan emphasizes improving compliance with existing environmental laws rather than arbitrarily establishing new protective laws. Compliance will be achieved through a combination of education and prioritized enforcement of laws that are expected to yield the greatest benefits" (OCSRI, 1997: 1).

Outreach and education is the central implementation strategy forwarded by the Oregon Plan. Traditional forms of education and outreach policies have focused on providing information to an uninformed public. The implication is that an informed public will be more apt to act in the best interests of natural resource protection. The Oregon Plan outlines another purpose: "The outreach and education section of the plan has moved from informing the public, to facilitating the development of education tools for private and public citizens to use to help implement the plan" (OCSRI, 1997: 8). Thus, the outreach and educational goals of the plan are designed to strengthen community partnerships and institutions that ensure collaborative stakeholder and public involvement. The 2001 update of the Oregon Plan lists numerous statewide education and outreach initiatives that have reached thousands of Oregonians. Many of the programs have included opportunities for citizens to sign agreements to adopt management strategies on their own land or within their communities (OCSRI, June 2001).

Funding incentives are also a major part of the Oregon strategy. The Oregon Watershed Enhancement Board (OWEB) was created in 1998 to promote and fund voluntary watershed restoration projects. The board serves a dual role: to enhance watershed conditions and to increase collaborative partnerships among citizen groups, agencies, and local interests. OWEB is charged with distributing $20 million in grant funding to projects that "restore critical salmon runs, improve water quality across the landscape, and enhance the biodiversity of ecosystems that are critical to achieving healthy watersheds" (OWEB, 2001: 1). OWEB funding priorities include those that enhance interjurisdictional and interagency coordination and cooperation, stakeholder collaboration, local partnerships, and outreach and education efforts to local communities (OWEB, 2001). These funding priorities coincide with coordination mechanisms and other implementation strategies supported by the plan further demonstrating the integrated approach of Oregon.

Both outreach and funding efforts are designed to enhance voluntary watershed protection and restoration projects of industry, landowners, farmers, and others as well as political actions of the public, interested citizens, and local government agencies to apply local solutions to watershed problems. These voluntary efforts will be complemented by greater enforcement of regulatory policies and clarification of rules. The 1997 plan makes it clear that current regulatory policies are likely sufficient to achieve water quality goals. However, a greater emphasis on effective enforcement will be needed to ensure that current regulations can reach their potential in protecting salmon and water quality in general. Various agencies have adjusted their internal activities to account for watershed health in their rulemaking and service provision. Since 1997, the Oregon Department of Transportation has revised its BMPs to meet Endangered Species Act standards, the Oregon Department of Agriculture has made significant progress on developing Agricultural Water Quality Management Plans for adoption in 41 basins, the Department of Forestry has revised state forest management practices, the Department of Environmental Quality and the Department of Fish and Wildlife have increased their involvement in statewide environmental law enforcement and monitoring programs, and many state agencies have enhanced employee and client training programs to ensure that watershed health is highlighted (OCSRI, June 2001). These are just a few of the accomplishments that state agencies have achieved since the passage of the first Oregon Plan for Salmon and Watersheds.

Many of these examples, while not all regulatory policies, represent the types of rules and internal reorganization efforts that have effects similar to those of regulatory policies.

Discussion

Oregon has had a long history of statewide planning. On the surface, the Oregon statewide planning program could be seen as a top-down management approach. On the other hand, Smith and Gilden (2002) contend that Oregon is frequently acknowledged as having very ambitious and mature approaches to supporting collaborative efforts using bottom up strategies in environmental and natural resource planning. An analysis of the Oregon Plan for Salmon and Watersheds suggests that Oregon may be doing both quite well.

The Oregon Plan emerged as a result of legislative requirements in the Endangered Species Act. The state responded by developing a comprehensive statewide plan to protect the threatened species and watershed health in general. The resulting plan was developed at the state level and brought together multiple state and federal agencies in the planning process. In terms of planning ideology, the Oregon approach models rational and adaptive planning at its core. It is a science based rational plan and depends upon scientific data gathering, continuous monitoring, and adaptive management as conditions change. The implementation strategies of the plan include enforcement of regulatory requirements to protect water quality and habitat health.

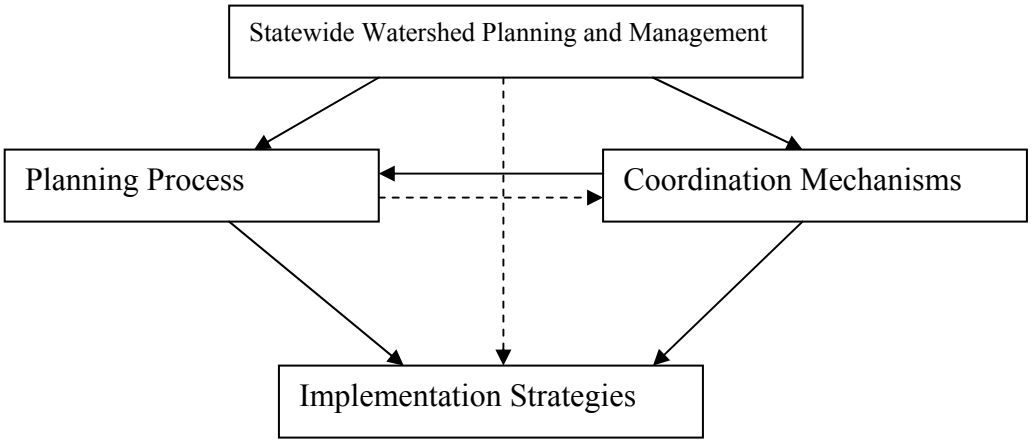
This top-down command and control approach is tempered by a dependence on public and stakeholder involvement, education, and outreach strategies. Although public participation in plan development seems to have been only slightly more than perfunctory, stakeholder collaboration and public involvement is central to the implementation of the plan. Moreover, updates of the plan integrate communicative planning ideology as the public plays an ever more significant role in the planning process. The addition of the Willamette Restoration Initiative's strategy for the Willamette River Valley to the Oregon Plan for Salmon and Watersheds is a testament to the importance of community based citizen groups and organizations in future planning for watershed management in Oregon.

The Oregon Plan builds coordination mechanisms necessary for interjurisdictional, interagency, and stakeholder collaboration and cooperation and engages citizens at every stage of the planning process. Through these mechanisms Oregon further encourages partnerships among local governments, community organizations, businesses, state and federal agencies, and other

interest groups. Finally, using regulatory top-down approaches for enforcement of existing policies and voluntary action from the bottom-up encouraged through creative education and outreach programs, the plan implements broad reaching strategies to achieve the goals of habitat enhancement for threatened Salmon species as indicators of overall watershed health in the state.

