

REVIEW DRAFT

REPORT ON A SYMPOSIUM

SOUTHEAST WATER RESOURCES: MANAGEMENT AND SUPPLY

Chattanooga, Tennessee, August 24-26, 1998

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EXECUTIVE SUMMARY

In August 1998, over 180 private and public-sector professionals convened for the Southeast Water Resources: Management and Supply Symposium. Its purpose was to begin building a foundation for developing an effective regional approach to managing water in the region. Over the course of two and one-half days, case studies and management frameworks were presented, and attendees participated in six assemblies that addressed issues significantly affecting water management. Three major conclusions emerged from the symposium. First, principal problems facing water management in the Southeast are regional population and land use trends and the lack of public awareness of how these trends affect water supply. Decision makers must convey to the public the relationship between these issues while building support for their regional management. Second, better water management requires comprehensive scientific data, sound economic analyses, and innovative educational programs. A challenge for decision makers will be obtaining resources to undertake these activities. Third, a regional water management approach will require greater public participation, more reliance on mediation, and rewarding conservation. A permanent regional dialogue across disciplines and jurisdictions is needed to meet these challenges.

The authors of this report intend for it to be a working document. Rather than providing a “blow-by-blow” account of the Chattanooga Symposium, we have instead provided presentation and break-out group summaries and highlights, major symposium outcomes, and recommendations based on these outcomes. Our purpose in using this format is to allow the reader to easily move through the report, and to avoid its

becoming another “shelf dust-collector.” More importantly, we hope it will: be thought-provoking, inspire comments, and useful as the basis for a follow-on summit scheduled for Atlanta in 2000. Summit attendees will primarily include decision makers from across the region involved in water management.

We begin the report by describing the overall process used, and outcomes from, the Chattanooga Symposium as well as those anticipated for the 2000 Atlanta Summit. We then dedicate the remainder of this report to describing the content of, and the major outcomes from, the Chattanooga Symposium. Presentation summaries are provided under the following major headings: Southeast baseline water conditions and trends; conflict-based case studies; and current and anticipated water management strategies. Results of the six break-out sessions (“issue assemblies”) are then provided. We conclude by summarizing the symposium’s major outcomes and offer recommendations based on these outcomes. These recommendations are those of the authors *alone*, and are intended to serve as a springboard for discussion by decision makers at the 2000 Atlanta Summit.

SYMPOSIUM GOAL

The goal of this symposium was to begin building a foundation for developing an effective *regional approach* to managing water in the Southeastern U. S. This approach would *recognize* how water problems in one part of the region affect the welfare of other parts; *acknowledge* interrelationships among physical, ecological, socioeconomic, and institutional factors; *provide* a coordinated decision-making framework to enhance cooperation among jurisdictions, agencies, and stakeholders; and *anticipate* sources of conflict before they lead to impasse.

SYMPOSIUM ATTENDEES

Over 180 individuals attended the symposium including representatives of federal, state, and local environmental, planning, and development agencies; environmental, natural resource, and community groups; and academics. Participants came from Alabama, California, Colorado, Florida, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, Texas, Virginia, and Washington, D.C. (See Appendix A for further description of attendees).

SYMPOSIUM FRAMEWORK AND PROCESS--A REGIONAL APPROACH

The Chattanooga Symposium is the first of two regional workshops intended to examine water management issues and problems in the Southeast and how they may be more effectively addressed through a regional approach (See Appendix B for Symposium Program). The second workshop is a decision-maker summit to be held in Atlanta, Georgia in March, 2000. It is anticipated that this regional approach to managing water will ultimately involve long-term partnership-building processes and mechanisms aimed at furthering regional dialogues on water management problems and their solutions.

Figure 1 illustrates the processes used in, and outcomes achieved from, the Chattanooga Symposium and those anticipated for the Atlanta Summit. The Chattanooga Symposium analyzed current Southeast water supply problems, management frameworks, and needs for reform, thus setting the stage for the Atlanta Summit. This Summit will be attended by government and non-government decision-makers. Its purpose is to further evaluate the problems and issues identified in the Chattanooga Symposium from a decision-maker perspective and develop collaborative mechanisms for addressing them. These mechanisms may include, but are not limited to the following:

- ◆ Regional fora, open to all stakeholders, for discussing water conflicts;
- ◆ Open platforms for mediation, negotiation, and dispute resolution;

- ◆ Independent, non-partisan study groups to explore ways to integrate economic, environmental, and other concerns in water management and planning;
- ◆ One or more institutional vehicles for facilitating exchanges of water management and planning information and experiences -- and which can promote water policies that are effective, fair, efficient, and sustainable.

