

**Learning *from* Innovations in
Environmental Protection**

RESEARCH PAPER NUMBER 7

**The WATERSHED
APPROACH:**

AN EMPIRICAL ASSESSMENT OF INNOVATION
IN ENVIRONMENTAL MANAGEMENT

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Learning *from* Innovations *in* Environmental Protection:

THE RESEARCH PAPERS

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The U.S. Congress initiated this study in FY 1998 when it asked the Academy to undertake an independent evaluation of some of the most promising innovations in environmental management. A panel of Academy Fellows and other experts is guiding the project. The panel selected the research topics and researchers, and encouraged the researchers to offer their own findings and recommendations. The reports in this series are the work products of the research teams; neither the Academy nor the project panel endorses their findings and recommendations. The panel will use the research reports as a foundation for its own report and recommendations to Congress and the U.S. Environmental Protection Agency later this year.

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Executive Summary

Based on an analysis of six collaborative watershed initiatives in three diverse states, we show that these environmental management approaches can result in demonstrable environmental progress as well as other accomplishments. We stress that at this stage in the development of the new approaches, reliance on environmental outcomes as the principal measure of success is inadequate; intermediate environmental results, institutional outputs and other achievements must be considered in assessing progress.

Although these collaborative watershed approaches involve partnerships between “grassroots” nongovernmental partners and federal, state and local governmental agencies, watershed partnerships rely heavily on governmental financing. Congress and EPA should increase funding and support for the new approaches to fully assess their long-term potential.

Among our principal findings:

- local citizens, community leaders and interest groups play pivotal roles in starting most watershed partnerships, but the partnerships rely heavily on the active involvement of governmental environmental and natural resource agencies at all stages;
- project-specific funding has been easier to obtain than unrestricted funding for organizational development activities and staff essential for sustaining those partnerships;
- for agencies to be effective partners in watershed initiatives, they must have a sustained presence in the watershed;
- in our cases, state point-source permitting programs are not well connected to collaborative watershed initiatives;
- our cases show examples of successfully linking local governmental land use planning authority to watershed partnership plans and activities;
- some major innovations in watershed management can be achieved at the state and sub-state levels.

Beyond increased organizational development and maintenance funding for watershed initiatives, our main recommendations include:

- EPA and states should improve linkages between state water-quality management regulatory programs and the concerns, planning activities, and programs of watershed partnerships;
- states should more effectively link local land use planning, growth management, and regulation to watershed initiatives;
- in any reauthorization of the Clean Water Act, or related legislation, Congress should include a title fostering the development of collaborative watershed initiatives; and
- Congress should sustain and strengthen agency programs which provide technical and capacity-building assistance to watershed partnerships.

Introduction

New watershed management approaches represent one class of environmental management “reinventions” that have garnered much attention and have been widely undertaken in recent years. Those approaches build on many decades of water resources planning and management at the watershed or river-basin scale throughout the United States and elsewhere. Federal, state and regional agencies have carried out watershed-scale fisheries management, water allocation, flood control, soil conservation and water quality programs, as well as more-comprehensive river-basin development schemes. The results of those agency-driven programs are mixed. Some have been of limited or questionable effectiveness; in some cases management activities have produced undesired or unanticipated outcomes.¹ New watershed-based approaches for solving water quality and related problems have evolved in response to the inadequacies of those traditional approaches. Those innovative approaches represent attempts to achieve more sustainable and effective environmental management, and are characterized by efforts to directly involve watershed stakeholders in the decisionmaking and management process.

To gain a better understanding of those initiatives for mobilizing environmental protection and management activities in watersheds, we examine six reportedly successful² examples of that new approach; the cases are drawn from three states and represent a wide range of watershed contextual settings. Our exploratory research focuses on two basic research questions: What did those watershed initiatives achieve? and What factors have shaped those efforts? We show that those collaborative watershed management approaches can result in demonstrable environmental progress, as well as other accomplishments. Based on our research, we present findings and recommendations to improve the efficacy of those new approaches to addressing complex environmental problems at the watershed scale.

The Watershed Approach

It is important to distinguish traditional watershed-based management from the new watershed approach. In the most basic sense, traditional watershed management has used the watershed or hydrologic basin as the fundamental spatial unit for analysis, planning and management of water and related natural resources. Moreover, traditional initiatives, which have

varied in scope from relatively narrow functional programs to more comprehensive efforts, have been undertaken and led by agencies and their professional staffs, i.e., they have been “top-down” programs. They are characterized by their substantial reliance on governmental command-control strategies and financial capacity, and by their relatively centralized agency decisionmaking. Federal and state water-pollution abatement-programs to address point sources of pollution—which have focused on basinwide planning, analysis, reporting, and in recent years permitting—exemplify traditional watershed-based management.

There are many and varied conceptualizations of the “reinvented” (to some degree, rediscovered) watershed approach, an approach which has been rapidly and enthusiastically embraced and extolled in governmental, professional and community-based circles.³ The new approach strives for improved interagency and intergovernmental coordination at the watershed level, and improved linkages between various related but often separated governmental programs. It goes farther, as well, incorporating “grassroots partnerships” and decentralized decisionmaking as core themes. In fact, there is a wide spectrum of “bottom-up” watershed activity and organization associated with the new efforts, ranging from informal citizen-based action to the formation of non-governmental watershed associations to extensive citizen involvement and collaboration in agency watershed programs. Our cases illustrate that diversity. Furthermore, as used herein, the emerging watershed approach entails a collaborative partnership between government and an inclusive collection of watershed stakeholders—and a blending of “top-down” and “bottom-up” action and decisionmaking. As our cases bear out, there is often a shifting of leadership and activity between governmental and nongovernmental partners during the evolution of the watershed partnership. Key elements associated with the new watershed approach include:

- watersheds and sub-watersheds as the fundamental analytical and management unit
- broader scope, ecosystem-oriented goals
- science-based and information-driven assessments, plans and decisions
- multi-agency and intergovernmental coordination (including information exchange, resource sharing, and shared decision-making)
- collaborative, voluntary and consensus-oriented interaction of local stakeholders, governmental units and agencies, communities and other watershed interests, and the formation of public-private partnerships
- action-oriented planning and management (including adaptive planning and decision-making processes) to reflect changing resource, socioeconomic and institutional conditions, and new knowledge gained from ongoing monitoring and evaluation.

Although individual watershed initiatives rarely fulfill every dimension of that somewhat idealized framework, it clearly characterizes the watershed approach as far more than unilateral actions by governmental agencies to solve problems at the watershed scale. Decentralized decisionmaking and nongovernmental “grassroots” partnerships inherent in the new watershed approach enhance the prospects for crafting durable, locally acceptable solutions to problems and fostering community-based environmental stewardship. Interaction and collaboration among local stakeholders, organizations, and communities—working with higher-level governments—to identify and solve “their” problems are central attributes of the emerging

paradigm. Thus a watershed is not only a geographic or hydrologic unit, but an institutional nexus as well.⁴ Our case selection and analysis reflect that broad contemporary view of the watershed approach.

A few caveats are in order. Although there are some examples of relatively long-standing watershed partnerships, most are relatively youthful—really institutional experiments that have been in progress for only a decade or so. They are not yet stable, mature institutional arrangements with well-established structures and processes; perhaps they will never attain such longevity. Neither are they mature in the sense of having achieved their long-term environmental goals. Our cases—ranging from five to fifteen years of age—illuminate the flows, ebbs and crests in those initiatives, including the waxing and waning of nongovernmental participation and citizen leadership. In short, and not surprisingly, there is substantial variability among and change within new watershed processes and structures. Attempts to design programs to support those initiatives must be based on a realistic understanding and appraisal of their dynamic efforts rather than idealized models that are not empirically verified. Our case descriptions provide rich detail regarding the nature and functioning of those watershed partnerships and suggest some of the key factors that warrant consideration in the design of programs for advancing those new watershed approaches.

As noted above, the new approaches are relatively immature in that, for the most part, they have not had sufficient time to develop and implement the requisite array of management programs to attain their environmental goals, particularly the ultimate goals related to healthy ecosystems or reductions in risks to humans. Thus it is difficult to evaluate their success only in terms of achieving desired environmental outcomes, i.e., measurable changes in environmental conditions. We address that dilemma in our case descriptions and evaluations by identifying intermediate environmental results, here termed environmental outputs, such as changes in land practices or land uses, that are likely to be instrumental in making progress on environmental goals. We have also identified a set of non-biophysical outputs and activities. Those less tangible institutional accomplishments, such as increased local problem-solving capacity, can serve as important benchmarks for measuring the progress of watershed initiatives.

Research Methods

This research employs a comparative case-study design of two watershed-planning and management initiatives in each of three states. For each of the six watershed cases, data were gathered about genesis and development, scope, context, partnership organizational structure and process, participant roles, information use, plans and planning processes, and accomplishments, including environmental results. Primary sources of information were semi-structured interviews with key informants, along with several limited informal contacts; formal and informal documents and local files; and site visits. Recognizing the potential for bias from assessing those cases in part through interviews with participants, facts and interpretations were corroborated to the maximum practicable extent with documents and multiple interviews for each case and state. Interviews were conducted with watershed initiative principals, coordinators, interest group participants, agency staff and governmental officials at state and local levels, tribal representatives, and academics; 112 people provided information through interviews or telephone contacts.

Cases were selected in consultation with Academy staff. Criteria for case selection included: documented nonpoint source pollution, biodiversity loss or habitat-degradation problems in the watershed; sufficiently advanced watershed initiatives enabling the assessment of environ-

mental outcomes; a sufficient data base to demonstrate results; watershed initiatives that used a collaborative integrated approach to planning and management. The Academy was specifically interested in cases demonstrating evidence of the environmental results of watershed protection efforts. Given time constraints, we interacted with a network of knowledgeable contacts in various states/regions to identify cases that appeared to meet our case selection criteria. However, verifiable environmental outcomes attributable to new watershed approaches are difficult to demonstrate. Our case watershed initiatives are not mature, and sufficient time may not have elapsed to manifest environmental response. For example, while rewatering of the Dungeness River in Washington produced demonstrable environmental change in short order, measurable changes in water quality from nonpoint pollution control activities may take decades or longer. Furthermore, pre-intervention data inadequacies, monitoring deficiencies, and changes in the watershed over time complicate the documentation and attribution of environmental changes. Thus, as we will argue later, the desirable ultimate measure—environmental change—is only one indication of the efficacy of a watershed partnership initiative.

In the following sections, we present a brief overview and summary for each watershed case-study, followed by a cross-case synthesis of our analyses and findings.

Case Summaries

Our cases involve six diverse watershed partnerships in three different states, each with a unique arrangement of water resource management programs and institutions. We present here abbreviated highlights from each case, focusing on a variety of partnership characteristics and accomplishments along with a brief case summary. We provide more complete case descriptions in Appendices A-F. The case summaries are preceded by brief orientations to each state's institutional arrangements for water-resource management, including identification of the major programs delivered on a watershed basis. We have grouped the cases in three sections, organized by state:

- Dungeness River Watershed, Washington
- Nisqually River Watershed, Washington
- Tomorrow-Waupaca River Watershed, Wisconsin
- Black Earth Creek Watershed, Wisconsin
- Upper Little Tennessee River Watershed, North Carolina
- Long Creek Watershed, North Carolina

Washington State: Two Cases

Washington's water-related management functions for fish and wildlife, health, state lands-management, and nonpoint sources of pollution are dispersed among a number of state agencies and commissions (Table 1). However, Washington has substantially consolidated water resources regulatory authority in the Washington Department of Ecology (DOE⁵). DOE issues water quality permits, administers water rights, conducts water quality monitoring and analysis, develops models for pollution transport and water flows, approves shoreline management programs under the Shoreland Management Act, and leads state efforts for watershed plan-

ning and management. The Department of Fish and Wildlife (DFW) leads traditional fishery management efforts, and provides grants for fishery research. The Governor’s Salmon Recovery Office leads efforts associated with the 1999 “threatened” listing of Puget Sound chinook salmon and other proposed listings. Other important agencies include the Department of Natural Resources, for state lands management; the state Conservation Commission, for coordinating nonpoint source and soil conservation programs administered by local conservation districts; the Interagency Commission for Outdoor Recreation, charged with administering grants related to salmon recovery funding; the Department of Community Trade and Economic Development (CTED), for oversight of the state’s Growth Management Act⁶; and the Puget Sound Water Quality Action Team (PSWQAT, formerly Authority), for education and nonpoint source planning and management. PSWQAT supports several “local liaisons,” located in Puget Sound counties. Washington State University-Cooperative Extension supports six water quality field agents assisting local governments and citizen groups in the Puget Sound basin. Washington’s state universities conduct water-resource-related research.

TABLE 1. MAJOR STATE WATER RESOURCE MANAGEMENT ENTITIES IN WASHINGTON

- Department of Ecology (DOE)
- Department of Fish and Wildlife (DFW)
- Department of Natural Resources
- State Conservation Commission
- Department of Community Trade and Economic Development (CTED)
- Puget Sound Water Quality Action Team (PSWQAT)
- Governor’s Salmon Recovery Office
- Governor’s Salmon Recovery Funding Board
- Interagency Commission for Outdoor Recreation

Interagency coordination related to watershed issues takes place through three main bodies: the agency director-level Joint Natural Resources Cabinet (JNRC); the senior management-level Statewide Watershed Leads group; and the Governor’s Salmon Recovery Office. The governor initiated JNRC, the latest in a history of somewhat similar policy-level coordination efforts, to serve as a mechanism for communication and coordination among directors of state agencies involved in water and related resource issues. In order to implement 1998 and 1999 legislation for watershed and salmon recovery planning,⁷ the director of each relevant agency appoints one agency representative as a “statewide lead” for staff level interagency coordination. The Governor’s Salmon Recovery Office coordinates overall salmon recovery strategy.

Through a series of court decisions and cooperative agreements with the state, Indian tribes now have significant influence with regard to Washington’s water and natural resource man-

agement programs and have significantly affected the design and implementation of watershed management programs. The 1974 Washington Supreme Court Boldt⁸ decision (and subsequent actions) resulted from lawsuits filed by tribal governments seeking enforcement of their treaty harvest rights. Boldt Phase I (1974) established a tribal right to harvest up to half of the fishery resource; Phase II (1980) tied the tribal right to harvest with a right to ensure adequate salmon habitat necessary to produce a harvest. While Phase II was remanded and eventually vacated,⁹ the state and tribes recognized the potential for continued protracted and costly litigation over tribal resource management issues and agreed instead to work cooperatively through a memorandum of understanding on environmental protection. Those decisions have changed an historical authority imbalance between tribal governments and the State of Washington and created tribal standing for water-resource-related discussions throughout the state, including both of our Washington cases.

Washington's overall state water-quality management program has involved planning and reporting activities on a basin scale since EPA delegated authority through the 1972 Clean Water Act. In 1993, DOE's Water Quality and Environmental Assessment Programs initiated an innovative watershed-based program for synchronous water-quality permitting of dischargers in each of the state's 23 water quality management units (largely river basins).¹⁰ DOE issues all of the water-quality permits within water-quality management unit following a five-year monitoring and assessment cycle. Washington and EPA have settled a lawsuit related to Washington's 303(d) list of impaired waters,¹¹ and DOE is leading a 15-year effort to develop management approaches, using watershed approaches and including total maximum daily load (TMDL) allocations as appropriate, for each water body on the list.

DOE has developed a sophisticated water-quality modeling program and is piloting a GIS-based approach to river basin characterization as a new planning tool for identifying, understanding and addressing priority areas of concern.¹² That information-intensive watershed-characterization model combines eight layers of water resources information with maps showing changes in land use over time to illustrate graphically the priority issues in a watershed.

In 1987, the newly formed Puget Sound Water Quality Authority (PSWQA) developed an overall water-quality plan for the Puget Sound that included a strategy for nonpoint source pollution. Through that plan, PSWQA provided state funds and technical support to counties to develop targeted action plans for reducing nonpoint source impacts in county-identified priority watersheds—those watersheds experiencing the greatest impacts from nonpoint source pollution. There are now 35 of those “400-12” plans (named for the Nonpoint Rule, WAC 400-12) for Puget Sound watersheds, each developed through a collaborative planning process and funded by the state's Centennial Clean Water Fund.

In 1990, a group of state agencies, tribal representatives, agricultural interests, municipal governments and others met at Lake Chelan in an attempt to reach a negotiated settlement to multiple water rights issues. The resulting “Chelan Agreement” established a process for addressing water rights disputes in watersheds and called for the state to fund two pilot watershed projects to implement the process. One of our cases, the Dungeness River watershed, was selected as a pilot for that new process; both pilots were considered successful, and continue to be the focus for DOE and other state agency initiatives. Although no additional funding was provided for expanding the Chelan Agreement pilots into other watersheds, valuable insights from the pilots contributed to several years of varied legislative attempts to develop similar statewide watershed planning and management programs, culminating with passage of the 1998 Watershed Management Act described below. Also in 1990, the legislature enabled the creation of twelve watershed-based nonprofit volunteer organizations, with state funding from

a fishing license surcharge,¹³ in an effort to encourage more citizen involvement in salmon restoration. Over the past few years, those watershed-oriented regional fishery enhancement groups (RFEGs) have been one of the mechanisms for local volunteer-driven habitat restoration projects.