Whereas North Carolina depended upon top-down rational planning methods to produce an educational tool for local community action and Massachusetts focused on garnering local community support to develop a planning process from the bottom-up, Oregon chose to blend these methodologies and provides a more holistic and integrated model for statewide watershed initiatives as depicted in Figure 3.8. The state guided the initial planning process and ensured coordination through the various committees, councils, and formal agreements. Moreover, the use of reinforced regulations and rules from the state level are integrated into implementation strategies. Thus, the statewide program is directly linked to planning processes, coordination mechanisms, and implementation strategies. However, Watershed Councils and coordinated agency activities guide ongoing planning processes and implementation strategies on a more localized level. Planning processes lead to implementation strategies and in some cases may even suggest new mechanisms for coordination. Moreover, Watershed Councils can develop implementation strategies directly through internal deliberations. The model depicted in Figure 3.8 demonstrates the complex web that characterizes the Oregon approach as every component is connected to the state level and local level directly and through coordination mechanisms and planning processes.

Figure 3.8: The Oregon Approach



Despite the fact that after the Oregon Plan's initiation the Salmon have remained on the threatened list, the Oregon Plan has succeeded in increasing public awareness, stakeholder involvement, and action steps by various levels of government and non-governmental organizations. Watershed Councils are engaging in various projects throughout the state to restore and protect stream banks. Habitat is being restored within streams. Community monitoring programs are springing up throughout the state. Several streams and rivers once uninhabitable to the threatened Salmon have been restocked and are serving as spawning grounds again (OCSRI, 1998; OCSRI, 1999; OCSRI, 2000; OCSRI, 2001). While the end goal is to remove the Salmon from the Endangered Species list, the strategies that the Oregon Plan identified to reach that goal are being implemented widely throughout the state. Thus, this plan, like the Massachusetts program, demonstrates its effectiveness through numerous success stories that fill the updates and newsletters associated with the program.

Three Distinct Approaches

North Carolina, Massachusetts, and Oregon offer three distinct approaches to statewide watershed planning and management. Each state at least partially if not wholly was responding to federal policy directives: the Clean Water Act, the Safe Drinking Water Act, and/or the Endangered Species Act. How each state chose to react to directives depended at the very least upon the political and social culture of the state, on funding at the state level, and on the relative flexibility of the directive to which the programs were responding. The planning processes, coordination mechanisms, and implementation strategies that emerged from these approaches are summarized in Table 3.3. In North Carolina, a largely top-down approach guides planning and implementation, but lacks coordination. Massachusetts has chosen to delegate authority to local communities with the planning process and implementation while the state ensured coordination, cooperation, and collaboration through Watershed Teams. Finally, Oregon blends the two models maintaining significant state level control and involvement at every stage of the process but allowing local communities to coordinate their actions and cooperate to develop planning processes and implementation strategies primarily through Watershed Councils.

Table 3.3: The Three Statewide Approaches

State	Planning Process	Coordination	Implementation	Key Characteristics
NC	Rational, scientific	--	Regulatory, educational	Top-down planning and management
MA	Communicative, collaborative	Watershed Teams	Education, outreach, voluntary action, shared resources	Civic environmentalism, bottom-up planning and management
OR	Rational, communicative, collaborative	Watershed Councils, Advisory Committees, Memorandums of Understanding & Agreement	Regulatory, education, outreach, voluntary action, funding	Integrated planning and management blending bottom-up and top-down approaches

Chapter 4: Discussion

Applying Watershed Principles to Regional Planning

This paper has focused on an analysis of statewide watershed planning efforts as regional approaches to water quality and ecosystem management. The Clean Water Act Amendments of 1987 and the analysis of the EPA Office of Policy, Planning, and Evaluation have led to greater emphasis on controlling nonpoint source pollution. The emerging management strategy for water resources is the watershed protection approach, a more holistic and integrated effort to plan and manage for environmental quality goals within an ecosystem context. The guidance of the EPA has led multiple states to implement watershed planning and management programs. Each state approaches watershed planning and management within the political, economic, social, ecological, and cultural characteristics that define the state's populous, geography, and environment.

Watershed planning and management, as a holistic approach, is a very complex method for addressing challenging water quality concerns. Even so, many states have responded with creative programs to engage in ecosystem management strategies. North Carolina, Massachusetts, and Oregon are three states that have attempted to develop watershed planning and management programs. Each of these states represents a distinct approach for developing and implementing watershed planning and management at the statewide level. Water quality managers, planners, and community members can gain many insights from these states to determine how to develop watershed planning and management programs to achieve environmental goals in the context of the characteristics of their state and local communities.

North Carolina, Massachusetts, and Oregon provide examples of three very different approaches to watershed planning and management at the state level. In every case, the effectiveness of the watershed or basin planning programs is hindered by the fact that state boundaries do not coincide with watershed boundaries. Until these states enter formal agreements with bordering states or where these states have voluntarily adopted statewide watershed initiatives of their own, water quality will likely be negatively impacted by in flows from neighbors. Nonetheless, these states have initiated watershed protection programs on a regional scale within their boundaries and encourage local jurisdictions to work together to achieve water quality and habitat protection goals.

North Carolina has a rational scientific approach to the planning process. Adaptive planning is formalized, but communicative planning is minimal. Planning documents serve primarily as educational tools and scientific information sources for communities and planners. Every river basin in the state has a plan, but implementation depends entirely upon localities. Watershed planning is required in the state for water supply protection. For those watersheds that feed a water body that serves as a surface water intake for community water supplies, localities are compelled to engage in watershed planning and management. However, for the remaining watersheds in the state, localities must voluntarily engage in watershed planning and management for it to be implemented on the ground. It is not clear whether the basinwide planning program is reaching local governments and associations to incite action at the local level. This approach appears to have limited success as currently developed.

In many ways, the Massachusetts approach is in sharp contrast to North Carolina's approach. Communicative and collaborative planning is paramount to the Massachusetts Watershed Initiative. Watershed Team leaders guide local communities through the planning and management process. This approach depends upon bottom-up planning and management efforts and provides only base line guidance from the state level. Massachusetts clearly has a long term commitment to watershed planning and management by giving power to locally based Watershed Teams. Currently, planning activities are somewhat inconsistent across the state. Some team leaders have garnered active community involvement and support in gathering data and engaging in the planning process. Moreover, many teams have engaged in direct restoration and pollution mitigation projects. Educational and outreach programs abound. However, several of the watersheds lack up to date scientific data and many do not yet have action plans. Future evaluations of the Massachusetts approach may reveal that in the long term this strategy is effective. It is nonetheless evident that this approach emphasizing community based watershed planning, while perhaps more effective than a purely rational approach with little stakeholder involvement, does not necessarily lead to immediate results in every community.