As a means of beginning a productive dialogue on a regional water management approach, the *Chattanooga symposium* had three foci. *First*, a series of sessions focused on the baseline conditions, problems, and issues facing the region. General issues raised during these sessions included pressures on water demand, supply, and quality, as well as generic lessons from the experience of the Western U.S. Specific case studies were presented that exemplified conflicts that have arisen from these problems and how they have thus far been addressed. The case studies included multi-purpose water management in South Florida, diversion of water from the Roanoke basin to Virginia Beach; resolution of interstate (i.e., Alabama, Florida, and Georgia) conflicts in the Apalachicola-Chattahoochee-Flint and Alabama-Coosa-Tallapoosa basins; land use impacts in the Conasauga watershed (Georgia and Tennessee); and water supply planning- and management-reform efforts in Texas, North Carolina, and California. These sessions depicted the challenges in ensuring a water supply that is readily available, safe, and managed appropriately for the benefit of ourselves, the environment, and future generations.

Second, three presentations addressed current and anticipated water management strategies in the Southeast. Two presentations addressed the activities of important institutions long-identified with the management of water supply in the region -- the U.S. Army Corps of Engineers and the Tennessee Valley Authority. These presentations outlined current management approaches and organizations as well as anticipated challenges to continuation of these approaches. The third presentation addressed EPA's Clean Water Action Plan -- a new framework for national water management which is based on reform and revitalization of the so-called "watershed approach" to public involvement, decision-making, and planning. This approach provides both a means of gauging the effectiveness of current institutional approaches and of assessing the efficacy of the recommendations proposed in the *Issue Assemblies*.

Third, each symposium participant assigned him or herself to one of six facilitated *Issue Assemblies*. Each Assembly covered topics that will continue to significantly impact water management in the Southeast. These included agriculture, urbanization, economic development, aquatic ecology, intra-interstate conflicts, and legal/institutional change. A minimum of five items of inquiry was explored by each of the Assemblies for their respective topics. These included:

- ◆ What factors currently affect and/or are anticipated to affect water management?
- ◆ How are these factors affecting or anticipated to affect water management?
- ◆ Who are the key players in these factors?
- ◆ What strategies may be used to more proactively address these factors?
- ◆ What further information do we need to acquire to implement these strategies?

Following presentations of Issue Assembly results, symposium participants were given the opportunity to rate the results' relative importance. Major results were depicted on flipcharts and participants placed markers on those they considered most significant. Overall ratings were analyzed to determine trends in what symposium participants thought were important water management issues and/or strategies.

BASELINE CONDITIONS AND CASE STUDY PRESENTATION SUMMARIES

Facts: Status and Trends of Water Use in the Southeast

Presenter: Wayne B. Solley, U.S. Geological Survey, Reston, Virginia

Summary: Water supply management in the Southeast is at a crossroads: surface supply alternatives are nearly fully developed, but -- due to population growth -- demand is increasing.

- ◆ Total Southeast population growth is projected to increase 50% by 2040 and five of the 10 fastest growing states are in this region.
- ◆ Demand patterns are changing: while industrial use has been declining, public, domestic, instream, and agricultural demands have been growing. Industrial use has in large part declined due to Clean Water Act incentives to recycle, reuse, and conserve water.
- ◆ Instream flow benefits, including protection of fish and wildlife habitat, endangered species, pollutant dilution, wetland protection, and recreation have, until recently, been ignored. As demands for all uses increase, growing conflicts between instream and offstream uses will occur.
- ◆ Water use does respond to regulatory and economic incentives. These incentives provide avenues toward solving growing demands upon a ‘fixed’ supply.
- ◆ New water demands, as well as potential conflicts between them, dictate a need for more accurate, reliable, and consistent water data.

Recommendation: To manage water supplies more effectively, more detailed, consistent, and reliable water use information is needed. In addition, innovative policy alternatives for ensuring adequate future supplies should be considered including economic and regulatory incentives to conserve, recycle, and more efficiently use water.