Although too recently to significantly affect our case study outcomes, Washington enacted two major pieces of watershed-based legislation in 1998 and 1999. Those laws—the 1998 Watershed Management Act (ESHB 2514) and 1998 and 1999 legislation for salmon recovery¹⁴—direct much of current state watershed management efforts. The “2514” planning process—supporting the many elements of the “new” approach characterized on page three—provides up to \$500,000 per water resource inventory area¹⁵ to local “planning units” for assessment and plan development. Plans must address water quantity issues, and local partners may also add components for water quality, habitat, and instream flows. Local governments initiate the program through an application process that requires concurrence of all of the water resource inventory area counties, its largest city or town, and its largest water-supply utility. All Indian tribes with lands in the area must be invited to participate, and local initiating governments must designate one entity to serve as a project lead. Although funded by the state and supported by state agency technical assistance, the “2514” planning processes demonstrates a shift from state to local leadership for watershed management. Local planning units formally request participation from specific state agencies through the governor’s office, and state agencies cannot directly participate in the planning unit without that explicit invitation. At the local level, all state agencies coordinate through “watershed leads.” Once a watershed assessment begins, planning units have up to four years to complete their planning and analysis. Once plans are approved by the planning unit and ratified by local governments, state agencies must act in accordance with the plan, with some limitations; that element of “state obligation” is designed to provide certainty to local governments. Thirty of Washington’s 62 watershed resource inventory areas have planning units engaged in “2514” processes.

Washington has been inventive in using statewide nongovernmental organizations to complement state agency management actions. The 1998 Salmon Recovery Planning Act (ESHB 2496) included \$1 million to be granted to a single 501(c)(3) nonprofit organization in the state to develop and manage a statewide volunteer salmon recovery initiative. The state granted that funding to A World Institute for a Sustainable Humanity (AWISH) to operate a project called People for Salmon—delivering training, funding volunteer coordinators for local groups (including RFEGs), funding public information and education efforts, and supporting tribal involvement in community-based salmon recovery efforts. Project funded was extended in 1999 through the newly created Salmon Recovery Funding Board. Another nonprofit organization, the Rivers Council of Washington, has also provided training and coordinating support for watershed groups across the state.

DUNGENESS RIVER WATERSHED

Washington’s Dungeness River watershed encompasses close to 300 square miles in the northern Olympic Peninsula and flows from Olympic National Park, through forested foothills and agricultural areas, and into the Strait of Juan de Fuca. Unlike most of the Olympic Peninsula, the lower Dungeness River watershed gets relatively little annual precipitation, and for more than 100 years, agricultural activities in the watershed have depended on irrigation water from the river. The Dungeness River supports four species (five stocks) of salmon as well as steelhead trout, although a shortage of spawning habitat, lack of refugia, and low streamflow threaten several stocks. The Dungeness also transports sediments and bacteria, threatening shellfish

beds in the Dungeness Bay, a region where the Jamestown S’Klallam Tribe has fished and harvested shellfish for thousands of years. The watershed includes the City of Sequim and a growing number of rural residences, including a large retirement population, all of which are putting increased pressure on river and groundwater resources through the need for private wells, dikes, and conversion of agricultural land. Such was the setting when several community leaders initiated what would become, over time, a series of partnerships to address water resources in the Dungeness (See Appendix A and Table 2).

Participants/Scope

Numerous overlapping and simultaneous collaborative watershed-oriented partnership groups have been active in the Dungeness River watershed over the past decade (see Figure A-1 in Appendix A). Current efforts are centered around the Dungeness River Management Team. DRMT participants (and those in previous efforts) include: federal and state agencies; county, municipal, and tribal governments; recreational, environmental, and conservation interests; and private property owners. Partners address salmon protection/restoration, nonpoint source pollution, shellfish bed protection/restoration, flood control, and groundwater management issues, and relationships between those issues and concerns of private property owners. Although currently resolved through an agreement discussed below, partnership efforts also address river flows and irrigated agriculture.

Accomplishments

The most significant environmental outcome from those watershed partnerships is the rewatering of the Dungeness River. After nearly a decade of interaction, agricultural water users—who hold individual senior adjudicated rights and claims to the water dating back as early as 1895—voluntarily reduced their withdrawals during critical low-flow periods so that additional water would remain in the river for salmon. Working through the 1991 pilot Chelan Agreement process, irrigators agreed to voluntarily limit their withdrawals. The voluntary arrangement continued for four years until 1998, when irrigators and DOE signed a formal memorandum of understanding¹⁶ institutionalizing the withdrawal agreement and creating trust water rights for the Dungeness. Under the MOU, the Water Users Association (a group of nine watershed irrigation companies and districts) agreed to divert no more than 50 percent of the Dungeness River flow at any time, with an upper limit of 156 cubic feet per second (cfs), the historic water rights of users determined by DOE. Historically, 16 percent of average daily flows have been below 156 cfs; the minimum-recorded average daily flow is 65 cfs.¹⁷ The agreement reduced uncertainty regarding tribal claims to instream flows and, as a result of the agreement, irrigators receive assistance for efficiency improvements on their aging irrigation systems, partly in the form of federal salmon habitat improvement grants through the tribe.

The Dungeness partnerships also resulted in a number of intermediate environmental outputs, particularly related to salmon habitat restoration. In addition to joint efforts at irrigation system improvements, partners completed several habitat restoration projects on tributary streams in the lower watershed, including riparian protection and channel improvements. Restoration projects in the river’s mainstem—guided by years of detailed scientific study, coordination, and planning—include numerous bio-engineered structures for habitat and streambank stabilization. Partners are also closely involved with two DFW captive brood-stock programs aimed at restoring wild chinook and summer chum salmon populations. Additionally, building upon past partner actions, major dike removal, bridge set-back and floodplain/estuary resto-

ration is being studied and planned for the near future.

Other important accomplishments of the partnership relate to public education efforts, research, and the partnership's function as a forum and information clearinghouse for river activities. The centerpiece public educational effort for issues facing the Dungeness River is the Dungeness River Natural History Center and "Railroad Bridge Park." The center, still under construction, features exhibits, trails, and a restored wooden trestle bridge that serves as a site for educational and local community events. State and federal agencies and private foundations fund the effort through more than \$500,000 in grants; the tribe owns the land and coordinates administration.

Partners have also developed multiple education strategies including the production of several educational booklets related to the river, bay and watershed tours, interpretive signs, and development of an environmental learning area (and associated curriculum) located on a tributary creek to the river. Dungeness partners are involved with current research on hydrologic continuity between the river, its tributaries, irrigation ditches, and groundwater. Partners are also involved with intensive water-quality monitoring and assessment work, led by DOE and the tribe, that is attempting to identify sources of bacteria polluting shellfish beds. Meetings of the current watershed partnership—the DRMT—are open and fully publicized.

TABLE 2. DUNGENESS RIVER WATERSHED, WASHINGTON

Size of watershed:	260 square miles (which includes about 30 square miles of small subwatersheds flowing directly into the Strait of Juan de Fuca)
Water and related resource problems:	Water allocation and instream flows, salmonid recovery, and bacteria/pollution from smaller tributaries leading to impending shellfish bed closures.
Sources of problem	Irrigation, timber and road-development activity, development, agricultural runoff.
Partnership focus:	Partnerships for the Dungeness River watershed focus on coordination for habitat restoration, water use and allocation, water quality, and education. The current partnership group is DRMT, created by a county-tribal joint resolution; many current partners have worked together in various overlapping collaborative watershed groups over the past decade.
Starting date:	1988, for the first partnership effort (see Figure A-1 in Appendix A).
Initiating event:	A County Commissioner initiated the first DRMT to improve communication and coordination about river related issues, including irrigation and salmon restoration (this reactivated as the current DRMT in 1995).
Participants:	Jamestown S' Klallam Tribe; Dungeness River Water Users Association (irrigators); Clallam County; DOE, DFW; landowners; private interests including recreational, environmental, and land trust; Washington State University-Cooperative Extension; Clallam Conservation District; Puget Sound Water Quality Action Team (formerly Authority); US Fish and Wildlife Service (USFWS); US Forest Service (USFS); Natural Resource Conservation Service (NRCS).

Regulatory and institutional issues:	Three main institutional issues underpin the partners' emphasis on salmon restoration: 1) Washington state's regulation of water rights; 2) Washington Supreme Court's Boldt decisions recognizing tribal rights to harvest and manage salmon; and 3) the 1999 listing of chinook and summer chum salmon in the Puget Sound area as a threatened species by the National Marine Fisheries Service and the prospect of additional listings. In addition, state health regulations relating to shellfish bed closures will soon apply to the Dungeness; DOE has initiated an investigation process leading to a TMDL allocation for bacteria on the river and tributaries in the lower watershed area and the bay.
Watershed plan:	<p>Numerous plans have been developed since 1993 to address salmonid restoration and water quality in the watershed, including:</p> <ol style="list-style-type: none"> 1) Dungeness-Quilcene Water Resources Management Plan (1994), resulting from a three-year, inclusive and structured planning process that grew from the 1990 Chelan Agreement. 2) Dungeness River Area Watershed Management Plan (1993), focused on nonpoint source pollution and developed through collaborative effort sponsored by the county and funded by the state. 3) Recommended Restoration Projects for the Dungeness River (1997), a plan for restoration actions in the watershed endorsed by DRMT
Primary funders:	DOE; USEPA (through Jamestown S' Klallam Tribe and Clallam County).
Management information base:	Inventories from planning efforts; flow monitoring from US Geological Survey (USGS), tribe, and irrigators; studies performed by agencies and partners.
Key accomplishments:	<ul style="list-style-type: none"> ■ Planning processes led to resolution of a water use conflict between irrigators and others that guaranteed water for salmon during critical low flow periods; their agreement was formalized in 1998 through a special trust water rights established in a Memorandum of Understanding between irrigators and DOE. ■ Partners developed and are carrying out a habitat restoration approach for the river and watershed. ■ Partners generated substantial funding for habitat restoration and water quality protection and are improving irrigation system efficiency.

Summary

As we have highlighted, partnerships for the Dungeness River watershed have: facilitated a major agreement for irrigation and instream flow protection; developed multiple collaborative, science-based action-oriented plans for water resources and salmon restoration; installed numerous river, riparian, and watershed conservation improvements; and achieved various other accomplishments. Those accomplishments, particularly the innovative trust water-rights agreement, are very promising indications that seemingly intractable issues can be successfully addressed in a watershed framework. The major accomplishments and pending restoration improvements here simply could not have developed without the a high degree of coordination, information sharing, and broad-scoped problem definition. In addition, salmon restoration and water use are highly salient issues in the watershed, and those partnerships have all ben-

efited from governmental assistance for staff and technical functions. Overall, partnerships in the Dungeness watershed have been highly successful at identifying, addressing, and partially meeting their watershed restoration and protection goals.

NISQUALLY RIVER WATERSHED

The Nisqually River watershed is an area of exceptional beauty and resource value comprising more than 700 square miles at the southern end of Puget Sound. It includes parts of Mount Rainier National Park, large tracts of public and private forest lands, and the Nisqually National Wildlife Refuge. The area has several small communities and a growing number of rural residential developments and “farmettes.” Even though the Nisqually basin is generally valued highly for its natural beauty and relatively pristine conditions, the river and tributaries face water-quality threats from forestry, agriculture, and expanding urbanization and development-related nonpoint sources of pollution and habitat degradation. Concerns over the impacts of those threats on the highly valued resource led to special legislation in 1985 directing DOE to develop a plan to protect and manage the river. The 1987 Nisqually River Management Plan, developed by the DOE-appointed Nisqually River Task Force recommended formation of a Nisqually River Council (NRC). The legislature approved the plan in 1997 and NRC and partners continue to coordinate resource management and implementation of the watershed plan (see Appendix B and Table 3).

Participants / Scope

The 20-member NRC consists of federal and state agencies, county governments, tribal government, and local municipalities. A separate Nisqually River Citizens Advisory Committee (NRCAC) includes citizens and nongovernmental organizations from the watershed. Both groups also link to the Nisqually River Basin Land Trust, the Nisqually River Interpretive Center Foundation, and the Nisqually River Education Project. Together, those partners address a broad scope of resource issues throughout the Nisqually River basin, including salmon restoration, water quality protection and restoration, land preservation, and environmental aesthetics.

Accomplishments

As intended, the most significant environmental outcomes have been in land conservation and protection. NRC helped facilitate the sale of a nine-mile “bluff to bluff” riparian corridor from Weyerhaeuser to Tacoma Public Utilities—as part of a Federal Energy Regulatory Commission licensing mitigation agreement—for protection and conservation management; private development of that corridor would have been significantly more lucrative. The Nisqually River Basin Land Trust, formed as part of the overall Nisqually River Management Program, holds more than 200 acres of riparian lands and oversees a special mitigation trust fund developed for the Nisqually Delta. A separate regional land trust targets watershed upland areas, in coordination with the Nisqually trust. NRC partners have also been working to develop the Nisqually-Mashel State Park, identified as the top recreation priority in the 1987 plan, through state investments of over \$3.25 million for nearly 600 acres of park lands to date.

Partners can also claim environmental accomplishments of a more intermediate nature. NRCAC, in particular, influenced changes in the design for a local wastewater treatment plant to preclude discharges to the Nisqually River and reclaim 100 percent of effluent. NRC helped lobby the legislature for nearly \$10 million in state funds for that innovative wastewater treatment solution. Partners have also funded and implemented several streambank stabilization

and instream habitat restoration projects in tributaries throughout the basin. Through the lead of county conservation districts, partners help target and fund various agricultural best management practices. Following expanded inventory work, partners received a \$360,000 EPA Section 319(h) grant for addressing nonpoint source pollution (including funds for education). Many of the basin's smaller "hobby" farms did not qualify for US Department of Agriculture assistance programs yet contributed significant sediment, nutrient and bacteria loads to tributary streams; NRC partners obtained additional funding from the US Fish and Wildlife Service and the state to assist those landowners.

TABLE 3. NISQUALLY RIVER WATERSHED, WASHINGTON

Size of watershed:	722 square miles
Water and related resource problems:	The Nisqually River begins at Mount Rainier and runs through this mostly rural watershed to southern Puget Sound. Partnership efforts focus on protection of this outstanding river and watershed resource. Concerns center around threats to the basin's aesthetic values, threats to salmonid habitat (from numerous sources), threats to tributary water quality and shellfish bed pollution from bacteria.
Sources of problems:	Watershed development, agriculture, forestry, land and stream modifications
Partnership focus:	This partnership is comprised of the 20-member NRC, the separate NRCAC (with joint subcommittees), and three additional closely linked organizations: Nisqually River Basin Land Trust; Nisqually River Education Project; and Nisqually River Interpretive Center Foundation. Partners focus primarily on coordination and information sharing for conservation, preservation and habitat restoration throughout the Nisqually River watershed.
Starting date:	1985
Initiating event:	The Washington State Legislature passed legislation (SHB 323) requiring DOE to develop a Nisqually River Management Plan and specifying that the plan must be approved by the legislature before it could be implemented. The state legislature formally approved the plan in June of 1987, leading DOE to initiate the NRC.
Participants:	Nisqually Tribe, DOE, conservation districts, municipal and county governments, Tacoma Public Utilities, National Park Service, USFWS, US Army Fort Lewis, USFS, WA Department of Natural Resources, WA Parks and Recreation Commission, DFW, University of Washington.
Regulatory and institutional issues:	Regulatory issues relate to water quality and endangered species. Several permitted discharges exist. Several locations are included on the 303(d) list of impaired waters because of excess bacteria, high temperature, and nutrients. The National Marine Fishery Service has identified chinook salmon as an endangered species throughout the Puget Sound.

Watershed plan:	The Nisqually River Task Force developed a concise statement of goals, objectives, and implementation items for 13 action categories; this plan was approved by the state legislature.
Primary funders:	DOE (through numerous sources), USEPA, landowners.
Management information base:	Research and monitoring by DOE, Nisqually Tribe, and other agencies and organizations (e.g., salmon enhancement group inventory; citizen information/input on projects, USFWS at reserve).
Key accomplishments:	<ul style="list-style-type: none"> ■ Partners facilitated establishment of a nine-mile conservation corridor. ■ Partner efforts helped install BMPs throughout the watershed for nonpoint source pollution abatement. ■ Partners established the land trust, interpretive center foundation, and education project recommended in the plan. ■ Partners helped win state legislative support for an innovative 100% water reclamation wastewater treatment plant for a watershed community. ■ Partners generated substantial funding for water quality and habitat research and restoration work for salmon and other biota. ■ Since 1987, partners have sustained active coordination between citizens and agency managers to reduce threats to habitat and water quality.