Of the statewide initiatives, Oregon is the most integrated. Using rational, comprehensive, adaptive, communicative, and collaborative planning processes, the state has developed a plan that highlights education and outreach programs while reinforcing regulatory and funding initiatives. Coordination mechanisms are formalized to ensure interagency coordination and interjurisdictional cooperation within the state. Local, state, and federal

agencies have been brought together to coordinate planning and management strategies. Stakeholder involvement is ensured through community-based planning and participation on Watershed Councils. This approach is the closest of the three statewide initiatives to thoroughly implementing the guidelines suggested in the academic and professional literature on watershed planning and management. Numerous success stories indicate that the planning and implementation processes are having a direct effect on water quality and habitat in the state. Although the community based Watershed Councils vary in their make up and enthusiasm, broad state level support provokes widespread action. It is important to point out, however, that this level of planning requires a significant amount of funding and administrative oversight. Not every jurisdiction will be able to invest the time and resources needed to achieve watershed planning of this magnitude. Moreover, political and social cultures in the state allow for this blending of top-down and bottom-up approaches. This type of approach, while accepted in Oregon, may not be politically feasible in other states. Nonetheless, of the three programs analyzed in this paper, the Oregon approach represents the most comprehensive, holistic, and integrated statewide watershed planning and management program.

Although an evaluation of the outcomes of these programs cannot be undertaken at this stage given the long term horizon of watershed planning and management, analysis of these three state programs suggests that coordination mechanisms are likely essential to the development of successful watershed planning and management programs. North Carolina is the only state that does not seem to have formalized coordination mechanisms in place. Clearly, the state recognizes the importance of coordination as evidenced in the rhetoric of the planning documents. However, a lack of formal coordination seems to limit the effectiveness of outreach and implementation efforts in the North Carolina model. Both Massachusetts and Oregon provide examples of strong coordination mechanisms that are designed to support interagency coordination, interjurisdictional cooperation, and stakeholder collaboration. The Oregon approach blends top-down and bottom-up coordination. The state plan outlines specific tasks for state agencies and federal agencies are brought into the process through formal agreements. Watershed Councils serve as the major coordinating mechanism on the local level ensuring stakeholder involvement and encouraging interagency coordination and interjurisdictional cooperation on a more local level. The Massachusetts approach to coordination is less developed than Oregon's at the top, but Watershed Teams serve a similar function as Oregon's Watershed

Councils. Collaboration among stakeholders, interagency coordination and interjurisdictional cooperation are encouraged through team membership and through outreach programs to the public and local governments within each watershed. The level of public participation encouraged by these mechanisms in both Oregon and Massachusetts ensures a more open planning process as well. This level of outreach and participation is a necessary component of watershed planning and management as an approach to deal with complex problems such as nonpoint source pollution. By engaging the public and stakeholders in collaborative watershed planning while seeking ways to work across institutional barriers inherent in American federalism, Oregon and Massachusetts have developed watershed planning and management programs that have initiated projects throughout each state for the preservation and restoration of water quality and habitat.

Future Directions: From Regional Policy to Local Implementation

Land use planning is a power generally delegated to municipal or county level jurisdictions. This delegation of power trusts that localities can better identify and plan for particular conditions within their communities better than a regional or state agency. Within environmental policy, the EPA has recently turned to communities to practice what is known as "community-based decision making" (Finnegan and Sexton, 1999: 333). Emphasizing a process of problem assessment and strategy development on the local level places significant authority in the hands of local communities.

In addressing water quality concerns, especially nonpoint source pollution problems, land use planning may play an essential role in defining problems and implementing solutions. However, water crosses jurisdictional boundaries. Recognizing this attribute of water has led to overarching regional policies and agreements that can guide local decision makers' responses to water quality and habitat concerns. Regional policies are explored in this paper through statewide approaches to watershed planning and management.

While state policies and plans provide a framework for guiding local efforts, the implementation of these broad based plans and policies frequently depends upon localities. Land use planning authority is still largely delegated to local policy makers. Thus, to evaluate the effectiveness regional watershed plans and policies, the analysis must be expanded to include a more thorough assessment of local planning and implementation efforts.

Translating regional policy objectives and integrating those objectives into local planning processes can be challenging given that numerous local governments must identify with the goals of the regional policy. Planning defines a policy direction and suggests strategies for action to achieve broadly defined policy goals. At the regional level, policy makers guide the planning on the local level. Local planners then interpret the policy direction into a local watershed plan. Finally, agencies, departments, and citizens at the local level implement the strategies defined in the local plans. The transfer of information and intent in this process can lead to significantly varied levels of success at achieving the broader goals of the regional plans and policies.

Future research in watershed planning and management is needed to explore these linkages between regional policies and local implementation. How do local planners integrate watershed management principles into their plans and planning processes? To what extent do local planners respond to regional policies versus identify local direction within their communities? How do local planners and communities influence the goals, objectives, and strategies identified in regional policies? How effective are strategies implemented on the ground and are they achieving stated goals? These are just some of the questions that should be explored further in future research on watershed planning and management.

Appendix: Watershed Units, Planning Stages, Coordination Mechanisms and Implementation Strategies

Watershed Units

The foundational level of the watershed concept is the basin, an area that includes all of the land associated with waters that drain into a specified river system or water body. The area of basins can reach many thousand square miles. Basins often cross state or even national boundaries and incorporate numerous local government units. A river basin consists of multiple sub-basins, each draining a river system that is a tributary of the larger river. Again, these sub-basins can cross state and national boundaries, but many are found within states as they tend to cover only in the hundreds of square miles. Each sub-basin consists of multiple watersheds, the first level of drainage systems upon which local planners often focus. Watersheds often cover less than 100 square miles and include the land area that drains a specific point on a waterway. Watersheds are sometimes contained within local planning jurisdictions; however, many watersheds cross jurisdictional boundaries and therefore require interjurisdictional cooperation for successful management.