Water Availability and Quality in the Southeast

Presenter: Jeffrey T. Armbruster, U.S. Geological Survey/National Water Quality Assessment Program, Norcross, Georgia

Summary: Growing water demands due to population growth, urbanization, and agricultural use are degrading water quality in the Southeast. This degradation presents a formidable challenge to water managers, particularly given the growing interdependencies among water users.

- ◆ Population growth, urbanization, and agriculture are growing sources of site-specific conflicts over water availability and quality.
- ◆ Water managers often fail to recognize increasing interdependencies. This failure, in part, results from multiple jurisdictions, independent supply facilities, differences in water laws, non-recognition of surface water/groundwater interconnections, and different data management and collection techniques.
- ◆ There is an increasing awareness among water supply managers that “water is power” and that information about water is power.
- ◆ The USGS National Water Quality Assessment (NAWQA) Program provides consistent and comparable information on sixty river basins and aquifers across the nation that may help address problems arising from water use conflicts.

Recommendation: To better manage water quality, decision makers need more consistent and comparable data on baseline conditions, contaminants and their concentrations, and other factors within and among basins, watersheds, and aquifer regions. This data can provide an unbiased basis for decision-making that transcends political jurisdictions.

What's at Stake: The Challenge of the West

Presenter: Douglas S. Kenney, Natural Resources Law Center, The University of Colorado, Boulder

Summary: Despite extensive experience in coping with water shortages and developing new supplies, Western states efforts have come at great environmental and social cost. The Southeast must recognize and learn from these mistakes in order to avoid them and their attendant costs.

- ◆ Western water mismanagement has resulted in damage to instream and riparian functions from land use practices, offstream uses, diversion, and inequitable allocation. For example, the diversion of the Colorado River has resulted in a 95% loss of the riparian areas in Arizona.
- ◆ Western water policies have particularly adversely affected native American and rural communities. State water laws have frequently ignored prior claims that tribal nations had to water, while the selling of rural water rights to urban areas has in some instances led to a collapse of rural communities and businesses relying upon farm-generating income.
- ◆ Western water laws and policies were designed to satisfy current and future water demand. In the end, these laws and policies promoted water use, thus generating, rather than minimizing, water conflicts. For example, the Prior Appropriation doctrine states that the first person to use surface and/or groundwater for some "beneficial use" (i.e., for agriculture or municipal use) claims a perpetual right to it. The result has been the creation of a mentality to "use it or lose it" regardless of downstream consequences.

Recommendation: Despite having a different water law doctrine (i.e., riparian rights) than the West, the Southeast is still subject to comparable problems. Thus, in devising a regional water policy, decision makers should balance growth against available natural resources, consider equity issues among economic sectors, states, and future generations, and promote water efficiency. To achieve these objectives, resources should be managed at the watershed/river basin level, broad stakeholder participation should be encouraged, conservation should be promoted through regulation and economic incentives, and practices that generate future management problems -- such as floodplain development -- should be avoided.

North Carolina Water Needs Assessment

Presenter: Billy Ray Hall, President, North Carolina Rural Economic Development Center, Raleigh, NC

Summary: Growing water and sewer needs in North Carolina, if left unmet, are expected to impose serious constraints upon community development. Reliable baseline data on existing infrastructure and projected demands are needed to accurately estimate costs, and build political support for, needed improvements.

- ◆ North Carolina water and sewer problems are evidenced by the state's high rank in rural households without indoor plumbing and by the large number of antiquated septic tanks and sewer systems.
- ◆ These problems are exacerbated by declining availability of water and wastewater government loans and grants over the past 30 years.

- ◆ A statewide water and sewer project led by the North Carolina Rural Development Center has produced a comprehensive data set on water and sewer locations and needs. It has involved inventorying existing public community water and sewer systems; assessing water and sewer needs over the next 20 years with cost estimates for each system; and creating a GIS data set containing this data for use in strategic and capital improvements planning and analysis.
- ◆ Project results have been used to leverage state financing of improvements.

Recommendation: Reliable statewide databases of water and sewer infrastructure can positively affect water policy throughout the region. They can encourage productive debates over future needs and establish a common baseline that diverse stakeholders can draw upon for use in long-term water planning and management.