Nisqually watershed partnerships have led to several additional accomplishments and institutional outcomes. Given the conservation emphasis of that partnership, a major institutional accomplishment has been the formation of a land trust, started by NRC, with close connections to all NRC partners, including another regional land trust. NRC serves as an information clearinghouse and forum for communication among a large and diverse group of partners, and has an expansive institutional memory for resource management in the basin. The Nisqually River Education Project, through separate grant funding, has numerous intangible effects on the resource through curricula development, teacher workshops, and water quality monitoring and stream restoration work with students. Nisqually Tribal resource managers have greatly enhanced their capacity through involvement with the partnership. The tribe has received more than \$1.1 million in state funds alone to support technical staff additions, monitoring, analysis, and restoration activities, and has used the information to influence overall partnership management actions. Finally, among the most promising “other” achievements suggesting sustainable outcomes, Nisqually basin partners have developed a mutual familiarity and trust as demonstrated by Nisqually tribal leadership in the current 2514 watershed planning process—the only tribe in Washington to have the lead role.

Summary

The partnerships emerging from the 1985 Nisqually River Management Plan development process have pursued a common set of articulated goals for environmental conservation and restoration in the Nisqually River basin. They have protected key lands in riparian and upland areas, influenced local land use policies through direct action and the plan document, and sustained a continuous 14-year focus on their river and watershed. Through regular cooperative interaction government agencies, organizations, individuals, and the tribe have found opportu-

nistic ways to pool their financial, technical, and other resources for watershed protection, e.g., coordinating state land acquisition with private protection efforts, coordinating information gathering and assessment efforts, jointly applying for and leveraging EPA Section 319 funds for nonpoint source pollution control, and negotiating development of the \$1.75 million Nisqually Delta Trust, which is managed by the land trust. Much of that interaction was prompted by perceived threats to the environmental aesthetics and natural resource conditions of that unique and highly valued area—protecting the watershed holds great salience for partners. State and federal governmental funding for staff support and technical assessment also facilitated those accomplishments. Overall, Nisqually River partnerships are highly successful.

Wisconsin: Two Cases

Wisconsin has consolidated regulatory responsibilities related to water resources largely within its Department of Natural Resources (DNR). That environmental superagency administers the full array of delegated environmental quality programs, including water-quality standards, pollution control permits, water-quality monitoring, and basin planning, as well as natural resource management programs for fisheries, wildlife, forestry, and state lands. DNR has recently reorganized administratively to decentralize authority along basin lines—officially labeled geographic management units—and is still clarifying relationships between central administration and dispersed GMU teams.

Several other state (see Table 4), local, and federal agencies play key roles in conservation and pollution abatement programs. Wisconsin Department of Agriculture Trade and Consumer Protection (DATCP) participates in nonpoint source pollution control efforts through shared responsibilities for the state priority watershed program and has additional responsibilities related to nutrient and soil erosion management, local agricultural shoreland zoning, and technical support for county-level conservation programs (in Wisconsin, county land conservation departments¹⁸ are lead local agencies for numerous rural land management programs). University of Wisconsin-Cooperative Extension (UWEX) plays coordinative, educational, and local support roles through several cooperative programs at the state and local levels. The university system also supports important state water-resource-related research programs. The Wisconsin Department of Administration oversees the coastal zone management program. State agencies and local conservation departments administer conservation and agricultural assistance programs in conjunction with NRCS.

TABLE 4. MAJOR STATE WATER RESOURCE MANAGEMENT ENTITIES IN WISCONSIN

- Department of Natural Resources (DNR)
- Department of Agriculture Trade and Consumer Protection (DATCP)
- University of Wisconsin - Cooperative Extension
- Land and Water Conservation Board

Although there have been various attempts to improve coordination among natural resource agencies, there are no formally designated cabinet-level committees for coordinating agency land and water resource management programs at is writing. A state-constituted Land and Water Conservation Board, whose members are appointed by the governor, does oversee and coordinate several programs, including the multiagency program for nonpoint source pollution control. Senior administrators from DNR, DATCP, the university, and NRCS recently began meeting through an informal Interagency Surface Water Quality Committee. Within DNR, a Watershed Advisory Committee consisting largely of state agency staff and interest groups has met over the past two years to provide policy guidance for DNR's Division of Water and Bureau of Watershed Management. Wisconsin has successfully maintained a non-regulatory but statutorily created Groundwater Coordinating Council largely comprising upper-level state-agency managers. Other coordination arrangements are initiated through memoranda of understanding and provisions for interagency coordination specified in program legislation and administrative rules (e.g., state programs for animal waste management, nonpoint source pollution control, and lake management). Much inter- and intra-agency program coordination occurs through individual staff-level relationships, program advisory committees, and ad hoc committees.

Wisconsin has a long history of watershed-based resource management activities, dating back to the infancy of the soil conservation movement.¹⁹ Water-quality management programs have been watershed oriented for more than 30 years. Under the Clean Water Act, Wisconsin has used basin plans for surface water quality inventories, water resource management priority setting, and as the basis for biennial 305(b) reports to Congress. Wisconsin DNR, however, has only recently turned its attention to developing a watershed-based water quality permitting program; two basins are exploring opportunities for nutrient trading through basinwide waste-load allocations. Wisconsin has not been the focus of lawsuits related to the state 303(d) list of impaired waters,²⁰ but under pressure from EPA over the past few years, addressing that issue has been an agency priority. Wisconsin's 303(d) list now includes approximately 550 lakes and stream segments, and DNR is in the process of developing a TMDL allocation strategy.

The pioneering Wisconsin Nonpoint Source Water Pollution Abatement Program (known as the Priority Watershed Program) has been Wisconsin's premier program for addressing nonpoint source pollution control, and is central to our Wisconsin cases. While limited in scope to nonpoint source pollution, the program is comprehensive in scale and means. The largely nonregulatory program was designed to promote the new watershed management approach described in our introduction by integrating multiagency efforts, seeking active citizen participation, providing long-term staff and financial support, and addressing nonpoint source pollution at a watershed scale. The program was created by the legislature in 1978 to target nonpoint source pollution abatement resources toward lakes and streams which exhibited nonpoint source impacts, had potential for improvement, and had supportive local project sponsors. It coordinates intergovernmental nonpoint source, soil conservation and nutrient management efforts within designated watersheds and uses federal, state, and local funding sources (\$2.5 million per year in EPA Section 319 funds, used largely for DNR program support; approximately \$35 million per year in state revenues). Local project sponsors receive funding for staff to conduct planning activities and provide technical and cost-share assistance to farmers and municipalities. Eligible farmers receive assistance for designing and installing a variety of agricultural management practices. Municipalities (including counties) receive assistance with developing runoff control ordinances and designing urban nonpoint source control practices. Projects involve a prescribed two-year planning phase of intensive outreach and watershed inventory

and analysis activities, followed by a decade or more of project implementation. As of 1999, nearly 100 watersheds had been included in the program, which is being redesigned.

Wisconsin has also used watersheds for other resource-management programs. For example, fishery management has been oriented to watersheds for decades. While not comprehensive in scope, fishery management plans have guided land acquisition for riparian protection and recreational access in fishery management areas; set habitat restoration priorities; and identified fishery management needs. The state's lake management program also incorporates a watershed approach.

Several statewide nonprofit organizations also complement state water-resource management efforts. The River Alliance of Wisconsin, focusing on river and related resource conservation and protection issues, provides a network and training opportunities for numerous watershed associations and groups. The Trout Unlimited State Council and local chapters are involved with watershed restoration efforts affecting coldwater fisheries. Gathering Waters, an umbrella organization for Wisconsin's land trusts, provides annual training opportunities for local counterparts and related conservation groups. Building on those statewide nongovernmental groups, in 1999 the state legislature allocated approximately \$600,000 that will be administered over the next biennium by a nongovernmental entity to support a small grants program for watershed organizations around the state.

Wisconsin's water-resource management programs are in a period of exceptional flux. Agencies and the legislature are reconfiguring several watershed/water-resource-related programs in areas of nonpoint source pollution control, water quality permitting, cooperative basin-level planning and decision making, and financial support for resource conservation.²¹ There is some concern that the redesign of the Priority Watershed Program, with increased reliance on the county rather than the watershed as the management unit may "diminish" watershed-based management efforts. Yet watershed efforts are being reinforced on a larger scale. As indicated earlier, in an effort to coordinate resource management actions in an ecosystem framework, in 1996 Wisconsin DNR delineated 22 geographic management units—largely along river basin boundaries. While not germane to our case histories, that represents a major program change for the state. For each GMU, DNR has assigned staff to an agency "land team" and "water team," and solicited participation from watershed stakeholders for a public-private "partnership team"²² to provide guidance for GMU resource management efforts. Teams are just beginning a two-year process for developing "State of the GMU" reports that absorb and augment the state's traditional basin planning and reporting activities into biennial reports of conditions and resource management priorities for each GMU. One promising aspect of the GMU structure is a new level of integration between education, conservation and resource management agencies. UW-Cooperative Extension, DNR, UWEX, and NRCS, working together have initiated both "basin educator" positions around the state to assist partnership teams as educators and facilitators, and a competitive grants program for nonpoint source related education and management projects, administered along watershed lines.

TOMORROW-WAUPACA RIVER WATERSHED

The Tomorrow-Waupaca River watershed drains nearly 300 square miles of varied flat and rolling glacial moraine and sandy agricultural lands in central Wisconsin. For years, groundwater contamination from nutrients and pesticides throughout Wisconsin's "central sands" region has been a major state water-quality issue, and groundwater contamination is the most significant water resource issue in the watershed. All of the area's residents draw their water supplies from groundwater, through either private or municipal wells, and groundwater throughout the

watershed contains high nitrate levels, presumably from agricultural and domestic nitrogen applications. The river and its tributaries support an exceptional coldwater trout fishery—also dependent on groundwater flows—that is threatened by excessive sediments, nutrients and degraded habitat. In addition to irrigated vegetable production and dairy farms, the area includes three small but growing communities, numerous developed lakes with homes, and an increasing number of rural residential homes. Capitalizing on the state priority watershed program, a citizen-based watershed group—the Tomorrow-Waupaca Watershed Association (TWWA)—facilitated state designation of their watershed for a collaborative 12-year water quality management program—the Tomorrow-Waupaca Priority Watershed Project (TWPWP). Following that designation, TWWA members became closely involved in a two-year TWPWP planning and analysis process and were sufficiently satisfied with the program that they stopped holding separate meetings and unofficially disbanded; individual (former) members continue to serve as part of an 80-member advisory body. The TWPWP plan was completed in 1995 (See Appendix C and Table 5.)

Participants / Scope

TWWA was initially comprised of citizens, recreational and environmental interests, university faculty, and local agency staff. TWPWP includes many former TWWA members through a large steering committee but is largely a staff-driven resource-management project to implement the collaborative nonpoint source management plan. Partners primarily address nonpoint source pollution issues related to groundwater and surface water quality as well as riparian and instream habitat restoration throughout the watershed.

Accomplishments

As of early 2000, the partnership had produced no measurable environmental outcomes—documented improvements in ambient surface water or groundwater quality. The partnership efforts have, however, led to several intermediate environmental outputs. Nutrient and sediment loads to surface waters have decreased as a result of changes in agricultural management practices. Barnyard improvements, animal waste storage structures, changes in nutrient management approaches and cropping practices have reduced phosphorus reaching surface waters by more than 21 percent (twice the TWPWP goal), decreased the amount of sediments reaching surface waters by more than 12 percent (surpassing the 10 percent reduction goal), and reduced overall nitrogen applications by 3 percent (TWPWP's goal is to reduce nitrogen as much as possible), including reduced applications in a critical municipal wellhead protection area. Sedimentation and scouring flows from urban stormwater have decreased in some areas through changes initiated by TWPWP-related stormwater management and land use planning efforts within the watershed. Partners installed protective fencing, streambank protection measures and instream habitat improvements along more than a mile of the river.

Partners have also achieved a number of other accomplishments. Partners generated awareness of the connections between urban development, stormwater and water quality, and convinced DNR to fund combined land use and stormwater-management planning processes for the watershed's urban areas. Education and public awareness have been partner priorities ever since TWWA's inception—partners held educational fairs and events, and generated attention in local newspapers. The educational emphasis has carried over to TWPWP's efforts at individualized agricultural nutrient management education and other programs. Clearly, TWWA's role in procuring designation of TWPWP was a significant accomplishment in its own right.

TABLE 5. TOMORROW-WAUPACA RIVER WATERSHED, WISCONSIN

Size of watershed:	300 square miles
Water and related resource problems:	Groundwater contains high nitrate levels and, in some areas, pesticides. The river and its tributaries support an outstanding coldwater sport fishery that is threatened by sediment, nutrients, and degraded habitat.
Sources of problems:	Agricultural practices, urban development and runoff, streambank erosion
Partnership focus:	This partnership between citizens, state agencies, and county government focuses on improving agricultural management practices, integrating land use planning into watershed management, and restoring habitat. Efforts include direct technical and financial assistance to farmers for BMPs, broad water resource educational efforts, and stream and riparian habitat restoration.
Starting date:	TWWA began in 1991; TWPWP began in 1993
Initiating event:	An activist riparian landowner in 1991 generated a dialogue among agencies and stakeholders to protect and restore a threatened high quality river.
Participants:	Landowners; Waupaca County Land and Water Conservation Department; Portage County Land Conservation Department; DNR; University of Wisconsin - Stevens Point; University of Wisconsin-Cooperative Extension; DATCP; NRCS; Trout Unlimited; City of Waupaca; and local farm cooperatives.
Regulatory and institutional issues:	High nitrates in groundwater pose a public health threat for private drinking water supplies, and some municipal wells are close to the regulatory limits for nitrates.
Watershed plan:	Partners engaged in a formal two-year planning process and produced an action-oriented, multiple-means plan for reducing nonpoint sources of pollution throughout the entire watershed.
Primary funders:	DNR; Portage County; Waupaca County; landowners.
Management information base:	Inventory and assessment work conducted by county staff; modeling and analysis from DNR, universities, and county staff; monitoring from University of Wisconsin – Stevens Point; technical assistance from NRCS and DATCP.
Key accomplishments:	<ul style="list-style-type: none"> ■ Nutrient and sediment loads to surface waters and groundwater have decreased as a result of changes in agricultural management practices. ■ Sediments and scouring flows from urban stormwater have decreased in some areas because of installed improvements and changes in development practices brought about by land use and stormwater management plans and planning processes in watershed communities ■ Partners obtained special funding to enable stormwater and land use planning efforts ■ Partners installed habitat improvements along more than a mile of the river. ■ A citizen group initiated/influenced participation in the state priority watershed program to address their water quality and habitat degradation concerns.

Summary

Partners in the Tomorrow-Waupaca have achieved several significant accomplishments: developing land-use plans for local communities; coordinating with local agricultural cooperatives to promote nutrient management among producers; installing management practices that reduce pollutant loads to surface water and groundwater; and coordinating to protect and restore aquatic and riparian habitat. TWWA's initiation, growth, and transition into TWPWP illustrate the potential value of citizen leadership to help governmental resource managers coordinate their programs. Without an open process and extensive citizen involvement, TWPWP would not have experienced the same degree of acceptance among landowners. Without special state funding, local partners could not have adequately addressed the same scope of issues or applied the same range of functional activities—coordinated staff deployment, monitoring, analysis, information management, planning, funding, education/outreach, and implementation actions. TWWA members successfully accomplished their primary reason for organizing: a sustained watershed-wide conservation and restoration effort. TWPWP has identified and is addressing a broad resource-management agenda and is successfully meeting several goals for pollution reduction. The partners, however, expect their greatest impact to occur through educational efforts that convince local agricultural producers of the continuing benefit of carefully managed nutrient applications.

BLACK EARTH CREEK WATERSHED

The Black Earth Creek watershed encompasses approximately 100 square miles of hilly glaciated and unglaciated terrain in northwestern Dane County, just west of the burgeoning Madison metropolitan area. The creek and its tributaries make up a highly valued coldwater fishery that is threatened by nutrients, sediments, and habitat degradation, largely due to nonpoint sources of pollution, both rural and urban. Stream flow is largely dependent on groundwater inflows; rapid urbanization and development in the watershed threaten stream baseflows by reducing recharge capacity and surface water quality through increased urban runoff. The Black Earth Creek Watershed Association (BECWA) and several agencies have collaborated since 1986 to address those and other resource issues through a nearly completed state-local priority watershed project (see Appendix D and Table 6).

Participants/Scope

BECWA, a 501(c)(3) nonprofit organization, consists of agricultural and urban landowners, recreational interests, local development interests, environmentalists, local officials, and other interested parties. It serves as a citizen advisory body to the Black Earth Creek Priority Watershed Project, which is managed by the Dane County Land Conservation Department with assistance from DNR. Jointly, partners address nonpoint source pollution control, fisheries management, wetlands protection, groundwater flow, land development, and environmental aesthetics related to the watershed.