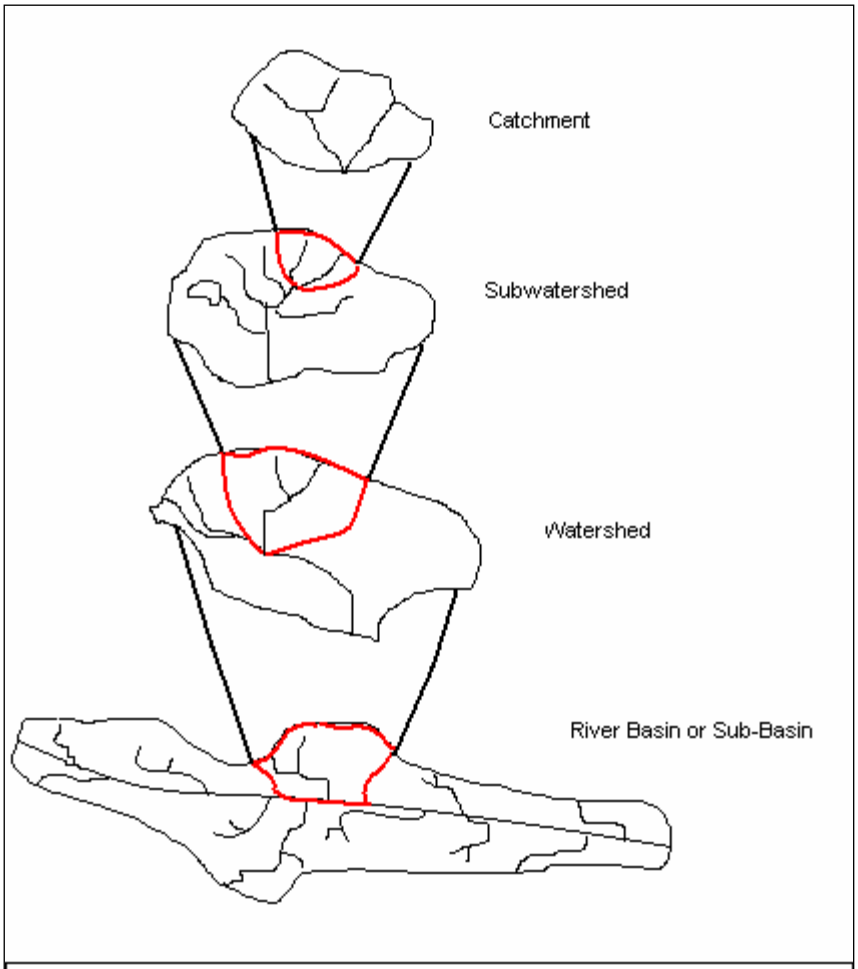


Figure A.1: Watershed Units

(Adapted from Schueler and Holland, 2000d)

Watersheds can be divided into sub-watersheds that usually include the land area that feeds runoff to a point at or near the confluence of two second order streams (those that emerge from the intersection of two headwater streams). Subwatersheds often cover areas of less than 10 square miles and are sometimes areas as small as 1 square mile. Some counties that engage in watershed planning and management divide their county into multiple "watersheds" based on the sub-watershed level, such as in the Fairfax County Comprehensive Plan. The final unit is the catchment, the drainage area of runoff from specific development sites that are generally less than half a square mile. Catchments are often used at the site development level and are almost always within local government jurisdictions (Schueler and Holland, 2000d).

Stages of the Planning Process

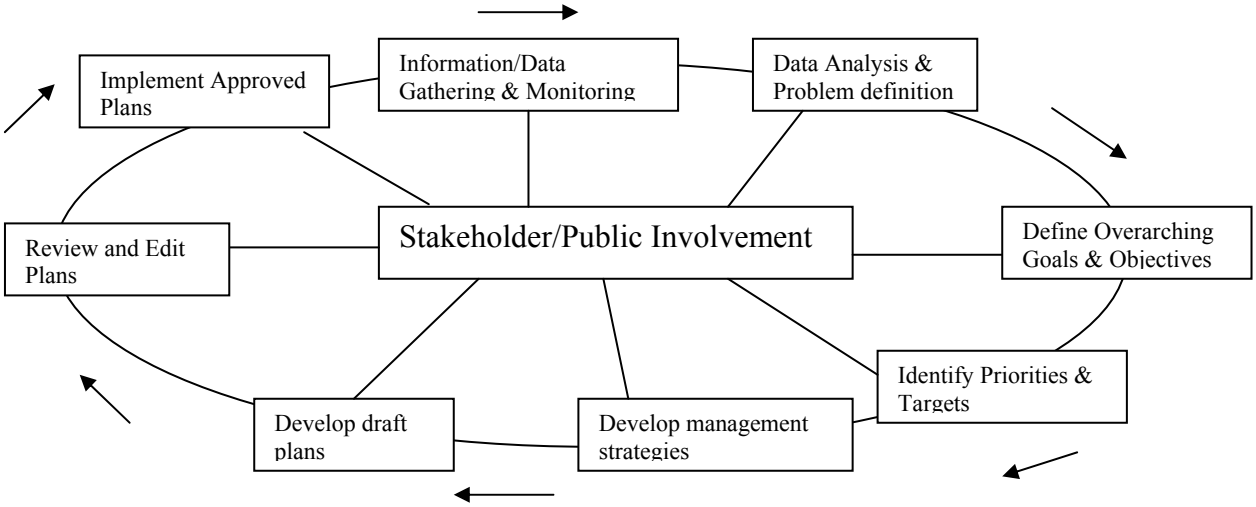
Various models of environmental decision making and watershed planning processes have been developed some of which are outlined in Table A.1. Basic elements of each model highlight planning stages and then attempt to identify where public involvement should take place. The National Research Council (2000) and Holst (1999) adapted the statewide EPA structure in their schematics. They emphasize stakeholder involvement at the center of their circular depictions that imply continuous adaptation. Heathcote (1998) outlines a planning process of 11 stages and insists that public involvement and adaptive management practices must be built into the framework. English (1999) specifies 9 stages and integrates adaptation and public participation. Duram and Brown (1999: 457) list 14 stages that serve as the basic structure of the watershed planning process. In the 64 watershed projects for which Duram and Brown (1999) gathered data, the public was involved either selectively or throughout the entire process. Thus, stakeholder involvement is not central in their model. Based on their findings, watershed planning seems to be built on the rational and adaptive planning models with communicative and collaborative planning mechanisms unevenly applied.