Case Study 1: Apalachicola/Chattahoochee/Flint - Alabama/Coosa/Tallapoosa River Basins

Presenter: John Keith Graham, U.S. Army Corps of Engineers, Mobile District, Mobile, AL

Summary: After years of protracted negotiations and study, Alabama, Georgia, and Florida have formed two interstate compacts designed to allocate water supplies and settle disputes: the Apalachicola-Chattahoochee-Flint (ACF) and Alabama-Coosa-Tallapoosa (ACT) compacts. While the conflicts prompting these disputes have evolved over several decades -- and include drought and conflicting water demands -- parties are now cautiously optimistic about prospects for resolving their shared water problems. The most difficult challenge still lies ahead: determining interstate allocation formulas.

- ◆ A critical vehicle for facilitating long-term negotiations has been a comprehensive study conducted by a team of federal and state agency representatives. The study has focused on three elements, using 2050 as their planning horizon: water demand, availability, and comprehensive management.
- ◆ A key outcome of the Comprehensive Study was the decision to use an interstate compact as a tool for managing water resources. This resulted from a comprehensive review of tools previously used to manage natural resources, input from the public, and outcomes of facilitated sessions among state and U.S. COE representatives.
- ◆ The Comprehensive Study has served as a forum for ongoing dialogue in both basins. In the absence of other mechanisms, this study facilitated nearly seven years of negotiations until the signing of the interstate compact.
- ◆ Compact provisions included commissions comprised of three voting members (state governors or their designates) and a non-voting Federal Commissioner appointed by the President. The commissions are to be staffed and funded by the states and a conflict resolution procedure relying on mediation is to be developed. In addition, each commission is to develop water allocation formulas.
- ◆ A NEPA scoping process has been initiated to assess the environmental impacts of the future potential water allocation formulas. This assessment was based on models developed for, and data collected in, the Comprehensive Study.

Recommendation: Parties negotiating interbasin transfers and other conflicts should consider initiating a joint comprehensive assessment. Such an assessment could serve to: 1) generate important baseline data upon which technical decisions may be made; 2) engage negotiating parties in ongoing open and productive dialogues; and 3) help to cooperatively identify a negotiating instrument (e.g., a compact).

Case Study II: Lake Gaston-Virginia Beach Diversion Controversy

Summary: After 14 years of litigation between Virginia and North Carolina, at a price tag of \$12 million, the City of Virginia Beach completed, in 1998, a water supply project that involved piping water from a reservoir straddling the boundaries of two states. Although the project is now complete, two questions remain: 1) What are the long-term consequences of the dispute? and 2) Could it have been avoided?

- ◆ This project was prompted by two major water supply issues facing Virginia Beach, the fastest growing city in Virginia. First, its water sources were undependable. Since 1923, the city has purchased water from Norfolk's "surplus waters" which were restricted during dry periods. Second, new local supplies have been limited by the area's topographic and geographic features.
- ◆ Initiated in 1983, the Lake Gaston project consists of a 76-mile long, 60-inch diameter pipeline designed to convey 60 million gallons per day from Lake Gaston to the Norfolk Reservoir system. Its final cost, including litigation fees, was approximately \$150 million.
- ◆ The principal source of contention revolved around an interbasin water transfer that affects users in two adjacent states. Three key issues were: Who owned the water?; How could economic rights of users in both states be protected?; How would the diversion affect ecological resources?; and, How could different political entities and jurisdictions negotiate alternative solutions to problems involving surface water quality, groundwater withdrawals, and interbasin transfer?
- ◆ Some feel that an alternative open to disputants -- which would have avoided the time, cost, and hard feelings, and that may have alleviated future water supply problems -- was negotiation of an interstate compact that would establish specific water allocations and provide a binding mechanism to mediate disputes.

Recommendation: Prior to entering interbasin discussions, parties should first weigh the consequences of the tools and processes they select for future negotiations. Parties also should consider the long-term consequences of their actions. While negotiating mechanisms may be initially difficult to establish, given the decade and a half struggle between two states, federal agencies, and non-governmental organizations in this case, such mechanisms hold the promise of addressing disputes before they reach a boiling point.