Accomplishments

The combined BECWA/priority watershed project partnership has helped to maintain a productive coldwater fishery and high water quality in the face of intense urbanization pressures. Research on the effectiveness of agricultural BMPs at various locations in the watershed demonstrates limited site-specific improvements in water quality attributed to BMPs installed through the partnership project. Throughout the entire watershed, similar BMPs totaling more than \$2.5 million (\$1.8 million of which was paid by the state) were installed by 108 landowners.

Practices included improvements to barnyards, animal waste-management systems, and soil conservation measures. Those practices have effectively controlled nearly all of the upland sediment and barnyard phosphorus entering Black Earth Creek. The initial watershed inventory identified a total of 428,960 tons/year of cropland erosion and 1,280 pounds/year of phosphorus from animal lots throughout the watershed. Based on new information and improved modeling over the course of the priority watershed project, project managers report reductions of over 426,700 tons/year of cropland erosion and 3,550 pounds/year of phosphorus from animal lots.²³ Because of improved information and better modeling techniques, load reductions significantly exceed original load estimates. While baseline data elements are now suspect, absolute reductions far exceeded all original goals for nutrient and sediment.

The accomplishments also include riparian protection totaling more than 130,000 feet (nearly 25 miles) of streambank work—including fencing, stabilization, and nearly two miles of streambank habitat restoration work that involved more than 500 special “lunker structures” for enhanced fish habitat. Partners have also acquired wetlands and riparian corridors through county acquisition and state land purchases. The partnership also supported a planned major new regional wastewater-treatment system and successfully argued for a “forced main” design to transfer waste, thereby discouraging development along the corridor between communities. The commissioners for that innovative bi-county arrangement include a former BECWA board member, as well as local elected officials with positive relationships with BECWA.

The Black Earth Creek partnership also has other accomplishments. Partners have promoted watershed protection through a long-term public information effort—articles in local and regional newspapers, special events, newsletters, educational workshops (coordinated by a county Cooperative Extension agent and supported by BECWA), and watershed signs. BECWA, in particular, as a non-advocacy nonprofit organization, has served as a public forum for addressing conservation and water-quality-related issues affecting the watershed. For example, local interactions through BECWA led to design changes for Department of Transportation highway system repair plans, mitigation of impacts from reconstruction of a railroad line that traverses the watershed, coordination with public and private organizations for land acquisition, and discussions related to urbanization and growth management.

TABLE 6. BLACK EARTH CREEK WATERSHED, WISCONSIN

Size of watershed:	100 square miles
Water and related resource problems:	The river and its tributaries support an outstanding coldwater sport fishery that is threatened by nutrients, sediments and habitat degradation, largely from nonpoint source pollution.
Sources of problems:	Agricultural nonpoint source pollution and degraded stream banks; urban runoff; and urbanization and development
Partnership focus:	This partnership consists of BECWA, conservation organizations, and several state and local agencies. Partners in the Black Earth Creek watershed coordinate management efforts for a wide range of water resource issues including nonpoint source pollution control, aquatic habitat restoration, land conservation and restoration, land acquisition, education/awareness, and other opportunistic issues potentially affecting the resource.

Starting date:	1985
Initiating event:	A cooperative DNR/UW-Madison watershed study developed management options that included recommendations for more integrated resource management; at about the same time, toxic leachate from a landfill was detected in groundwater and threatened private household wells.
Participants:	DNR, Dane County Land Conservation Department, Town and Village governments, University of Wisconsin – Cooperative Extension, DATCP, NRCS, USGS, Trout Unlimited.
Regulatory and institutional issues:	The creek is subject to a more stringent level of water quality protection because of status as a state Outstanding and Exceptional Resource Water and state Class I (highest quality) trout stream in the upper reaches.
Watershed plan:	Partners developed a plan for addressing nonpoint source pollution and other water quality impacts through a two year planning process.
Primary funders:	DNR, Dane County, landowners, nongovernmental conservation interests
Management information base:	Inventory and assessment work conducted by University of Wisconsin-Madison, Dane County, NRCS, and DNR; monitoring from DNR and USGS; modeling support from DNR and NRCS; fishery data from DNR.
Key accomplishments:	<ul style="list-style-type: none"> ■ Partners reduced nutrient and sediment loads and improved habitat through installation and use of best management practices (BMPs), land acquisition, and instream improvements. ■ As a forum and clearinghouse for watershed issues, the partnership helped resolve several controversies, for example related to railroad and highway reconstruction, and increased general regional awareness of the creek as a highly valued resource. ■ Relationships strengthened through this partnership helped lead to an innovative institutional arrangement where area municipalities have formed a regional bi-county sewage treatment commission.

Summary

Among their accomplishments, BECWA, the priority watershed project, and other partners have reduced pollutant loads, influenced land management practices and land acquisition decisions, restored and enhanced instream and riparian habitat, and provided a forum and information clearinghouse for river and watershed issues. The partnership has succeeded in maintaining an interagency and multi-organizational focus on resource management and protection for the Black Earth Creek watershed for almost 15 years and has generated widespread recognition of the significant value of the creek and related environmental resources to the region. Despite a lack of success in generating a mediated watershed-wide dialogue on urbanization and land use management, BECWA has engaged local municipalities in community-specific discussions of conservation and watershed protection. While many factors have contributed to partnership accomplishments, strong local conservation leadership and perceived threats from rapid area growth and development catalyzed initial partnership action. Continued local concern and leadership, clearly defined science-based directions, and state funding for local administrative and technical staff helped sustain those efforts. The Black Earth Creek

partnership has successfully addressed its goals to date and will continue exploring long-term protection opportunities.

North Carolina: Two Cases

North Carolina's environmental management functions and regulatory programs are consolidated largely within the Department of Environment and Natural Resources (DENR) (See Table 7.) Within that environmental superagency, the Division of Water Quality (with oversight from an Environmental Management Commission) issues water quality related permits, conducts water quality monitoring and modeling activities, and directs basin planning efforts for water quality and for wetland protection. DENR also oversees a range of programs related to soil and water conservation (with oversight from a separate Soil and Water Conservation Commission), water allocation, public health (Health Services Commission oversight), land management, and numerous additional management areas. The North Carolina Wildlife Resources Commission is closely linked to DENR but maintains its own staff of 500 for fish, game, and recreation-related management. The North Carolina State University Cooperative Extension Service provides field staff in the Neuse River basin and supports numerous watershed initiatives throughout the state; NCSU and the University of North Carolina System engage in water-resource-related research statewide. Both the USFWS and Tennessee Valley Authority support fishery-related water-quality management activities in North Carolina's western mountain region.

**TABLE 7. MAJOR STATE WATER RESOURCE
MANAGEMENT ENTITIES IN NORTH CAROLINA**

- Department of Environment and Natural Resources (DENR)
- Environmental Management Commission
- Wildlife Resources Commission
- Soil and Water Conservation Commission
- Health Services Commission
- Cooperative Extension Service

Other than normal administrative coordination of senior division managers within DENR, North Carolina does not have a cabinet-level mechanism for water-resource program coordination. Two groups with substantial overlapping membership coordinate nonpoint source pollution control activities. The State Nonpoint Source Workgroup (representatives from the various DENR divisions, commissions, and other state agencies, including the NC Department of Transportation and the NC State Cooperative Extension Service) meets specifically to review and prioritize, through consensus, proposals for competitive EPA Section 319 funds for nonpoint source pollution-control projects. The North Carolina Agricultural Cost-Share Program Technical Review Committee meets regularly to discuss agricultural nonpoint source issues, and make recommendations regarding practice eligibility of the cost-share program.

That program provides funding for local conservation districts to assist farmers with agricultural BMPs.²⁴ Most coordination of water-resource-related programs occurs informally at the operating level between local and regional staff.

North Carolina has been a leader in using river basins as the basic management unit for its regulatory water-quality management programs. Beginning in the early 1990s as a DENR Water Quality Section initiative, and codified by the legislature in 1997,²⁵ that intensive process involves a sequence of biological and chemical monitoring, basin assessment, plan development, multiagency and public workshops, formal plan approval, and finally, water quality permits for all dischargers in the basin. The first plan was completed in 1993 for the Neuse River basin, and the sequence is now repeated every five years for each of the state's seventeen river basins. The basin plans include extensive reference information and specific recommendations for strategies to reduce both point and nonpoint source pollution. While DENR must follow recommendations related to point-source control, the recommendations for nonpoint source control are directed largely toward local governments and landowners and are primarily beyond DENR authority. As part of its basin-permitting approach, DENR has encouraged water-quality permit holders to form basin discharger associations that pool monitoring resources for joint permit-related water-quality monitoring. The discharger association in the Tar-Pamlico basin has progressed to a format enabling nutrient trading among association members.

North Carolina has prepared a 303(d) "impaired waters" list,²⁶ and DENR has strong programs for monitoring and modeling. DENR is developing several TMDLs for bodies of water around the state and has completed a major TMDL for total nitrogen in the Neuse River²⁷ that includes strategies for controlling nonpoint source pollution to reduce total nitrogen. The Neuse River TMDL, completed in 1999, resulted from a 1996 law suit brought against EPA by the Neuse River Foundation²⁸ over inaction in developing a TMDL specifically for the Neuse River; the case was settled in 1998. For most of the impaired waters on the 303(d) list, there is either insufficient information to address the problem, or the problems do not require a management strategy involving modeling. DENR and partners in the academic and private sectors are exploring intensive new approaches for linking information to management actions. One such effort is "MODMON"²⁹ (modeling and monitoring), a cooperative project led by UNC-Charlotte to develop a complex multidimensional water quality model. In 1999, the Clean Water Management Trust Fund (CWMTF) awarded DENR Division of Water Quality \$2 million to conduct intensive monitoring of 11 small watersheds on the 303(d) list in an effort to determine requisite information needs for resource management.

The state provides two primary sources of funds that support local watershed-management efforts: the Agricultural Cost-Share Program for agricultural nonpoint source pollution-management, described above, and CWMTF, maintained through annual state appropriations exceeding \$30 million. In their applications for CWMTF funding, applicants must demonstrate consistency with recommendations found in DENR's basin plans. North Carolina is also focusing on special resource management for the Neuse River basin, particularly emphasizing nutrient reductions from nonpoint sources. The state legislature provided additional funding and staff to both the Cooperative Extension Service and DENR's Division of Soil and Water Conservation, specifically for outreach and assistance to farmers in the Neuse River basin.

DENR has developed only limited partnerships for water resource management with statewide nonprofit organizations. The North Carolina Watershed Coalition is a statewide nonprofit organization that serves as a network and information clearinghouse for the state's watershed groups. The coalition, DENR and other nongovernmental groups are developing a volunteer-driven rivers-assessment to document aesthetic resources associated with rivers.

Several Riverkeeper organizations advocate for basin-level water quality protection, often in conflict with DENR and state agencies.

North Carolina has other programs with watershed-management dimensions. Building upon the state's water-quality basin-planning efforts, DENR has developed interim wetland and riparian restoration plans for each basin through the Wetlands Restoration Program. Those interim plans are revised as basin plans are updated for each river basin. Moreover, two basins have basin-oriented fishery management plans. The NC Department of Transportation abets river-basin recognition with an educational watershed signage program throughout the state.

UPPER LITTLE TENNESSEE RIVER WATERSHED

The Upper Little Tennessee River flows 53 miles from northern Georgia, through the western North Carolina mountains into a large impoundment at Fontana Lake. The river is divided roughly in half by a small run-of-the-river hydropower facility at Lake Emory, near Franklin, NC; that impoundment is almost entirely filled with sediment deposited by the river. Excess sediment is the main pollutant in the Little Tennessee. The lower 12 miles of river between Lake Emory and Fontana Lake is relatively undeveloped and highly valued by the western North Carolina environmental community for both its scenic qualities and for its biodiversity, including several endangered species. The river below Franklin is the only major river in the Blue Ridge Biogeographic Province with all of its fauna still present.³⁰ In an effort to protect the entire river, a group of citizens and agency representatives convened in Franklin in 1993 to explore river protection and restoration options. Building on that conference, a group of committed local citizens formed the Little Tennessee Watershed Association (LTWA), which became the core for a series of partnership activities (see Appendix E and Table 8).

Participants/Scope

LTWA has a board of directors, comprised of interested citizens, community leaders, professionals, and locally based conservation agency staff; an advisory board that includes numerous state and federal agencies and nongovernmental organizations; and a membership of approximately 100 area residents. LTWA and partners address riparian habitat and water-quality protection and restoration issues throughout the watershed, primarily through restoration projects, research and monitoring, coordination, land conservation, and education and awareness building activities.

Accomplishments

After only five years, partnership efforts in the Upper Little Tennessee are still in an early phase, and while they have achieved numerous successes (described below), they have not yet produced measurable changes in overall environmental quality of the river. LTWA is sensitive to its situation and notes that measurable impact on the health of the stream system will not be evident from restoration of a limited reach of streambank. LTWA partners have installed more than three miles of full-tree revetments on highly erosive streambanks, more than three miles of riparian fencing, and five miles of additional riparian restoration work in the Upper Little Tennessee River watershed.

Partners in the Upper Little Tennessee have achieved numerous other goals. LTWA is driving awareness of the Upper Little Tennessee River and its tributaries as a valuable regional resource in need of protection and restoration. It has improved coordination for watershed management through strong relationships and regular interaction with agencies and other

related nongovernmental groups. It has created—and is sustaining—a forum for watershed issues, and has strengthened the local conservation district/NRCS conservation-management programs by obtaining supportive grant funding and helping to gain acceptance for conservation programs among historically resistant landowners. LTWA provides a point of public contact for state and federal resource management agencies and through interaction with and financial support from agencies, LTWA is building a strong local capacity for sustaining watershed management; many LTWA members participate in monitoring and/or workdays.

There are a number of promising signs from the partnership. LTWA has initiated discussions with the county relating to land use regulations, specifically for floodplain zoning and for construction standards for rural gravel roads, which during storm events carry high sediment loads into the river. A larger partnership between LTWA members, the county, the Town of Franklin, and the Land Trust for the Little Tennessee (formerly Nikwasi Land Trust) received a combined grant for nearly \$4 million from the state Clean Water Management Trust Fund, providing nearly \$3 million for a greenway project in and around Franklin, and nearly \$1 million for watershed-wide stream restoration work to be led by LTWA (with close participation from the local conservation district and NRCS). In addition, the baseline data produced from an extensive citizen-based biological and sediment monitoring program has the potential to drive targeted watershed restoration and rehabilitation activities.

TABLE 8. UPPER LITTLE TENNESSEE RIVER WATERSHED, NORTH CAROLINA (AND GEORGIA)

Size of watershed:	450 square miles (including headwaters in Georgia)
Water and related resource problems:	The Upper Little Tennessee River watershed is divided roughly in half by an impoundment, creating Lake Emory at Franklin, NC. The entire 53-mile length of the river both above and below Lake Emory is threatened by sediments from nonpoint sources of pollution. Sediment deposition from the upper watershed has nearly filled Lake Emory. The area downstream from Lake Emory supports several state and federal threatened and endangered species.
Sources of problems:	Runoff from agriculture, urban development, and rural roads; streambank erosion.
Partnership focus:	This partnership centers around a citizen-led association and its multi-agency advisory group. Partners emphasize riparian and water quality restoration and protection throughout the Upper Little Tennessee River watershed
Starting date:	1993
Initiating event:	Local citizens and organizations initiated and hosted a conference focusing on the Upper Little Tennessee River watershed, leading to formation of LTWA in 1994.
Participants:	Local residents, Macon Soil and Water Conservation District SWCD, Nantahala Power and Light Company, NRCS, TVA, DENR, NC Wildlife Resources Commission, US Forest Service (USFS) and USFS - Coweeta Hydrologic Laboratory, Southwest North Carolina Resource Conservation and Development Council.

Regulatory and institutional issues:	Two small water-supply watersheds in the headwaters of a tributary river (the Cullasaja) are polluted by nonpoint sources of sediment and the state added these streams to their 303(d) list of impaired waters in 1998, although the LTWA partnership is not directly involved. Local facility-siting and land-use controversies have led to the partnership's attempts to persuade the county to develop local ordinances for flood plain development and road construction.
Watershed plan:	Partner activities are not guided by a watershed plan developed by LTWA. However, DENR has produced two plans for the area—a water quality management plan and a wetland protection/riparian restoration plan—that include specific recommendations for this watershed and that were used by partners when applying for CWMTF funding.
Primary funders:	North Carolina CWMTF, TVA, DENR, USFWS, USEPA, private foundations, and landowners (including Nantahala Power and Light Company)
Management information base:	Sediment and biological volunteer monitoring, DENR.
Key accomplishments:	<ul style="list-style-type: none"> ■ Partners have installed several miles of streambank stabilization improvements. ■ Partners generate increased interest in and acceptance for conservation programs among historically resistant landowners. ■ Partners sustain a citizen-based monitoring effort.