Table A.1: Stages in the Watershed Planning Process

Summary Model	Heathcote, 1998	Holst, 1999	Duram & Brown, 1999	English, 1999	NRC, 2000
Information/Data Gathering & Monitoring	Develop watershed inventory	Gather & Asses Data; Strategic Monitoring	Outreach for information; Analyze data; Clarify data; Resource status	Characterize social, economic, environmental, legal, and regulatory setting	Inventory and contaminant assessment; Monitoring and Evaluation
Problem Definition	Define & scope problem	Data Assessment	Identify issues	Specify the issue	Contaminant assessment
Goals and Objectives	Set clear goals		Define goals	Determine the goals and values	Goal and objective setting
Priorities & Targets	Criteria and constraints; Compare alternatives	Establish Priorities and Targets	Prioritize issues; Refine goals	ID goals, values, characterizations; Identify options; Forecast; narrow options	
Management Strategies	List, evaluate, test options, assess feasibility; develop strategies	Develop alternative management strategies	Select option		Development of protection strategies
Draft Plans	Develop implementation measures	Develop mgmt plans	Prepare draft plan		
Review and Edit			Review/public hearing		
Implementation		Implementation	Implement approved plan; update plan		Implementation

Drawing from the above literature, a combined model for the planning process for watershed management is provided in Figure A.2. The model is elliptical to demonstrate that the process is continuous and ongoing. Any of the steps of the planning process may occur simultaneously. Moreover, continuous monitoring and data analysis calls for adaptive management and planning. Plans are updated as changes occur. Finally, stakeholder involvement and public participation is tied to every stage of the planning process. Because there is no clear polluter in nonpoint source problems, it is difficult to determine who should pay the costs of clean up and prevention. Thus, policy makers enlist the support of citizens and interest groups at every stage of the process. Duram and Brown (1999) point out that watershed processes across the nation utilize public input selectively in some cases. Effective management may be achievable if some of the links to stakeholder and public involvement are broken. However, this model suggests that public participation should be sought at every stage possible.

Figure A.2: Modeling Watershed Planning Processes



Coordination Mechanisms

Coordination mechanisms in watershed planning and management can take a variety of forms. Nonetheless, some level of formalized structure is generally needed to ensure interjurisdictional cooperation, interagency coordination, and stakeholder collaboration. The following exploration of scholarly literature lays the foundation for understanding the importance of coordination mechanisms in the realm of watershed planning and management.

Interjurisdictional Cooperation

Dworsky et al. (1991: 480, as cited in Ballweber, 1999) suggest that the federalist system of the United States has greatly influenced the type of management approaches used in water resources:

> Water and related natural and environmental resource management…has always been guided by the fact that the nation's waters…are largely interstate either directly or indirectly. We find that the planning and management of such systems and the evolved national (federal, state, local) management institutions requires close cooperation and collaboration—close intergovernmental sharing—for interstate as well as intrastate matters.

Current management paradigms separate various levels of government and encourage definition of governmental objectives and visions in isolation (Cortner and Moote, 1999). Watershed management requires consideration at large spatial scales and therefore invariably crosses political boundaries. Depending on the watershed unit chosen for management local, state,

federal, and/or international levels of government may be involved in the planning process. Cooperation among these various levels of government ensures that the planning process and management strategies are efficiently and effectively implemented. Watershed Councils, Watershed Commissions, Soil and Water Conservation Districts, and Interstate/International Commissions are some of the types of coordination mechanisms used to guide local and regional planning efforts and ensure consistency across jurisdictions.

Interjurisdictional cooperation can take shape in many ways. Some legislative support for this interjurisdictional coordination exists. The National Environmental Policy Act (NEPA) requires federal government agencies to coordinate their efforts in resource planning with state and local governments. Public and private concerns must also be taken into account. Several legislative requirements for federal agencies ensure that agencies will coordinate with other levels of government as they enact their missions (Cortner and Moote, 1999).

Working within larger political boundaries is an approach often used in watershed management. Choosing this route eases tensions that may result when involving other jurisdictions and levels of government. Many states have chosen to enact watershed based planning initiatives. These initiatives encourage (or coerce) local compliance with state goals or plans. Thus, interjurisdictional cooperation is enforced through standardized goals, procedures, and implementation strategies at a higher level of government. Watershed management and planning at this level only impacts portions of watersheds that are within state borders thus the states avoid conflicts that may arise in working with neighboring states. North Carolina, Massachusetts, and Oregon have enacted statewide policies that are analyzed in Chapter 3. The greatest weakness of this approach is that few basins are fully contained within one state. In basins that cross state borders, watershed management takes place only on the portions of the rivers within state boundaries. This assessment simplifies the reality that some states have also sought to engage federal agencies and bordering state agencies in their planning processes. Nonetheless, coordination across state boundaries is not always formalized in the statewide planning process.

Many states and federal agencies have worked beyond political boundaries to develop policies and plans designed to achieve goals within an ecosystem unit, usually an entire drainage basin at the regional level. Regional plans often require that several states or even more than one nation are involved in developing goals, objectives, and strategies to meet environmental or

water quality aspirations within a large watershed area. Joint agreements emerge from a political process that involves high level interjurisdictional cooperation. Implementation of the agreement often depends upon individual state or national governments setting standards for local government units. Again, interjurisdictional cooperation of this type depends upon a higher level of government ensuring that local governments comply with standards. Still, interstate regional agreements develop coordination mechanisms that build cooperative working relationships among state and federal agencies across multiple jurisdictions to achieve common goals. The Chesapeake Bay Agreement, the Great Lakes Joint International Commission's policies and plans, and the Gulf of Maine Council on the Marine Environment are examples of region-wide ecosystem based policy agreements the latter two of which cross national as well as state boundaries.

Finally, local governments are sometimes quite innovative in their efforts to develop consistent plans within a smaller regional scale. Local governments can work together independent of an overarching structure to develop watershed based plans. Local governments also work within existing regional authorities such as Planning District Commissions or Soil and Water Conservation Districts to ensure collaboration in local planning processes. They may solicit the input or expertise of nongovernmental agencies that can guide collaborative processes among several jurisdictions. The Anacostia Watershed Restoration Agreement among Prince Georges County, Montgomery County, and the District of Columbia is an example of local communities working together to develop watershed based strategies. The scope of this paper does not allow for analysis of this level of interjurisdictional cooperation; however, future research in watershed planning should focus on local interjurisdictional cooperation as implementation of watershed management objectives and strategies depends largely on local governments.

Interagency Coordination

Comprehensive watershed planning and management cannot be achieved by a planning department in isolation of other governmental agencies. As Ballweber (1999: 643) suggests, "there is a growing realization that traditional governmental boundaries and agency administrative infrastructures are often ineffective and subject to institutional gridlock when applied to natural systems such as watersheds or river basins." He further notes that agency

missions are often conflicting or divergent and authority at the state and federal levels may be blurred with natural resource concerns (Ballweber, 1999). Thus, in order to achieve broad ecosystem goals, some level of coordination among various agencies is essential for integrated watershed planning and management.

Schueler and Holland (2000a) concur with Ballweber on this point. They contend that interagency coordination is essential especially when more than one political jurisdiction is involved in watershed management. Cortner and Moote (1999) point out that the administrative cultures within agencies often leads to a stance of "turf protection" rather than cooperative arrangements. Coordinating across agencies "is needed to meet the greater data and research requirements of ecosystem management, reduce repetition, ensure data comparability, and share results" (Cortner and Moote, 1999: 118). Across jursidictions, agencies often rely on political agreements to guide agency actions and legitimize partnerships with other agencies. Even at the local level, however, agency coordination is important in watershed planning and management efforts. Coordination is somewhat less complicated when involving only one jurisdiction:

> bureaucratic navigation can be confined to local agency coordination, i.e., reaching consensus among the many conflicting units of local government (planning, development review, public works, parks, resource management, transportation, and economic development to name but a few). Each of these units of local government plays a key role in either the formulation or implementation of the subwatershed plan, and needs to be represented in the stakeholder process (Schueler and Holland, 2000a: 160).

Within the local government structure and regional frameworks, departments and agencies charged with planning are not the only actors that can affect land use practices and implementation of water quality protection. Health departments, parks and recreation, transportation, water and sewer, erosion and sediment control, environmental quality regulators, and many other offices can have profound impacts on the effectiveness of water quality efforts. Without the insights, knowledge, and support of these myriad agencies, achieving the goals of the watershed plan can be hindered. Moreover, a lack of coordination among these actors risks inefficient resource allocation and repetitive or conflicting policy approaches.

Stakeholder Involvement and Public Participation

The accomplishment of ecosystem or watershed based goals may depend upon successful democratization of decision-making (Michaels, 1999). Involving stakeholder groups, community members, concerned citizens, agency officials, and other interested parties in the process of

developing ecosystem and watershed based plans provides the opportunity for numerous points of view to be heard and integrated into the planning process. This type of involvement is vital in the watershed management framework, especially when dealing with nonpoint source pollution problems (Brady, 1996; Duram and Brown, 1999; Heathcote, 1998). Participating members of the public can help define the goals of the plan or policy and will more likely support the outcome. Community members and other stakeholders provide input into all phases of the planning process from adding another layer in information gathering to suggesting innovative ideas in the implementation phase. This allows for inclusion of local knowledge to enhance understanding of public concerns and for information to be shared to enhance plan effectiveness in implementation.

Environmental regulatory approaches have recently focused on involving the public and specific stakeholders in meaningful ways in both the information gathering and decision-making processes. Edward Weber (1998) demonstrates that involving the public and stakeholders in environmental decision making processes can be extremely complicated, especially when developing national level policies; still, he contends that when conditions warrant the involvement of stakeholders, creative policy solutions can result. Wondolleck and Yaffee (2000) and John (1994) suggest that public participation and collaboration is not only achievable, but it may lead to more effective long term solutions to environmental problems at state and even federal levels.

In some environmental policy arenas, however, collaborative processes and consensus decision making may lead to the implementation of largely ineffective policy measures because of extensive compromises needed to reach consensus. Coglianese (1999) describes an EPA led process which was meant to revamp the nation's environmental policy structure through a consensus decision making process involving nearly 30 stakeholder groups. His assessment of the final document is that it lacks analytical robustness, fails to identify specific measures to achieve goals, and does not achieve the desired innovation. While the report calls on policy makers to engage stakeholders and the public in a collaborative consensus building process, it also notes that collaboration can be slow, require substantial resources, and be contentious (Coliagnese, 1999).

In her discussion of the case of the New England fisheries crisis, Judith Layzer (2002) points out that the involvement of multiple stakeholders in the decision-making process led to

ineffective policy making as well. She notes that in their attempt to balance conservation of groundfish with preserving the New England fishery industry, the "fishery managers have spun their wheels" (Layzer, 2002: 203). Responding to their mandate to implement cooperative management, the fishery managers sought not to antagonize environmentalists, fishery scientists, and the fishers who depended upon catching and selling the fish. For nearly two decades an incremental policy approach simply slowed the economic demise of fishers while continuing to deplete the groundfish stocks in the Gulf of Maine. Until lawsuits led to a redefining of the policy with more regulatory teeth, the cooperative management approach involving stakeholders did little to protect either the declining groundfish stock or the New England fishers (Layzer, 2002). This case demonstrates that stakeholder involvement does not always lead to effective management of natural resources and the environment.

Within the realm of watershed management, finding the balance between involving members of the public and seeking consensus across multiple interest groups will largely depend upon specific situations in target watersheds. At times, consensus does not eliminate conflict or lead to more effective policies (Coliagnese, 1999; Layzer, 2002). On the other hand, not involving the public in the process at some level in watershed management will inhibit the ability of planners and managers to deal with the most significant challenge facing water resources today: nonpoint source pollution (Schueler and Holland, 2000a). The environmental scientific and policy communities have not developed a definitive way to mitigate nonpoint source pollution. Not involving stakeholders and the public hinders the inclusion of multiple perspectives on how to deal with nonpoint source pollution problems. Moreover, dealing with nonpoint source pollution requires that multiple landowners in the watershed alter traditional land use practices. Consensus decision-making may not be necessary but stakeholder and public involvement is generally regarded as essential at some level to ensure support of diffuse landowners and communities (Heathcote, 1998; Michaels, 1999 and 2001; Randolph, 2003; Schueler and Holland, 2000a).

Within watershed management, public participation and stakeholder involvement varies widely across the nation. Duram and Brown (1999) surveyed 126 (64 respondents) federally funded watershed initiatives throughout the nation to determine the level of public participation in watershed planning. They identified five major factors that should be evaluated when assessing public participation in watershed planning: management approaches, identification of

stages where public will be involved, solicitation methods for participation, level of participation, and the impacts that participation may have on the watershed (social, political, and environmental). Briefly, management approaches include regulatory/bureaucratic, a top-down approach, or collaborative/grass-roots efforts that engage decision makers and the public in consensus decision making. The public can be involved in the various stages of the watershed planning process either selectively or throughout the process. Participation can be solicited using one-way (pamphlets, newspapers) or two-way (interviews, public meetings) communication means. The public can be engaged on the decision making level or the advisory level. Finally, the positive impacts of public participation include greater citizen awareness, interagency coordination, information dissemination, consensus in decision making, and improving environmental and social conditions. Duram and Brown (1999) found that the public can be involved throughout the process or only at select stages. Yet, the public was engaged at some level in every project they assessed.