Summary

LTWA has mobilized significant state and local financial, technical, and in-kind resources to address restoration and conservation issues in their watershed. It is developing extensive sediment flow and biological monitoring data through local leadership, government funding, corporate support and volunteer monitors; that information will lead to a strategy for sediment reduction throughout the watershed. Although they have not been guided by a formal plan thus far, partners are stabilizing stream banks, protecting riparian areas, and exploring land acquisition opportunities. That partnership has assembled the pieces for a sustainable citizen and agency effort for watershed protection and restoration. As a result of a recent land-use siting conflict, LTWA has initiated discussions with the county relating to land-use regulations. LTWA members are motivated by the aesthetic and regional ecological value of the lower river-reach and riparian corridor. Inclusive participation and strong local leadership are also critical contributors to their accomplishments. LTWA's dedication and focus on expanding citizen participation, as well to enlarging the scope of its watershed activities, is a promising sign for future accomplishments.

LONG CREEK WATERSHED

Long Creek is a small tributary to the South Fork of the Catawba River in North Carolina's southwestern piedmont, just northwest of the growing Charlotte metropolitan area. In the late 1980s, Long Creek became the focus of a Gaston County water-resource management initiative. The creek was selected because it lies entirely within the county and includes a mix of urban, agricultural, and rural-residential land uses, and because members of a newly formed

county Quality of Natural Resources Commission (QNRC) wanted to address a water quality issue at a scale in which they had influence. A small catchment in the creek's headwaters serves as a water-supply watershed for a small community. The upper reaches of Long Creek are affected primarily by runoff from agricultural areas and excessive erosion from streambanks and exhibit better water quality than the lower half of the watershed, which is highly degraded by a combination of point and nonpoint sources of pollution. In order to establish the actual sources of pollution, Gaston County initiated a monitoring program for the creek, with help from EPA . In 1992, Long Creek became part of the EPA Section 319 National Monitoring Program—a program primarily focused on assessing the effectiveness of BMPs; that new monitoring initiative, funded at \$900,000, led to a new structure for watershed partnerships (see Appendix F and Table 9).

Participants/Scope

Partnership efforts for Long Creek began with QNRC—a diverse citizen-advisory body for the Gaston County Board of Commissioners—and has involved landowners, municipal governments, DENR, Duke Power Company, the NC State Cooperative Extension Service, the EPA, NRCS, Gaston County Cooperative Extension, and the Gaston Natural Resources Conservation District. Partners primarily address agricultural nonpoint source pollution in the upper watershed, through educational, technical and financial assistance to landowners.

TABLE 9. LONG CREEK WATERSHED, NORTH CAROLINA

Size of watershed:	62 square miles (smaller 45-square-mile focus area)
Water and related resource problems:	Sediment, nutrients, and bacteria impact water quality throughout the watershed. Long Creek's headwaters include a small water supply watershed affected by sediment. Recent biological monitoring in the lower watershed indicated very poor water quality in two stream segments, apparently due to both point and nonpoint sources of pollution.
Sources of problems:	Agricultural runoff, urban runoff, streambank erosion, urbanization
Partnership focus:	This partnership—primarily county-level agencies, NCSU - Cooperative Extension, and municipalities—grew from a citizen-led county government effort to improve water quality in Long Creek. The creek is now part of the USEPA Section 319 National Monitoring Program. Partners conduct research related to effectiveness of practices in reducing pollutant loads and encourage farmers to adopt and install agricultural management practices. This partnership has not addressed the water quality threats related to rapid urbanization, and its watershed-scale activities have been limited.
Starting date:	1989
Initiating event:	A newly formed county natural resources commission, representing a diverse range of citizens and local officials, selected this watershed as a focus for water quality restoration and protection.
Participants:	Gaston County Extension, NC Cooperative Extension Service, Gaston Natural Resources Conservation District, NRCS, QNRC.

Regulatory and institutional issues:	Regulatory issues in the watershed relate to state permits and impaired water quality in the lower watershed, where two streams are listed on the state's 303(d) list of impaired waters. This partnership has not addressed issues related to state effluent discharge permits, but it has helped dairy farmers meet state requirements to develop farm nutrient management plans.
Watershed plan:	Partners follow a detailed plan related to research activities and prepared a partial watershed assessment.
Primary funders:	Gaston County, USEPA, DENR, landowners.
Management information base:	A comprehensive countywide natural resource inventory/analysis conducted by NCSU at the outset of the county project (1989), and a detailed assessment of the upper watershed in 1992. Gaston County initiated a detailed monitoring program, which is now supported through the USEPA Section 319 National Monitoring Program.
Key accomplishments:	<ul style="list-style-type: none"> ■ The partnership has demonstrated water quality improvements in numerous site-specific and concentrated (e.g., for a 160-acre subwatershed) areas through reductions in sediment, nutrient, and bacteria loads. ■ Partners assisted farmers to install 1,270 BMPs for water quality throughout the upper watershed. ■ Partners constructed a wetland in a small urban subwatershed and rehabilitated a reach of urban riparian corridor. ■ Partners advance youth and adult environmental education programs throughout the county using the watershed for demonstrations and activities.

Accomplishments

Because of the intensive research and monitoring nature of the National Monitoring Program component, the partnership can demonstrate water quality improvements from numerous site-specific and small-scale (e.g., for a 160-acre subwatershed) reductions in sediment, nutrient, and bacteria loads as a result of BMPs for agricultural practices and riparian area management. In addition to practices at the research sites, partners have worked with farmers throughout the upper watershed to install 1,270 individual BMPs of more than 40 different types through a mix of state and federal cost-share program funds that total more than \$700,000. Those include more than 15 miles of streambank stabilization and riparian restoration, more than four miles of livestock exclusion, numerous dairy waste management improvements, and dozens of individual crop and pasture practices. Those practices in the upper watershed have reduced agricultural erosion by 60 percent, animal-lot phosphorus loads by 70 percent, and nitrogen loads by 10 percent. Partners also constructed a wetland to test water-quality enhancement in a small urban subwatershed and rehabilitated a reach of urban riparian corridor.

In addition to research activities, partners point to accomplishments in other areas such as countywide youth and adult education programs that use the watershed for demonstrations and activities. Project research generates substantial data that appears to validate the effectiveness of numerous agricultural management practices for reducing pollution loads to surface waters. Leading and coordinating the partnership and cooperative project has built local capacity and developed stakeholder relationships among a core set of participants. Those factors may facilitate undertaking an expanded watershed management effort at a larger scale with a new array of partners.

Summary

The Long Creek partnership has successfully addressed many agricultural nonpoint sources of pollution in the upper reaches of the Long Creek watershed. It has installed animal feed- and waste-management systems, changed cropping practices, protected streams and riparian areas with fencing, planted stabilizing vegetation along riparian corridors and more. The partnership has met some of its initial goals related to education and outreach and gaining experience with collaborative water resource management efforts, and has conducted extensive monitoring that demonstrates site-specific improvements in water quality. Partners have accomplished those actions through capable and dedicated local conservation staff using primarily county, state, and federal funds, with contributions from landowners and limited corporate assistance. However, that partnership has not addressed the watershed's major water-quality threats related to urbanization, and outside of incentives for agricultural producers, partnership efforts lack broad salience among other watershed interests. By failing to address the full scope of watershed issues at the scale of the entire watershed, the accomplishments in the upper watershed risk being undermined by urbanization. The partnership's participation in the National Monitoring Program is now in a post-BMP-installation monitoring phase, and partners are contemplating using that experience as a point of departure for addressing a broader set of issues for a larger watershed to which Long Creek is tributary.

Cross-Case Comparison

Context and Setting

State Context

Although the cases exhibit contrasting geographic and historical elements, they share a number of institutional attributes with regard to their water-resources management arrangements. Washington, Wisconsin, and North Carolina have taken major steps over the years to reorganize governmental arrangements for water-resources management. Each now has an environmental superagency (Washington DOE, Wisconsin DNR, North Carolina DENR) that has consolidated, to varying degrees, the array of water-resource management functions performed at the state level in efforts to achieve better coordinated, effective and accountable water management. Those agencies also incorporate a varied mix of other resource management functions, with Wisconsin's DNR being the most encompassing.

In spite of the substantial organizational consolidation and integration of functions, there are inevitably many other agencies in each of the states with water-resource management-related responsibilities. For example, water-quality issues strongly tied to agriculture are generally linked to a state agricultural agency, as well as the environmental/natural resources management agency; that is the case in the study states. There are numerous overlapping and shared program responsibilities and authorities. New watershed-related policy initiatives in the states (e.g., related to salmon recovery in Washington; livestock water-pollution concerns in North Carolina; and ecosystem-oriented, decentralized management in Wisconsin) have layered new programs on existing ones. That's a normal evolution in both policy and politics, but has potential for added confusion and coordination demands. Although the three states might have addressed potential administrative and management problems through cabinet-level coordination mechanisms, only Washington currently has such arrangements in place.

Place-based management offers another approach—which can be complementary to state-level efforts—to coordinating and integrating a variety of related programs. All the states deliver major state programs using watersheds as the planning and management unit; Wisconsin's pioneering nonpoint source pollution abatement program and Washington's watershed pilot programs are good examples. North Carolina is the leader among the three states in institutionalizing a basinwide, synchronous regulatory permitting program for the point-source water-

quality management program; Washington has emulated that effort, and Wisconsin is beginning to move in that direction.

Those states—all of which have been recognized nationally for various aspects of their natural resource and environmental management programs—are presently going through major changes and many watershed-related programs are in a state of flux. Washington has launched legislative initiatives addressing statewide watershed-based planning led by local planning groups, as well as salmon recovery and habitat restoration driven by enormous regional and federal concerns about the endangered status of Pacific salmon. Wisconsin is in the midst of total reorganization of land and water resources management institutional arrangements, with significant delegation of authority to watershed-based “geographic management units” comprising a diverse array of watershed stakeholders—and is simultaneously completely redesigning its long-standing state priority watershed nonpoint source pollution abatement program. North Carolina, in response to a number of highly publicized pollution events caused by livestock runoff, has initiated new programs targeting individual major watersheds. Thus, our assessment of watershed initiatives coincides with significant changes in watershed-based management programs in our three case states.

Cases Context

The watersheds examined in this study represent a diverse sample of small to mid-size watersheds. They range in size from 62 square miles (Long Creek), where the programmatic focus was scaled down to a smaller portion of the watershed and specific reaches therein, to 722 square miles (Nisqually River). Most of the watershed initiatives were broad in scope and addressed a wide array of problems and issues in the watershed. The Nisqually, Dungeness and Black Earth Creek initiatives are the broadest in scope. Those three partnerships considered a set of inter-related issues, including instream, riparian and wetland habitat; water quality; water quantity and instream flows; fisheries; recreation and river access; groundwater; aesthetic resources; and agricultural land-use and land development. The substantive scopes in the Upper Little Tennessee River and Tomorrow-Waupaca River were more limited. They initially addressed nonpoint sources of pollution, particularly sediment, and aquatic habitat improvements, but expanded their scopes over time. The Tomorrow-Waupaca effort added land-use planning in the watershed, and increased the emphasis on groundwater protection. The Upper Little Tennessee initiative has recently become concerned with roads, urbanization and floodplain management in the watershed. Long Creek is the narrowest scope effort in our study. While initial goals were to assess and address water quality concerns in the entire Long Creek watershed, the partnership became much more focused on research and demonstration efforts related to agricultural nonpoint sources of pollution in the upper portions of the watershed, due largely to successfully seeking funding, which led to inclusion in the EPA Section 319 National Monitoring Program. Thus it appears that for our cases, the generally recognized need for watershed partnerships to achieve some early, although perhaps very small-scale, successes has not precluded the adoption of a substantive scope which embraces an often complex multi-functional, ecosystemic diagnosis of a watershed.

Outcomes and Accomplishments

We noted earlier the difficulties of measuring environmental outcomes in watersheds because the consequences of management actions affecting water quality or losses in biodiversity

may not be evident for decades or longer. Furthermore, watershed interventions are rarely controlled experiments. Population growth, land-use changes and development activities, as well as other human-induced and natural events make watersheds dynamic places where the demonstration of no further degradation in water quality, for example, may represent a positive outcome of environmental management. For numerous reasons, causality can be difficult to validate. Where there are measured changes, it is difficult to verify that they could result only from new watershed approaches, as opposed to traditional environmental management. Assessment of the results of new watershed approaches thus is challenging.

Our case studies have documented only a limited number of changes in environmental conditions in watersheds—measurable and attributable improvements in water quality or resource improvements. We therefore emphasize documenting intermediate environmental outcomes—really resource-level biophysical outputs—such as measurable changes in agricultural land management practices and habitat rehabilitation. The consequences of such outputs in terms of recovered species or biodiversity, or improved water quality, are not yet evident, but the science suggests those are steps in the right direction. As one scientist we interviewed noted:

“...it is our children who will see the real benefits of this. I come up against this reality every time I do biomonitoring. If a point source appears or disappears, you can often measure the improvement. But work on nonpoint sources is by nature incremental. What you can measure at any point on the stream represents the sum of everything that happens, good or bad, upstream and upslope. You can’t have measurable impact on the health of a stream draining 100 square miles by fixing a quarter-mile of bank...”³¹

We note that some results, e.g. protection of wetlands, may be a desired environmental *outcome* (protection of a particular type/scale ecosystem or open space preservation) as well as an intermediate *output*, where the ultimate consequences for water quality improvement or flood flow reduction are not yet realized or measurable.

Watershed initiatives lead to another set of less-tangible, but no less real, accomplishments. Given the long-term nature of seeing direct environmental results from watershed partnerships, those other accomplishments, often in the form of institutional changes, are important interim measures of progress and success. Measures of capacity building, process improvements, and participant satisfaction are among the dimensions that are important to measuring progress.³² In our cases, documentation of those less-apparent advances is largely derived from testimonial evidence.

Environmental Outcomes

Among our cases, the most significant environmental outcome resulting from a watershed partnership effort is the “rewatering” of the Dungeness River to assure sufficient flows for salmon during critical periods of their life cycle. Irrigators in the watershed are limiting their withdrawals to 50 percent of flow, subject to a maximum withdrawal-threshold, producing a major change in river conditions and habitat for salmonids and other biota. Another major environmental outcome, as a result of efforts by NRC, is land conservation and protection in that watershed. NRC was influential in facilitating the “bluff to bluff” land sale along a nine-mile riparian conservation corridor of the Nisqually River to Tacoma Public Utilities for FERC-related mitigation measures; that land had great potential value for private development, but

was secured as a significant conservation corridor. In the lower Nisqually watershed, NRC partners negotiated a major contribution to the local land trust they helped establish, which in turn has been acquiring critical habitat in the Nisqually delta and riparian corridor. In the Black Earth Creek watershed, the maintenance of water quality and a naturally sustaining regionally renowned coldwater fishery in the face of intense urbanization pressures represents a positive environmental outcome. In both Black Earth Creek and Long Creek watersheds there are site-specific improvements in water-quality parameters as the result of installation of BMPs, but those are BMP research and evaluation sites with little relationship to water quality in the watershed as a whole.

Environmental Outputs

The greatest evidence of results from watershed initiatives is the wide array of management interventions, instrumental in affecting biophysical and landscape changes but not reflecting directly changes in fundamental environmental outcomes. As we noted in our case summaries, and expand in Appendices A through F, all case watershed-initiatives have installed a range of agricultural BMPs and habitat improvements. In the Pacific Northwest cases, barriers to salmon migration are being removed and instream habitat is being restored. Improvements in stormwater management systems, land acquisition/protection, wetland restoration, and streambank stabilization are among the outputs of case watershed initiatives. In the Dungeness watershed, more than \$1 million from various grants received by the partnership has been directed to irrigation system efficiency improvements; that water-conservation effort has helped enable the rewatering of the Dungeness River.

In two cases, significant innovations in wastewater management have emerged from watershed partnerships. In the Nisqually watershed, the NRC and its Citizens Advisory Committee played a pivotal role in influencing the city of Yelm to build a wastewater treatment plant that reclaimed 100 percent of its effluent. (Yelm had originally intended to discharge treated effluent into a canal which then flowed into the Nisqually River, but now uses the treated effluent throughout the community as “gray water”). The watershed partners helped lobby successfully the state legislature for pilot funding for that innovative zero-discharge system. In the Black Earth Creek watershed, building on the cooperation among local units of government facilitated by the watershed partnership, a regional wastewater system and sludge management program is nearing completion—an environmentally positive result of watershed intergovernmental cooperation.

Other Accomplishments/Institutional Outputs

Among the additional real but less-tangible accomplishments, our case partnerships are all engaged in major education and awareness-building activities. Such efforts aim at increasing “watershed literacy” among citizens, and a better understanding of watershed ecology, interdependencies, and management problems. Clearly one of the objectives of those efforts is to expand the constituency for watershed protection and management and to foster watershed stewardship. It seems unlikely, for example, that public support for land use planning in the Tomorrow-Waupaca watershed—a requisite for genuinely addressing watershed problems there—would have been so enthusiastic without educational efforts, or that institutionalization of local governmental budgeting for water resources management would have happened absent an informed, strong constituency. In the Nisqually River watershed, the Nisqually River Interpretative Center Foundation, an entity spawned by the NRC, is raising funds and planning a major educational center in

the watershed; a highly successful education project, loosely tied to the partnership, has focused on watershed education for pre-college students, teacher training, curriculum development and water-quality monitoring. Opinion-shaping educational events and field trips for elected and other officials are cited by partnership members in the Black Earth Creek and Long Creek watersheds as improving governmental actions affecting those watersheds.

The watershed partnerships all operate information clearinghouses; provide a vehicle for improved interagency coordination; open avenues for citizen participation; and serve as fora for civil dialogue, interaction and dispute resolution among diverse interests in the watershed. Those are viewed as important accomplishments by participants. In the Dungeness watershed, the pioneering water-rights reallocation agreement has its roots in the shared learning and trust-building associated with watershed partnerships. Dungeness partners believe that their engagement in multiple planning activities and studies over a period of many years has improved their shared understanding of the ecosystem; thus, an advanced ecosystem-based habitat conservation approach was unanimously endorsed by the partnership, and is now being implemented. The recognition of the importance of land protection, along with other factors, has led to the creation of land trusts in the Little Tennessee, Dungeness and Nisqually watersheds, providing the partnerships with another institutional tool with which to pursue their goals.

Other Assessment Considerations

There are other promising signs related to the efficacy of watershed initiatives. The Dungeness River, Tomorrow-Waupaca River, and Black Earth Creek partnerships have helped establish the preconditions (studies, problem recognition) for addressing the complex and controversial issue of groundwater management as part of an overall watershed strategy. LTWA, after five years of existence, is strengthening its organizational arrangements and has hired its first executive director. Established as a non-adversarial citizen-based conservation organization, LTWA is now engaged in a dialogue about how to influence local governments to address contentious land-use issues related to floodplain zoning, local road construction and maintenance standards, and urbanization effects on the river environment. The collaborative experience in the Long Creek watershed, while limited in scope, may provide a governance and process model and furnish experienced participants for a much-expanded watershed effort in the South Fork of the Catawba River basin in which the smaller Long Creek watershed is located. Watershed partnerships have enabled individual partners to strengthen their abilities to address watershed problems and issues, which in turn strengthens the partnership. In our Pacific Northwest watershed cases, funding has helped Native American partners build tribal management and natural resources analytical and management capacity, and simultaneously the overall capabilities of the partnership. Consequently, as a result of capacity- and trust-building in the Nisqually River watershed, the Nisqually Tribe is taking the lead role for the new state watershed planning program—the only tribe in Washington to do so.

In spite of limited evidence of achieving long-term environmental outcomes, there is a significant record of accomplishment by watershed partnerships. We have highlighted some of the gains—often not apparent—that are the outgrowths of a sustained collaborative watershed enterprise. There are other evaluation criteria advocated by the Academy which, while perhaps more useful for traditional regulatory and funding programs, provide some added insights into assessing the new generation of watershed initiatives. Those include cost-effectiveness and the potential for short and long-term gains; risk-reduction; certainty of effect; predictability of the process; transparency to the public; equity; and effect on problem-solving capacity.

The issue of cost-effectiveness of new watershed approaches is vexing. Traditional water resource management efforts (fragmented, narrow, reactive, “top-down”) have been inadequate with regard to diagnosing the fundamental causes of problems in complex riverine ecosystems, designing ecologically sound solutions to identified problems, and implementing management measures. The solution of more complex environmental problems demands the integrative, coordinative, collaborative processes and structures embedded in new watershed approaches. Watershed initiatives—as shown by our case studies—have significant potential for achieving short and long-term gains, *results that were not or could not be achieved otherwise*. Thus there really is no basis for any cost comparison of alternative strategies to solve major watershed problems. While it is premature to quantify costs and benefits and therefore measure the relative cost-effectiveness of different watershed initiatives in addressing similar problems, there will likely be opportunities to improve the efficiency of those efforts for achieving desired outcomes as practitioners gain more experience in their deployment.

Measuring the actual costs incurred through the watershed approach is also problematic. In addition to difficulties quantifying the high transaction costs, volunteer and staff resource costs, and opportunity costs, aggregating actual monetary expenses for a single watershed presents additional challenges, especially with multiple projects led by different partners. At a local level, government agencies may or may not track expenses by watershed, and project grants and agency costs tend to cross watershed boundaries and are not necessarily categorized by watershed. Staff-time limitations complicate maintaining sufficiently detailed records and producing expenditure reports by watershed. Contributions from nongovernmental organizations and private individuals can also be difficult to document. The United States General Accounting Office reinforces the difficulties and inadequacies of identifying and estimating costs associated with just nonpoint source pollution control efforts;³³ the difficulties multiply with the expanded scope of more-complex watershed initiatives.

There is evidence of some success in risk reduction. Both the Dungeness and Nisqually cases involve progress in addressing pollution of shellfish beds, which can threaten human health. The Long Creek and Waupaca-Tomorrow cases deal with reducing exposure of humans to risks from contaminated drinking water. The focus in the Black Earth Creek case on preservation of groundwater baseflows to the stream reflect efforts to reduce risks to both humans and a healthy ecosystem.

Certainty of effect, as used here, has two dimensions. The first relates to the certainty of specified consequences stemming from management strategies employed in watershed initiatives. For example, the effect of a better informed watershed citizenry as a result of the Nisqually River Education Project and the establishment of the Nisqually River Interpretive Center Foundation can be measured; however, the ultimate effect on environmental outcomes owing to education is uncertain. Citizens may be better educated and watershed-literate, but may not necessarily be motivated to take or support actions on behalf of watershed health. The same generally holds true for other noncoercive voluntary strategies commonly associated with watershed initiatives.

The second consideration with regard to certainty of effect relates to the causal theory associated with management actions. For example, there is significant scientific uncertainty regarding requisite actions to insure recovery of salmon populations in the Puget Sound region (Dungeness and Nisqually); the consequences of management actions cannot be known with certainty, although the management actions taken are disciplined by current knowledge.

Unlike a regulatory or grant program, with carefully articulated timelines and protocols, watershed initiatives exhibit less-predictable processes. Part of that lesser predictability stems

from the inherent nature of partnerships involving voluntary participation of nongovernmental and private interests. The partnership entities are often only partially institutionalized—certainly in comparison to governmental units and agencies—with an ebb and flow not only of their membership, but of the activity level of the partnership. The flexibility and “civic entrepreneurship” characteristics of watershed initiatives, attributes generally viewed positively when contrasted against the perceived rigidities of governmental agencies, are partly responsible for their limited predictability. They are, however, very transparent to the public. As shown by all our cases, meetings are open, citizen participation is genuinely encouraged, efforts are made to publicize actions, and ongoing educational and awareness activities with a variety of publics tend to keep watershed initiatives accessible and intelligible to the public.

If the equity criterion is construed as fairness between the incidence of benefits and costs resulting from watershed-management actions, it is not well met by new watershed approaches. Much of the funding is derived from sources external to the watershed, particularly from state and federal government, and is rationalized like many environmental protection/restoration public investments in terms of dealing with common property resources and public goods. Funding sources appear to be focused on efficacy, recognizing the somewhat experimental nature of new watershed initiatives, rather than equity. On the other hand, if equity implies fairness in representation with regard to decision-making in watersheds, the new watershed approaches have been successful in engaging stakeholders who were directly affected by management actions or who held rights, but who were not historically included in planning and decision-making processes. The direct involvement of Native American tribal governments and environmental/conservation interests are examples of more equitable representation.

Perhaps the most important of the Academy criteria for judging new watershed approaches is their effect on problem-solving capacity. New watershed approaches expand the geographic, substantive and functional scope of the enterprise, thereby fostering multi-issue analysis and problem-solving and the potential for integrated environmental management. As shown in our cases, watershed partnerships facilitate information sharing and interagency coordination, including the targeting and/or pooling of technical and financial resources—requisites for problem-solving that have often stymied traditional management approaches. A history of sustained interaction and cooperation, shared incremental successes, and institutional memory—characteristics common to more experienced watershed partnerships—lays the base for addressing complex distributional resource problems, as well illustrated in the Dungeness River case. Problem-solving capacity is also strengthened when the capacity of individual partners in a watershed initiative is enhanced, as evidenced by the Nisqually River and Tomorrow-Waupaca and other cases. Finally, new watershed approaches can effectively involve local governments, influential entities, and private interests in the initiative. That can have the effect not only of influencing watershed public opinion and understanding, which are important preconditions for action, but also of engaging those private and local governmental entities that have the authority to act in areas related to land use and development. The ability to positively affect problem-solving capacity, with an emphasis on increased ability to implement proposed solutions within the socioeconomic, cultural and political context of a particular watershed, is one of the most significant features of new watershed approaches.

Contributing Factors

Our research was designed to gather information on a number of institutional and related variables that may have contributed to the success of our case watershed initiatives. Variables

were identified based on literature review³⁴ and prior experience assessing watershed initiatives. The role of those factors, singularly or in combination, in successful watershed environmental outcomes and outputs has not been well established. Much of the prevailing knowledge base is anecdotal and subjective, and any conclusions about key contributing factors should be taken as suggestive rather than definitive. Moreover, contextual circumstances and settings for watershed initiatives can greatly affect prospects for success. With those qualifications, we summarize our cases in terms of selected potential contributing factors.

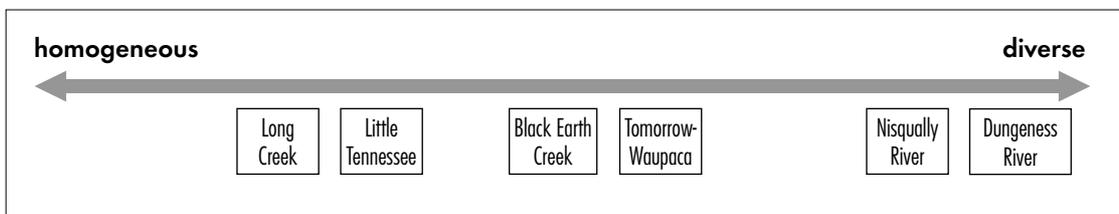
Issue Salience

A contextual variable that appears to be of critical importance in the initiation, sustenance, and success of watershed partnerships is the salience, immediacy, or priority of the problems/issues to be addressed. The issue(s) must have high salience in the eyes of prospective partners and, to some degree, in the eyes of the general public in order to provide the motivation for pursuing, undertaking, and sustaining a collaborative watershed effort. Most of our case watershed-initiatives grew out of local interest and concerns about protecting and/or restoring highly valued environmental resources, as well as threats of degradation. In the Dungeness, Nisqually, and Black Earth cases, the watershed issues also were high-priority concerns for state and federal environmental and natural resource agencies. In Black-Earth Creek, Tomorrow-Waupaca, and Long Creek, concerns about public health and compliance with drinking water standards played a role in fostering the formation of a watershed initiative. The threat of non-local regulatory intervention (possible reallocation of irrigators vs. water rights for salmon recovery) appears to have helped catalyze the watershed partnership in the Dungeness watershed. In Long Creek, where watershed-scale accomplishments were limited, improving the stream and watershed did not appear to hold great salience over time for most nongovernmental interests.

Broad Inclusive Participation

New watershed initiatives have representation from diverse interests and the resultant partnerships have been characterized as assemblages of “unlikes.” While partners generally share some interests and positions regarding natural resources in their watershed, the partnerships do not comprise like-minded recreationists, conservationists, or existing rights holders and landowners. Such watershed entities composed of “likes” (for example, the Black Earth Creek Conservation Organization in the Black Earth Creek case, Trout Unlimited chapters in Tomorrow-Waupaca, or irrigators in the Dungeness case) are among the varied groups collectively comprising watershed partnerships. Of our cases, Long Creek is the least diverse; the

FIGURE 1: GROUP COMPOSITION



Washington cases the most (Figure 1). Of course, group composition is dynamic and composition changes over time. In general, there appears to be an under-representation of business and financial interests in those six watershed partnerships. The failure to have key interests involved in the watershed initiative can undermine the effort or limit success. For example, the absence of the development-building community and urban interests generally from the Long Creek initiative largely precluded addressing critical urban runoff problems in the watershed. Although broad inclusive membership can result in partnerships of unmanageable size, our cases have successfully addressed that potential problem. Generally a smaller core-group (an executive committee or informal circle of leaders) provides leadership. Representatives of key agencies involved in the watershed tend to be active in the core group, even if on an ex-officio basis. NRC, our largest watershed partnership with 20 members, has about 15 active members. While the core groups in our cases are generally less than ten individuals, citizen advisory committees and other “offshoots” of the partnerships can be far larger (Tomorrow-Waupaca had 80 people on the citizen advisory committee), allowing for meaningful participation by the full array of partners.

Citizen and Agency Leadership and Sustained Participation

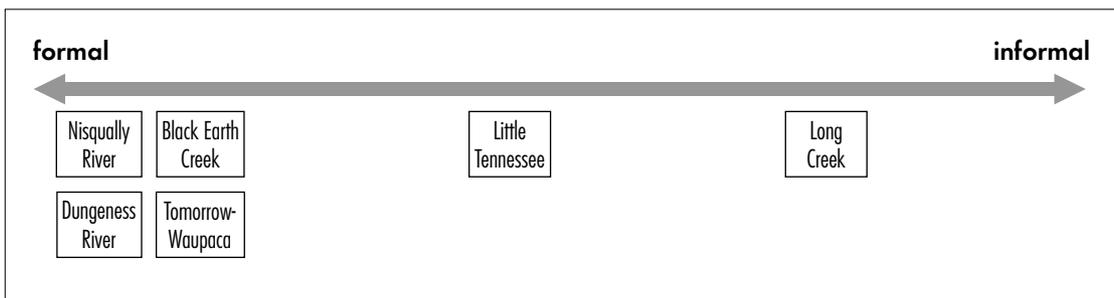
Watershed efforts have been initiated across the country by citizens and nongovernmental groups, governmental units and tribal entities. In our cases, individual local activists, local conservation entities (both governmental and nongovernmental), tribes, and community officials played pivotal roles in the startup of watershed initiatives. Only the Nisqually River effort was established by state legislation, which was initiated by a leading local legislator. Prominent *local* involvement appears to be an important ingredient in starting a watershed partnership (although significant state funding prospects clearly influenced undertaking watershed initiatives in the Black Earth Creek, Tomorrow-Waupaca and Dungeness cases). Capable leaders appear to be essential not only for initiating, but more importantly, for sustaining a watershed partnership. All of our cases benefited from the strong leadership of individuals who took the initiative, were committed to the concept of a watershed partnership, were influential, possessed networking and coalition-building skills, and stayed active over time. State and local governmental agency staff, along with citizens and nongovernmental staff, played key, often sensitive, leadership roles in supporting partnerships; agency staff who played important leadership and supportive roles seemed to have allegiance to the watershed partnership balanced with responsibilities to their home agency. Three of the cases exhibited both nongovernmental and agency-based leadership; those have been successful watershed partnerships over time, and complementary leadership within and outside government may be a factor. Leadership in the Little Tennessee case was from citizens, although agency representatives were also key players in LTWA activities. The Long Creek and Tomorrow-Waupaca partnerships relied heavily on local agency leadership (early citizen activism waned in TW over time).

Organizational Factors

Watershed partnerships are relatively recent phenomena: Little Tennessee has been in existence for five years; Nisqually River and Black Earth Creek for only three times that long. The actual age of the cooperative relationships can be misleading; some of our watershed partnerships had precursor task forces, conferences, or study committees, for example. Some have become dormant for periods (Tomorrow-Waupaca), while others have undergone name and

membership changes while still preserving a core group (Dungeness). Regardless of age, our cases generally exhibit a high degree of organizational formality, i.e., they have legislative charters (Nisqually), articles of incorporation, bylaws, nonprofit status, and provisions for structure and process (see Figure 2). Such formality appears to be necessary for recognition, legitimacy, and receiving governmental financial support. Provisions for an acceptable structural arrangement and operating and decision-making procedures for the watershed partnership, while adaptable to local circumstances, appear to be essential for sustained effective functioning. However, the institutional rules for watershed partnerships can be deceptive. NRC and BECWA tend to behave quite informally; Long Creek—which is our least institutionalized partnership—has a parent county-commission which is formal. TWWA ceased to be active before adopting formal rules developed in its early existence, but generally operated using those rules; and the LTWA is now moving towards more-formal arrangements.