Standard public involvement tactics include open meetings, workshops, or trainings that are designed mainly to "inform" the public. Watershed management, in principle, should provide more substantial opportunities for public and stakeholder involvement in every stage of the planning process. Dennis Hall, a watershed coordinator in Ohio, suggests that watershed management cannot depend on educating people. Instead, "learning" and "understanding" must be promoted by watershed managers (US EPA, Office of Water, 1997). Hall recognizes that knowledge is expanded when shared among stakeholders in the watershed. Thus, traditional public involvement tactics that mostly inform interested citizens are not enough for watershed plan development and implementation.

With the help of multiple watershed and environmental managers, Schueler and Holland (2000a) identified 11 reasons that watershed plans have failed at the local level and 12 elements of effective watershed plans. One of the 11 reasons that plans failed was that public participation and stakeholder involvement was minimal or non-existent. In some cases, the affected stakeholders were either not identified or allowed to participate in the watershed planning process. This is contrary to the principles of watershed management:

> The purpose of the watershed management process is to allow stakeholders a legitimate and early opportunity to participate in the development of the plan. Stakeholder involvement provides the foundation to obtain the feedback, consensus, and support needed in the implementation (Schueler and Holland, 2000a: 154).

Their findings suggest that key stakeholders should be identified up front and allowed to participate in the process from the beginning and that the public at large should be given opportunities to participate early and often. Based on the experiences of these practitioners, planners who attempt to develop plans without involving stakeholders and the public may find implementation of their plans very challenging.

In terms of coordination mechanisms to support stakeholder involvement, interagency coordination, and interjurisdictional cooperation, multiple strategies exist. Lead agencies often institute Watershed Councils, Advisory Committees, or Task Forces to guide the planning and decision making processes (Randolph, 2003). These institutions generally include stakeholders from affected community groups, business leaders, environmental groups, agency contacts, political leaders, and others. Providing seats at the decision making table for multiple stakeholders is one way to ensure that the needed communication among various parties is woven into the planning process.

Implementation Strategies[2]

Implementation strategies are policy responses that attempt to enhance water quality and habitat in pursuit of watershed planning goals. In theory, the purpose of public policy is to correct collective action problems (Bickers and Williams, 2001). Policy attempts "to change people's behavior and… coordinate individual and organizational behavior in the service of collective goals" (Stone, 2002: 263). Schueler and Holland (2000c) of the Center for Watershed Protection (CWP) provide a list of eight major tools and numerous subtools that are essentially implementation strategies for watershed planning and management. These tools are summarized below with the addition of market systems, a response omitted by Schueler and Holland (2000c). Table A.2 lists the subtools and classifies them as regulatory, funding, education and outreach, or voluntary action implementation strategies. These categories are outlined briefly in Chapter 2.

Zoning: The primary tool of land use planning is zoning. Within a watershed, the CWP suggests using watershed based zoning, overlay zoning, and large lot zoning[3] to protect water

[2] Except where noted, the majority of this section was adapted from the Center for Watershed Protection article, "The Tools of Watershed Protection", Schueler and Holland (2000c).

[3] Research by Booth, Hartley, and Jackson (June, 2002) in King County, WA suggests that large lot zoning may not be appropriate in all cases as the use of chemical fertilizers and pesticides on lawns as well as a decrease in porosity

resources. Each of these tools is designed to regulate the location of various land use activities. The primary concern to land use planners is the level of imperviousness in a watershed. The goal is to minimize impervious surfaces while concentrating development in areas away from surface waters. Urban growth boundaries (UGBs) are another tool of the land use planner that can help contain development within a designated location while also influencing timing as the boundary delineating where development can take place shifts over time.

Land Conservation: Land conservation efforts can include land acquisition, conservation easements, regulation of land alteration, exclusion or setbacks from water hazards, inclusion in green space or open space designs, landowner stewardship and public sector stewardship. Aquatic buffers are a type of land area that the CWP encourages for land conservation efforts. The importance of aquatic buffers as a critical area for the protection of water resources is highlighted in the article demonstrating that planners should protect these areas in multiple ways.

Better Site Design: Key strategies within better site design include open space or clustered residential subdivisions, green parking lots, headwater streets, and rooftop runoff management. Better site design is an effort to decrease the amount of impervious cover in a given watershed area. Cluster or open space designs can reduce lot sizes on concentrated development areas decreasing street requirements while increasing the percentage of open space and pervious land cover. Green parking lots rely on semi-pervious paving options and/or a decrease in size requirements for lot coverage to reduce the level of runoff from commercial areas. Headwater streets are deigned to reflect waterway attributes: the further upstream you go, the narrower the streams become. Adjusting the requirements for street widths based on traffic volume calculations can reduce overall imperviousness. Finally, rooftop runoff can be directed to run over pervious surfaces before reaching impervious streets and drainage systems reducing the level of runoff from a particular site.

Erosion and Sediment Control & Stormwater Management: Erosion and sediment controls protect against soil losses from a development site that can severely impact water resources.

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of soils in suburban style yards can be nearly as damaging to water quality as impervious surfaces in dense population centers. Therefore, they suggest measuring impervious cover as a negative and forest cover as a positive on competing ends of the land use spectrum within a watershed area.

Because development often involves the removal of vegetation, natural forms of erosion prevention are eliminated. Special efforts should be made to reduce the deleterious impacts that development projects can have on waterways. Once development is completed, stormwater management practices are implemented to guide runoff from the site while providing opportunities to reduce the rate and volume of the runoff and to clean the runoff chemical content. Stormwater controls traditionally were designed to decrease flooding. However, as more is learned about water quality degradation through urbanization, stormwater controls have been adapted to incorporate ecosystem protection as well.

Non-stormwater Discharges: Non-stormwater discharges can come from industries, wastewater treatment plants, or even septic systems. The National Pollution Discharge Elimination System (NPDES) has had a significant impact on the quality and quantity of point source discharges (Ortolano, 1997 and Freeman, 2000). Nonetheless, these discharges can still have significant impacts on surface and groundwater quality. Because of their widespread use across many watersheds, septic systems are sometimes considered diffuse pollution sources given that they are site specific and the actual source of fecal coliform bacteria in waterways and groundwater can be difficult to determine. Still, watershed managers can take steps to educate septic owners and work with the health department to identify particular threats.