FIGURE 2: DEGREE OF FORMALITY



Formal Governmental Support

All of our case watershed partnerships rely, in varying degrees, on federal, state, tribal and/or local government for support. While funding support is critical, governmental agencies and their staffs play essential roles in watershed partnerships with technical assistance, information provision and analysis, supportive staffing, and many other functions. In some cases they have been particularly supportive and creative in interpreting their programs and varied authorities and responsibilities in ways that significantly facilitated the functioning of the partnership (Nisqually, Black Earth, Tomorrow-Waupaca). Interestingly, while some training to support the overall conduct of new watershed approaches has been provided by extension educators (Tomorrow-Waupaca, Black Earth Creek, Dungeness, Long Creek), state agency staff, and non-governmental organizations, our case interviews reveal little awareness or use of EPA's Watershed Academy and training programs.³⁵

Broader measures of formal governmental support for watershed initiatives include the degree to which efforts/partnerships are formally recognized and given standing by governmental units; and whether they formally adopt or incorporate partnership actions and plans into their own activities, thus fostering implementation of partnership watershed management. Several of our cases involve formal recognition of the partnership. The state legislature established NRC by law, with accompanying agency recognition. State environmental agencies formally recognize partnerships in their plans and related statements (for example, Black Earth Creek and the Washington cases), and formally participate in the partnerships. Where state programs and/or funding are embedded in the partnership, state agencies formally approve or

adopt plans and recommendations (Wisconsin and Washington cases). Where Native American tribes are involved, tribal governments can join other governmental entities in establishing and formally supporting partnerships (Dungeness and Nisqually). Local governments and their agencies also play pivotal formal support roles. The county government jointly established DRMT with the tribe; Gaston County formally established the commission which was the parent of the Long Creek initiative; and the local conservation district is the principal instrument for erosion control and habitat improvement in the Upper Little Tennessee watershed. In Black Earth Creek, the county formally approved the priority watershed project and is a key implementing entity; and in Tomorrow-Waupaca, the watershed plan was adopted by county resolution. One of the key factors in successful watershed initiatives is local governmental willingness to use their authority—especially with regard to land use—to advance plan-implementation. Local governments in our cases demonstrate some progress in that area: Tomorrow-Waupaca local units have addressed stormwater management and land-use planning to achieve watershed water quality objectives; counties in the Nisqually River watershed, are incorporating the NRC plan into their state-mandated local growth management activities by adoption or formal reference. Thus, while citizen and nongovernmental “grassroots” involvement is a cornerstone of the new watershed approaches, formal governmental support appears crucial for long-term success.

Funding

Although there is some limited nongovernmental funding—including landowner cost-sharing, corporate and foundation support, volunteer in-kind contributions, and the like—our case partnerships depend heavily on federal, state and local government funding. Federal and, especially, state funding through non-point source pollution abatement programs are key factors in a majority of our cases. Funding supports staff, data gathering and analysis, planning and implementation activities. Restricted funding for carrying out specific watershed projects is more readily available than funding for organizational development and maintenance of the watershed partnership. However, the watershed partnerships in our study have proved quite adroit (although sometimes greatly overextended) in garnering flexible funding, often with the help of agencies which provide latitude in use of program funds. Such flexible funding has enabled support activities for maintaining the partnerships, as well as the opportunity to experiment and be innovative in tackling watershed issues (Black Earth Creek and Waupaca-Tomorrow cases). It should be noted that where Native American tribes are involved in watershed partnerships, funding is available through the federal Bureau of Indian Affairs and EPA tribal programs that is not available to others; such funding has been a key factor in our Washington cases.

Gaining stable long-term sources of funding poses real challenges to watershed partnerships. In the Wisconsin cases, partnerships were able to obtain stable long-term funding through the state’s nonpoint source priority watershed program—a program which by design incorporates several elements of the new watershed approach. However, program execution relies on local government agencies, and the nongovernmental side of the watershed partnership can decrease involvement, as happened in the Tomorrow-Waupaca case. TWWA was unable to get sufficient funding on its own to pursue its watershed objectives, and worked to obtain state designation as a priority watershed so it could attain its goals. The ending of long-term projects (e.g., Black Earth Creek) again poses the challenge of funding to sustain the watershed partnership. Of course, short-term grants are also part of the overall funding base for watershed

partnerships. The appendices describe how successful place-based initiatives have been at accumulating a variety of funds from a mix of sources to further their watershed work. They have been entrepreneurial and aggressive in terms of mobilizing funding, but sustained funding for staffing continuity and partnership maintenance activities have strained the efforts of most our case partnerships at one time or another.

Staffing

There are two broad categories of staffing associated with watershed partnerships: staff involved with the organizational support and development activities required to sustain the partnership enterprise; and staff involved in the planning and execution of various programmatic activities—from educational programs to watershed assessment and planning activities to the installation of various practices and management efforts. With regard to the first category, partnership organizations must perform numerous administrative and coordinative functions; while unpaid citizen volunteers can play a key role in starting the partnership, the increasing and continuing workload and duties can “burn out” volunteers. All of our case partnerships had staff for performing organizational support functions, as well as for specific projects. The staffing patterns varied, with state and local agencies commonly providing staff to the partnership (Black Earth Creek, Tomorrow-Waupaca, Long Creek) or providing funding for staffing of the partnership (all cases). Staffing through tribal governments was a key factor in maintaining the Dungeness partnership. Among our cases, only the Little Tennessee has hired an executive director after four years of relying on volunteers and agency staff. As suggested earlier, staff from agencies working on behalf of the watershed partnership indicated a primary allegiance to the partnership; agency staff appeared to be sensitive to the issue of staff bias in favor of their home agency, and agency “assignees” tended to minimize their agency affiliation, which significantly helped the partnership.

With regard to programmatic staffing, partnerships drew extensively on universities and their cooperative extension units; and tribal department and agency staffs for watershed technical analysis, ecological and related assessments, and much of the on-the-ground implementation activities. Those agencies with a field presence were the most actively involved. Volunteer staffing of programmatic activities played significant roles in monitoring (Little Tennessee), educational activities, and selected habitat improvement and other field work.

Scientific Basis

Successful watershed approaches—and their plans, decisions, management actions and evaluations—are science-based. While the state of scientific knowledge may be inadequate to prescribe a guaranteed course of management action, it can bound the uncertainty and discipline planning and decision-making (for example, habitat restoration and salmon recovery activities in the Dungeness River watershed). Biophysical and socioeconomic monitoring programs provide the basis for assessing watershed problems and designing interventions, and for feedback and adaptive management. Our cases employed a range of science-based activities (Table 10). Scientific information was gathered through watershed-scale inventories and studies, and through biophysical monitoring. Applied research was an inherent component of all the initiatives. Acknowledging the human dimensions of watershed management, four cases employed socioeconomic surveys and analyses to help direct their efforts. Modeling was used as a tool for watershed analysis, planning and evaluation in four cases.

TABLE 10. INFORMATIONAL BASIS FOR DECISIONMAKING

	Dungeness River	Nisqually River	Tomorrow-Waupaca River	Black Earth Creek	Upper Little Tennessee	Long Creek
Watershed-scale inventory and assessment	■	■	■	■		
Chemical/biological/hydrological monitoring	■	■	■	■	■	■
Use of modeling	■		■	■		■
Socio-economic surveys/analyses	■		■	■		■

Watershed Plans

Well-prepared, science-based plans have guided management interventions in four of our successful watershed partnership cases (Table 11). The plans vary in scope, from comprehensive watershed plans (Nisqually) to watershed plans that address nonpoint source water pollution (Black Earth Creek) or habitat restoration (Dungeness). In some cases (e.g., Dungeness and Black Earth Creek), there have been multiple generations of varied types of plans. In spite of changes in the watershed partnerships during the course of the various planning efforts (well illustrated in the Dungeness case), some continuity and institutional interconnection was maintained because core members of the partnership have been involved in all or most of those planning activities. Although Table 11 indicates that no partnership plan yet exists in the Little Tennessee watershed (LTWA is contemplating preparing one in the near future), there are actually two separate formal plans prepared for the watershed by the North Carolina DENR. The Upper Little Tennessee is incorporated into the basin plan that supports the agency's water-quality management program and that governs the regulation of point sources of pollution through discharge permitting. Although the plan includes substantial information and recommendations for water-quality management and related natural-resource concerns, and although citizens attended public meetings during the planning process, there appears to be little local ownership or perceived utility for the plan. The same appears to hold true for the "Basinwide Wetlands and Riparian Restoration Plan" prepared by DENR; the plan guides DENR actions, but seems to have very limited value for the watershed association. A formal comprehensive watershed-scale plan was never prepared in the Long Creek case, reflecting their ultimate focus on a narrower set of watershed actions.

TABLE 11. USE OF THE PARTNERSHIP WATERSHED PLAN

	Dungeness River	Nisqually River	Tomorrow-Waupaca River	Black Earth Creek	Upper Little Tennessee	Long Creek
Partnership Watershed Plan	■	■	■	■		

Lessons Learned

The six watershed partnership cases described in the appendices present a rich and detailed picture of the new watershed approach. In earlier sections of this report, we focused on documenting the accomplishments of those six initiatives, which were selected based on their reputed success, and have identified key factors that appear to influence their achievements. Based on our analysis, we have distilled a number of lessons to be learned from the overall assessment, as well as the specific case studies. We caution that our watershed cases ranged from 60-700 square miles, and that their lessons may apply only to comparably sized watersheds.

- At this relatively early stage in the evolution of new collaborative watershed approaches, principal reliance on environmental outcomes as a measure of success is overly simplistic. As our cases demonstrate, sufficient time has not elapsed to see the long-term consequences of implementing those watershed efforts. Although it is essential for those enterprises to continue to strive to measure significant changes in environmental indicators stemming from their watershed management activities, environmental and institutional outputs provide a more complete assessment of the progress and promise of those “reinventions.” While the watershed partnerships can point to many tangible on-the-ground results, participants in those new watershed undertakings generally believe that their “softer” accomplishments also reflect significant progress and the great long-term potential for effectively addressing and solving watershed problems. Such accomplishments include: increased scientific capability within a partnership; development and maintenance of an information clearinghouse; increased public and official understanding of watersheds and problems/issues, as well as greater public support for action, through education and awareness activities; and sustained provision of a forum or public “space” where diverse interests can learn together, share ideas, discuss controversial watershed topics in a neutral environment, realize changed stakeholder relationships, and search for acceptable solutions to watershed problems. Collectively those are indicators of the enhanced problem-solving capacity gained through new watershed approaches.
- Watershed initiatives come in varied forms; there is no single prescription or model. Watershed partnerships, particularly with regard to the nongovernmental and citizen dimensions, generally do not have the comparatively enduring and stable character of governmental agencies and units. As best illustrated by the Dungeness case, they are dynamic and nonlinear; they ebb and flow, become dormant or extinct, and resurface with old and new participants under new names and organizational forms. Furthermore, the balance of responsibility within the watershed partnership between govern-

mental and nongovernmental participants can shift markedly during the evolution of the partnership and the execution of its programs, as shown in the Tomorrow-Waupaca case.

- The new watershed initiatives are by definition intended to move watershed management in the direction of more integrated, ecosystem-oriented environmental management. Our cases show that is often not realized at the outset of partnership activities. In attempts to gain some early partnership successes, narrower, more incremental objectives and projects are pursued, e.g., an awareness-building watershed festival in Tomorrow-Waupaca or a habitat-improvement project along a reach of stream in the Little Tennessee. However, over time, our cases (with the exception of Long Creek) demonstrate that the substantive and functional scope of watershed partnership concerns can be expanded to address major complex watershed issues.
- Local citizens, community leaders, and interest groups play a pivotal role in launching most watershed partnerships. That locally based initiative notwithstanding, our cases indicate the important complementary role played by local and state agencies and their staffs in both starting and sustaining these efforts.
- Governmental agencies and staff provide critical sustenance for watershed partnerships in the form of funding, staff and organizational support, scientific information and analysis, shared leadership, supportive program management and recognition/ legitimacy. All our watershed partnerships rely heavily on the active involvement of government, especially state environmental and local natural resource agencies, at all stages of those collaborative undertakings. Governmental agency collaboration and financial support appear essential for success.
- For state and federal agencies to be effective partners in watershed initiatives, they must have a sustained field presence. Partnerships are strongly affected by personal relationships developed over time. The presence of such USDA agencies as NRCS, USFS and the Cooperative Extension Service in our case studies is closely related to their decentralized field presence within local offices. The active involvement of state agency staff in watershed partnerships, e.g., Washington DOE in Nisqually and Wisconsin DNR in Black Earth Creek cases, directly results from a presence in the field. Although there is a potential danger of agency programs and staff dominating watershed partnerships, our cases overall demonstrate the ability of agency professionals to work cooperatively and sensitively within the partnership culture.
- The geographic and sociohistorical context in which watershed partnerships develop is an important factor influencing the success potential for watershed partnerships. In all our cases but Long Creek, the major issues driving the formation of a partnership were visible and of sustained high salience to potential partners, and to some degree to the watershed public at large. All of our cases involved small to mid-size watersheds, a geographic scale where interests can interact and gain an overview of issues in the whole watershed.
- All of our cases exhibit a degree of organizational formality—in the form of articles of incorporation or charters, bylaws, structural arrangements, and nonprofit organizational status. Those arrangements are essential for effective functioning, as well as for meeting accountability requirements associated with formal recognition and governmental financial support.

- Adequate scientific data and analytical capacity are essential for sound watershed planning and decision-making. For the most part, the successful partnerships in our case studies have been able to acquire or are developing requisite information. In general, they have been able to access technical assistance from a variety of providers, including state, tribal and federal agencies and academic institutions. Watershed monitoring and applied research also provide information and guidance for experimental learning through pilot watershed management interventions, and adaptive management; watershed initiatives have had successes in learning through special studies and pilot projects, e.g., bio-engineered streambank erosion control and habitat improvement practices.
- Our case watershed initiatives have shown significant ability to mobilize funding to pursue their place-based goals and activities. Beyond state and federal agency programmatic funding, they have: gained added sources of support, pooled resources effectively; capitalized on special pilot-project and monitoring funding opportunities; leveraged available funds, including those from local governments, through creative cost-sharing; and developed new vehicles (such as land trusts) for funding and program delivery. The partnerships have found it easier to obtain funding for project-specific purposes than for organizational maintenance. That has meant a struggle for partnership volunteers and paid staff, dissipating staff time and energy and threatening essential partnership support activities. While long-term state programmatic support has helped in the attainment of some watershed partnership objectives (e.g., nonpoint source load reductions in Black Earth Creek), funding will continue to be a critical concern of partnerships in pursuit of long-term watershed goals. A long-term fiscal plan to achieve the full array of watershed goals was not present in any of our watershed cases, possibly due to the difficulty of realistically assessing costs. Further, coordinated budget data documenting annual funding and in-kind contributions for all partner-activities within case watersheds was not available, making it impossible to assess cost-effectiveness and to project future needs.
- In four of our cases, science-based watershed plans have guided management actions. Plan-development in every case was funded by government. The initiatives employed accessible, intelligible and transparent planning and decision-making processes, leading to better understanding and expanded support for watershed protection and restoration actions, and presumably thereby facilitating implementation. In some cases, overlapping planning processes undertaken simultaneously create some confusion; however, as shown preliminarily in the Dungeness case, a watershed partnership is a venue where multiple or differing watershed plans can be sorted out and rationalized.
- State water-quality regulatory programs are largely disconnected from watershed partnerships. Some agency programs, such as largely nonregulatory *nonpoint* pollution control and/or fishery management programs, connect effectively with and are core components of watershed initiatives (e.g., Black Earth Creek, Dungeness, Long Creek). That is not the case for state environmental agency *point source* pollution abatement programs. In spite of the substantial state and federal investment in basinwide planning and analysis for water quality management, and efforts to move pollutant discharge permitting activities towards cumulative, synchronous *point source* regulatory programs, in our cases there appears to be little meshing of that fundamental state agency regulatory program with watershed partnership activities. While some water-quality monitoring

data has been exchanged between our partnerships and state regulatory agencies, and partnerships on occasion participate in individual permitting activities, the interaction is minor. That may simply be the consequence of the success of that established program; watershed concerns may be focused on other watershed problems that go beyond resolution through point source pollution abatement. TMDL work is limited within the case watersheds, and perhaps because the impetus for TMDL efforts is quite recent, TMDLs have not been important to our case studies.

- Much of the authority and ability to act in addressing watershed problems, particularly with regard to land use and development, rests with sub-state units of government. Linking local government land-use programs and decisions to watershed initiatives is politically challenging but possible. Specific land-use development and facility-siting decisions have been major issues in our Black Earth Creek, Little Tennessee, and Nisqually cases. In those controversial situations, members of the partnerships—but not the partnership itself—have been involved in the decision-making process. The most promising examples of local governmental usage of their land-use planning and decisionmaking authority in furtherance of watershed partnership goals are the Tomorrow-Waupaca and Nisqually cases, where local land-use planning activities and policy decisions have been linked to watershed plans. LTWA is also beginning to engage local governmental units with regard to floodplain zoning and road construction and maintenance standards.
- Watershed partnerships are characterized by numerous interactions sustained over long periods of time, and successful efforts unavoidably involve high transaction costs in comparison to traditional “top-down” environmental management. Our case partnerships document the many ongoing multi-party meetings and other interactions essential to collaborative undertakings, where decisions and actions are interdependent rather than unilateral. For example, the technical advisory committee for just one of the Dungeness planning processes met 31 times in less than two years—in addition to regular monthly meetings of the full partnership; total volunteer time for that entire two-year process alone exceeds 10,000 hours.
- Some major innovations in watershed management, particularly with regard to water rights and water-quantity management, can be achieved at the state and sub-state levels. The formal agreement reached in the Dungeness River watershed with regard to water reallocation and rewatering the river during low-flow periods is exemplary. The growing role of local land trusts in watershed and habitat protection demonstrated in several of our cases is another illustration of innovation and the deployment of new tools in environmental management.
- Support for watershed initiatives transcends the many water and related programs of the Environmental Protection Agency. As noted above, there are many other key federal contributors to watershed initiatives, especially among those agencies with a field presence and technical assistance capability at the watershed level; our case study partnerships have worked with them extensively. Because of EPA’s training and related activities involving the EPA Watershed Academy, we sought to determine if those efforts played a role in our successful watershed cases. Based on interviews, there is little evidence to date that watershed partnerships in those states make use of EPA’s Watershed Academy and its programming—or are even aware of those activities.

Conclusions and Recommendations

Because the new watershed approach is viewed as an environmental management “re-invention” by EPA and others, we have explicitly tried to illustrate the nature and variability of those watershed partnerships so governmental programs and expectations are grounded in reality, and the need for a robust assessment-approach that goes beyond environmental outcome analysis and includes a broad review of accomplishments, including institutional outputs. The potential for watershed initiatives to expand the scope of watershed management and move in the direction of more integrated, ecosystem-oriented environmental management; to design solutions to watershed problems that are acceptable to stakeholders and more likely to be implemented; and to help build problem-solving capacity and ecological understanding within the watershed “community” is demonstrated by our case studies.

We conclude with the following recommendations aimed at strengthening the functioning and effectiveness of emerging watershed-management initiatives.

For EPA and States

1. Increase funding and support for new watershed approaches to environmental management.

Our cases have documented the accomplishments and potential for future success of the new generation of watershed partnership initiatives. Although those partnerships are characterized as a blending of nongovernmental “grassroots” stakeholders with state, federal and local agencies, governmental support and funding for those initiatives is essential for sustenance and success. Our cases have emphasized the need for flexible, unrestricted funding to support the organizational development and maintenance and staffing of those initiatives. Such funding, which complements the programmatic funding generated by watershed partnerships, should be long-term—renewable for at least five years. The EPA Watershed Assistance Grant Program, part of the Clean Water Action program, could be expanded to address that need. Because the new watershed-partnership initiatives are to some degree institutional experiments, funded initiatives should be required to monitor intermediate environmental outputs, as well as institutional and other accomplishments and environmental outcomes. EPA can further support watershed initiatives by modifying guidelines for relevant grant and monitoring pro-

posals, giving additional weight in ranking criteria for activities undertaken as part of a new watershed approach and/or consistent with watershed partnership goals and plans. To improve the fiscal accountability of those partnership initiatives and provide a better basis for financial planning for the overall watershed initiative, EPA should consider developing model budget templates for watershed partnerships. Of particular use would be coordinated budget data that documents annual funding and expenditures and in-kind/ volunteer contributions for the full array of watershed partner activities.

2. Improve linkages between state water-quality management regulatory programs and the concerns, planning activities and programs of watershed partnerships.

The cases examined in this study are characterized by watershed activities largely separated from the states's pollution-abatement planning for regulated point sources. Water-quality problems due to point source pollution have largely been addressed by state permitting programs, and water-quality and habitat-degradation concerns addressed by our case watershed partnerships are largely attributable to nonpoint source pollution. Indeed, all our cases show substantial success at coordinating various nonpoint source programs (Section 319, USDA, and state programs) at the watershed level. While the cases may not be representative of program relationships nationwide, better meshing of core state water-programs with watershed partnership activities should assist states in achieving their overall environmental management objectives in watersheds, and might facilitate improved integration of point and nonpoint source pollution control programs. Recognizing that watershed-based initiatives are not a replacement for regulatory programs, but that there are potential benefits to strengthening the linkage, EPA could provide guidance to states regarding: monitoring; information sharing; early involvement of watershed partnerships in basinwide planning; and meaningful reviews of standards, criteria, use designations, and alternative remedial strategies by watershed partnerships in order to better incorporate watershed-based concerns and priorities into state basinwide permitting.

3. EPA, along with other federal agencies, should document and help facilitate the transfer and diffusion of state and sub-state environmental-management innovations in watershed management.

Major innovations in watershed management outside the purview of the federal government have been achieved by watershed partnerships. EPA and other federal agencies can help in the documentation and transfer of successful watershed innovations regionally and nationally. Our cases are illustrative. The formal water-reallocation and water-rights trust-agreement reached in the Dungeness watershed may have significant transfer value to other Western states. The creative use of state watershed program funding to address land-use planning, growth management and stormwater/groundwater issues in our Tomorrow-Waupaca case warrants dissemination to other watersheds with similar problems. The experience of the Black Earth Creek Watershed Association in trying to use a relatively new tool—mediation—to address growth and consequent watershed environmental concerns would likely be of value to other watershed partnerships. The growing role of local land trusts, and options for financing their activities, is demonstrated in several of our cases; the tool has potential application in watershed restoration and protection strategies across the country. EPA's Watershed Academy could be a likely entity to assume the role of diffusing innovation.

4. If needs-assessments demonstrate a demand for the capacity building, training and clearinghouse activities of its Watershed Academy, EPA must improve the visibility and marketing of its services.

Interviews conducted during our case studies indicate very little knowledge and use of the Watershed Academy by watershed partners. If our cases are indicative of the national level of awareness, and if those services are desired and needed by the watershed “community,” more effective marketing of their content and availability is needed.

5. EPA and the Department of Transportation, along with their state counterparts, should review TEA-21 and other transportation programs to link their environmental mitigation and protection provisions, including funding, to watershed initiatives.

Our research suggests that there may be a role for federal and state transportation departments in watershed partnerships. North Carolina’s DOT has been carrying out a watershed signage program in major river basins in the state—an important educational effort to help establish a watershed identity in the public mind. Washington’s DOT has conducted a pilot project that allows the agency to meet construction-related environmental mitigation requirements by funding watershed partnership restoration priorities.³⁶ Highway and bridge construction and repair can be designed and conducted to advance watershed partnership goals, as illustrated by our Dungeness case. Given the substantial funding available to states through TEA-21, coordination with DOT at both the state policy and watershed levels may offer significant opportunities for funding watershed restoration and protection efforts, while allowing DOTs the opportunity to more effectively meet their environmental mitigation obligations.

For States

1. Link local land-use planning, growth management and regulation to watershed initiatives.

One of the potential benefits of active local government participation in watershed partnerships involves connecting local government land-use planning and decision-making with watershed initiative plans and goals, given that much of the authority to influence land use is vested in local governments. Our case studies provide successful examples of that connection. They also, however, illustrate the controversial dimensions of local land-use and growth-management planning, facility-siting decisions, and land-use regulations. In many geographic settings (and for all of our cases), managing land use and development in watersheds is central to watershed restoration and protection, yet it has proved to be a challenging undertaking. State government should take the lead in assuring that local plans prepared within a state growth management or “Smart Growth” framework take into account plans developed by watershed partnerships.

2. Promote state programs for capacity building and funding to aid the establishment of local land trusts.

Several of our cases (Nisqually, Dungeness, Little Tennessee) document the growing role of local land trusts in watershed restoration and protection. Wisconsin provides public funding to a statewide nongovernmental organization focused on building local land-trust capacity in the

state. Modest investments by states, working collaboratively with nonprofit organizations and the private sector, can significantly amplify watershed protection and restoration activities. States should consider the legislative establishment of such innovative programs.

For Congress

1. In any reauthorization of the Clean Water Act, or related legislation, Congress should include a title fostering the development of collaborative watershed initiatives.

Collaborative watershed initiatives represent a relatively new approach to protecting and restoring the ecological health of watersheds and reducing health risks to humans. They are not a replacement for regulatory programs, but rather a complement that has the potential to achieve environmental results beyond those possible through command-and-control approaches. Congress should include provisions for fostering development of collaborative watershed initiatives in reauthorization of the Clean Water Act or related legislation. Legislation to incorporate that approach into the nation's water resources management portfolio should not be overly prescriptive in its requirements. Based on the findings of this and other studies,³⁷ program design should be flexible and allow a range of options with regard to partnership purposes, composition, structure/process institutional arrangements, watershed plans and planning processes, performance evaluation, and public participation.

2. Sustain and expand the Department of Agriculture's technical assistance and capacity-building programs related to watershed initiatives.

Our case studies demonstrate the important partnership roles played by USDA units that are decentralized and have a local field presence. Those activities and programs deliver program funding and technical and other assistance directly at the watershed level. Their funding for outreach and technical support for communities and landowners, including urbanized and developing areas, should be sustained.

Endnotes

- 1 Frank Gregg, “Irrelevance and Innovation in Water Policy: Lessons from the WRPA,” in *Redefining National Water Policy: New Roles and Directions*, Stephen M. Born, ed., 1989; J.W. Koebel, Jr., “A Historical Perspective on the Kissimmee River Restoration Project,” *Restoration Ecology*, Vol. 3; L. A. Toth, “The Ecological Basis for the Kissimmee River Restoration Plan,” *Florida Scientist.*, 1993. 56-25-51.
- 2 Where success was defined by the Academy as measurable environmental improvements or the adoption of practices likely to lead to environmental improvement
- 3 For a diverse cross-section of perspectives about the “watershed approach” see: Born and Genskow, 1999; Loucks, 1998; Griffin, 1999; Rieke and Kenney, 1997; Kenney, 1999; *River Voices*, 1995; Huntington and Sommarstrom, 2000; EPA 1996; Western Governors’ Association, 1994.
- 4 Born and Genskow, 1999.
- 5 Although the Washington Department of Ecology is called “Ecology” in the state, in this document we refer to it as DOE to standardize agency acronyms.
- 6 Washington’s Growth Management Act (RCW 36.70) requires counties to develop land-use plans that designate critical natural resource areas for protection.
- 7 Watershed Management Act (RCW 90.82/ESHB 2514) and the 1998 Salmon Recovery Planning Act (ESHB 2496), augmented by the 1999 Salmon Recovery Funding Act (ESHB 5595).
- 8 US v Washington, Phase I, 384 F. Supp. 312 (1974), 356, affirmed in Washington v Passenger Fishing Vessel Association, 443 US 658 (1979); US v. Washington, Phase II, 506 F. Supp. 187 (1980).
- 9 759 F 2nd. 1353 (9th Cir. 1985).
- 10 Washington’s 23 water-quality management units (used for synchronous water quality permitting) are aggregates of the state’s 62 water resource inventory areas. Those watershed-based water resource inventory areas may include parts of larger watersheds (e.g., central Washington’s Yakima River basin includes three separate water resource inventory areas) or multiple smaller watersheds. The multiple watershed aggregations are particularly evident in coastal areas (e.g., our Dungeness case), where a single water resource inventory area might include a larger river system and several smaller tributaries that flow directly to the coast. Washington provides a map of its water resource inventory areas at <http://www.wa.gov/ecology/eils/wrias/index.html>.
- 11 States are required to identify water bodies that do not support their designated water quality uses under section 303(d) of the Clean Water Act. Those lists of impaired waters are often referred to as 303(d) lists. States are also required to develop a total maximum daily load (TMDL) allocation, where necessary, to identify and address the sources of impairment.
- 12 DOE completed a pilot for an area that was information-rich, and is now developing a characterization for an area with less information available; summary information may be viewed at <http://www.wa.gov/ecology/watershed/Characterization.htm>.
- 13 RCW 75.50.
- 14 See *supra* note 7.
- 15 See *supra* note 10.
- 16 “The Memorandum of Understanding to Transfer Water Under Trust Water Rights Program Chapter 90.42 RCW” signed April 1998.

- 17 Based on average streamflow recorded daily since 1937 from USGS Station number 12048000 near Sequim, Washington.
- 18 In 1981, Wisconsin dissolved its special purpose soil conservation districts and incorporated their functions into county government. Wisconsin counties now have land conservation departments, which are accountable to county executives, and land conservation committees comprised of county board supervisors.
- 19 Arts and Church 1982; Johnson 1991.
- 20 See *supra* note 11.
- 21 In addition to funding for nonpoint source pollution abatement, Wisconsin has allocated about \$200 million over the past ten years to the Knowles-Nelson Stewardship Fund for purchase of conservation properties. The current budget provides approximately \$46 million per year for a redesigned Stewardship program and limited funding for a smaller grant program to aid watershed-based organizations.
- 22 While each arrangement is somewhat unique, partnership teams include staff from other agencies and representatives from basin communities, industries, recreational interests, nongovernmental organizations, and interested individuals. Land and water teams (DNR Team Leaders and staff) synthesize and act upon priorities set by partnership teams and by central DNR regulatory and programmatic requirements.
- 23 Dane County Land Conservation Department records and DNR, 1998.
- 24 Agricultural Cost-Share Program funds (\$6 million annually, distributed among 96 conservation districts) are intended for strategic use by conservation districts for water-quality improvements. The funds support 75 percent of BMP costs, subject to an annual \$75,000 and lifetime \$150,000 cap per farm.
- 25 HB 515/SB 114; NC General Statutes Chapter 143, Article 21.
- 26 See *supra* note 11.
- 27 NC Department of Environment and Natural Resources, Division of Water Quality. June 1999. "Total Maximum Daily Load for Total Nitrogen to the Neuse River Estuary, North Carolina."
- 28 *The Neuse River Foundation, Inc. v. Browner*, No. 4:96-CV-188-BO(3) (E.D.N.C.). The case settled in 1998 through a Joint Stipulation of Dismissal in which a date was set for completion of a TMDL for the Neuse River.
- 29 Information may be found at www2.ncsu.edu/c11/nuese.html
- 30 William McLarney, PhD, biologist, Little Tennessee Watershed Association. Personal communication.
- 31 *Ibid.*
- 32 See, for example, Huntington and Sommarstrom, 2000; Taylor-Powell, Rossing and Geran 1998.
- 33 United States General Accounting Office. In its report, GAO state the following regarding complications for estimating costs associated with addressing just nonpoint source pollution: "Estimating the costs to control nonpoint source pollution nationwide is a difficult task. Critical information, such as identification of waters contaminated with nonpoint pollution and the contribution of each of those sources is not readily available at the local level..."(p 6). The report continues to suggest that EPA's methodology, while one of a very few attempts to actually estimate the nationwide costs, involves considerable uncertainty. Both EPA and GAO comment on the need for a new estimation approach and the high costs associated with simply developing an appropriate model.
- 34 Born and Genskow 1999; Coughlin, *et al.* 1999; Griffin; Natural Resources Law Center 1996; Huntington and Sommarstrom 2000.

- 35 During our interviews, we routinely asked about familiarity with EPA's Watershed Academy or any other relevant training support for watershed groups directly available from the agency. With one exception—a former Watershed Academy instructor—no one had even heard of the Watershed Academy. A few of our contacts were familiar with EPA's Internet-based watershed information (particularly the Surf Your Watershed site, <http://www.epa.gov/surf2/hucs/17110020/>), but were largely frustrated by incomplete, incorrect, or inaccessible information.
- 36 Born and Genskow 1999.
- 37 Born and Genskow 1999; Huntington and Sommarstrom 2000; Reike and Kenney 1997; Economic and Engineering Services, Inc., 1999.

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Table Of Acronyms

AWISH	A World Institute for Sustainable Humanity
BECWA	Black Earth Creek Watershed Association
BMP	Best Management Practice
cfs	Cubic feet per second
CTED	Department of Community Trade and Economic Development
CWMTF	Clean Water Management Trust Fund
DATCP	Department of Agriculture, Trade, and Consumer Protection
DENR	Department of Environment and Natural Resources
DFW	Department of Fish and Wildlife
DNR	Department of Natural Resources
DOE	Department of Ecology
DRMT	Dungeness River Management Team
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GMU	Geographic Management Unit
JNRC	Joint Natural Resources Cabinet
LTWA	Little Tennessee Watershed Association
MOU	memorandum of understanding
NCSU	North Carolina State University
NRC	Nisqually River Council
NRCAC	Nisqually River Citizens Advisory Committee
PSWQAT	Puget Sound Water Quality Action Team
PWSQA	Puget Sound Water Quality Authority
QNRC	Quality of Natural Resources Commission
RFEG	Regional fishery enhancement group
TMDL	Total maximum daily load
TWPWP	Tomorrow-Waupaca Priority Watershed Project
TWWA	Tomorrow-Waupaca Watershed Association
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

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