Watershed Stewardship: Finally, the CWP suggests that Watershed Stewardship Programs are a significant component of a watershed planning effort. These programs include watershed advocacy, watershed education, pollution prevention, watershed maintenance, indicator monitoring, and restoration. Most of these efforts are ways to reach out to the public, interest groups, area businesses and industries, and others to educate them when necessary, promote citizen efforts when possible, and gain the support of the public in monitoring and assessing watershed conditions.

Markets: None of the tools identified by the CWP create markets for goods where no markets currently exist. Examples of this type of strategy might be similar to tradable pollution permits currently used to control sulfur dioxide emissions or BOD dischargers on the Fox River in Wisconsin (Ortolano, 1997:232-237). Nitrogen trading permits and point-nonpoint trading

permits are potential market based strategies in the Chesapeake Bay (Horan et al., 2002). However, given the sporadic use of market based mechanisms in watershed management at this stage, these types of implementation strategies are not thoroughly discussed in this paper. As experimentation in this policy realm expands, future research will need to focus more resources on exploring the effectiveness of these mechanisms in water quality management.

Table A.2: Classification of Watershed Protection Tools as Implementation Strategies

Watershed Protection Tools	Regulation	Education	Funding: Tax, Subsidy, or Grant	Voluntary Actions
Land Use Planning	Zoning, UGBs	Public participation		
Land Conservation	Regulate land alteration, setbacks from water hazards	Education programs for landowners	Land acquisition, conservation easements, public sector stewardship	Conservation easements, landowner stewardship
Better Site Design	Clustered subdivisions, green parking, rooftop runoff, headwater streets	Education programs for developers	Reduced fees or subsidies for implementing better site design techniques	Clustered subdivisions, green parking, rooftop runoff
Erosion & Sediment Control	E&S ordinances	Education programs for developers	Reduced processing fees for exceeding requirements	Developer going beyond ordinance requirements
Stormwater BMPs	Stormwater management ordinances	Education programs for developers	Subsidies or reduced fees for BMPs beyond requirements	Better site design techniques beyond ordinance requisites
Non-stormwater discharges	NPDES system, septic permits	Public health agency programs		Septic owner maintenance
Watershed Stewardship		Advocacy, education, and outreach	Maintenance and Restoration programs	Pollution prevention, indicator monitoring, maintenance, restoration

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William Hale Butler

Education

Master of Urban and Regional Planning, *May 2003* GPA: 4.0/4.0
Virginia Polytechnic Institute and State University, Blacksburg, VA
Focus Areas: Environmental planning, growth management, comprehensive planning, and research methods
Other Courses of Interest: Land Use and Planning Law, Theory and Practice of Planning, Environmental Economics
Major Paper: "Planning for Water: Statewide Approaches to Watershed Planning and Management"

Bachelor of Arts, Economics and French, *May 1996* GPA: 3.89/4.0
Guilford College, Greensboro, NC High Honors & Departmental Honors
Focus Areas: Micro and macro-economic methods, international economics, research methods and analysis

Planning Projects

Mayo River State Park Master Plan, Rockingham County, North Carolina
Planning Consultant for the Dan River Basin Association, May 2003-present
• develop an assessment of geology, natural resources, historic resources, and recreational uses on the Mayo River
• work with local community members and state officials to develop a general design of the Mayo River State Park
• create maps and descriptions of focal points, linear connections, facility sites, recreational opportunities, and other essential components of the park plan

Environmental Component of the Comprehensive Plan, Montgomery County, Virginia
Class project for Environmental Studio, Virginia Tech course UAP 5794 Fall 2002
•developed water resources components of the comprehensive plan, specifically surface waters and groundwater
•assisted classmates in developing open space and other water resources components

Future Land Use Study and Plan for Price's Fork, Virginia
Class project for Land Use Planning, Virginia Tech course UAP 5304 Fall 2002
•created environmental land use maps and a developability scale for future land use on parcels in the community
•developed a future land use scenario for a hamlet model for the community

Water Quality and Recreational Use Plan for the Mayo River Corridor, Rockingham County, North Carolina
Project for Natural Resources Planning, Virginia Tech course UAP 5414, Spring 2002
Internship for the Dan River Basin Association (DRBA), Summer 2002
•developed water quality and water resource use assessment
•assessed recreational use conditions along the Mayo River
•recommended action steps for a future Paddle Trail, riparian buffer protection, and water quality enhancement
•developed landowner maps and lists for DRBA to assist with land conservation efforts

Comprehensive Plan, Town of Ridgeway, Virginia
Class project for Urban and Regional Planning Studio, Virginia Tech course UAP 5124 Spring 2002
•developed the Economic component for the comprehensive plan
•assisted classmates in developing and editing other components of the comprehensive plan

Conferences and Trainings

14th Annual Environment Virginia Conference
Water: Securing Virginia's Future, Lexington, VA April 2003

Community-wide Dispute Resolution Training
Institute for Environmental Negotiation, University of Virginia, Charlottesville, VA January 2003

44th Annual American Collegiate Schools of Planning Conference
Waters and Shores, Baltimore, MD November 2002

9th Annual Virginia Watershed Management Conference
Local by Nature, Roanoke, VA September 2002

Honors and Awards

- **National American Institute of Certified Planners Award for Academic Achievement** *2003*
- **Virginia Citizens Planning Associate Fellowship for Outstanding First Year Graduate Student** *2002*
- **Guilford College Honors Scholar** *1992-1996*
- **Quaker Leadership Scholarship** *1992-1996*
- **Dean's List** *1992-1996*
- **Dana Scholar** *1993-1996* (awarded for academic performance, community participation, and strength of character)
- **E. Garness Purdhom Leadership Scholarship** *1995* (awarded for academic achievement and community leadership)
- **Who's Who Among American College Students** *1995*
- **Eric Reid Leadership Memorial Award** *1994* (awarded for campus leadership and community involvement)
- **Order of the Arrow Founder's Award, BSA,** *1992* (awarded for service above and beyond the call of duty)
- **Order of the Arrow Vigil Member, BSA,** *1989* (awarded for outstanding leadership and future promise in the lodge)
- **Eagle Scout** *1987*

Memberships and Professional Associations

- Dan River Basin Association
- National Committee for the New River
- American Planning Association
- Virginia Chapter of the American Planning Association
- Graduate Urban Affairs and Planning Association of Virginia Tech
- American Collegiate Schools of Planning

Skills

natural resource planning
watershed planning
group discussion facilitation
course development and instruction
group dispute resolution facilitation
oral presentation/public speaking
comprehensive planning
environmental planning
plan creation and implementation
independent research and analysis
academic and business writing
experience with MS Office, SPSS, Wordperfect, GIS