Case Study III: Lessons of the Central and South Florida Project & Comprehensive Review Study

Presenter: Tom Teets, South Florida Water Management District, West Palm Beach, FL

Summary: A multiagency water-management planning effort is currently being conducted in Central and South Florida (C&SF) to effectively manage the region's water supply and to restore South Florida's ecosystem. Referred to as the 'Restudy,' this effort involves reevaluating and revising the U.S. Army Corps of Engineer's 1948 water management plan for South Florida. Initiated in 1996, it consists of 1) developing a conceptual plan, 2) evaluating a range of water storage component configurations, 3) completing a comprehensive water management plan, and 4) submitting this plan to Congress by July, 1999. To date, a draft plan has been completed and a number of lessons learned.

- ◆ The Restudy was prompted by three major threats to South Florida's water needs and the area's ecosystems: 1) increase in land used by the agricultural industry; 2) population growth in the Greater Miami Metropolitan area; and 3) rerouting of water flow away from sensitive ecosystems.
- ◆ The Restudy Team is composed of 80-100 participants, ranging from federal to local levels and encompassing many disciplines including planners, engineers, and ecologists. Team members were

selected by requesting agencies to identify key personnel that had the ability to work together, had a set of project-relevant skills, and were willing to think unconventionally.

- ◆ An iterative evaluation process was used to determine the most effective water storage component configuration. Two Restudy Project technical teams evaluated nine configurations using feedback from other Restudy Team members and the public. A web site was used to obtain feedback.
- ◆ The initial comprehensive draft plan enlarges the amount of water available for users, ensures adequate water quality, and restores connectivity within the Everglades to increase flow. The principal objective of this plan is to disperse water storage throughout the system in order to provide water where it is most needed.

Recommendation: Five principal lessons have thus far been learned. First, public participation must begin at the inception of the process to ensure that all contentious issues are dealt with early on. Second, effective planning requires a multi-disciplinary team. Third, interagency participation is critical to developing a plan that will be widely accepted. Fourth, coordination among working groups is essential to project success. Fifth, results from computer modeling do not necessarily reflect reality and should only be used in conjunction with a team's best professional judgement.

Case Study IV: The Case of the Conasauga

Presenter: George Benz, Southeast Aquatic Research Institute & Tennessee Aquarium, Chattanooga, TN

Summary: The Nature Conservancy is currently working with the Conasauga River Alliance -- a coalition of local citizens, conservation groups, and businesses -- on an initiative aimed at both protecting and improving the Conasauga Watershed. Members of both groups have formed the Conasauga River Site Conservation Planning Team to develop an action plan to mitigate threats identified in a watershed assessment conducted by the Conservancy. While the Conservancy and Conasauga River Alliance have made long-term commitments to implementing this action plan, its success will in large part depend upon partnerships that endure over several generations.

- ◆ The Conasauga River stretches 100 miles and its watershed encompasses 730 square miles in two Tennessee and six Georgia counties. It is one of the most species-rich regions in North America.
- ◆ Three major threats to the Conasauga's water quality and aquatic habitat are: 1) excessive sediments from accelerated erosion; 2) nutrients from fertilizers, animal wastes, and leaking sewer lines; and 3) toxic chemicals from industrial and domestic wastes and herbicides and pesticides from farm and lawn application.
- ◆ Water quality problems have in large part been traced to six socioeconomic and land use trends: growing population; increased housing starts; a decrease in farming; growing employment in manufacturing of nondurable goods; and below national average incomes.
- ◆ The Action Plan has identified four subwatershed regions: upper, middle and lower watershed sections and an area comprised of darter springs and streams scattered throughout the watershed. Threats within each were ranked based on high, medium, and low relative impacts. The Planning Team has concluded that the upper and middle regions are top priorities for intervention.

Recommendation: Steps to successfully implement a watershed management plan should, at minimum, include: 1) performing a comprehensive watershed assessment that includes an analysis of land use and socioeconomic trends; 2) developing an action plan based on prioritized watershed threats; and 3) developing and fostering watershed partnerships that will last over several generations and engender a local environmental stewardship ethic.

Case Study V: Implementation Issues Associated with Water Policy Reform in Texas

Presenter: Tommy Knowles, Texas Water Development Board, Austin, TX

Summary: Texas is currently conducting a statewide, regional water plan, as mandated by Senate Bill 1 (SB1). The primary intent of SB1 is to increase local involvement in, and support for, water management planning. Sixteen regions have been established by the Texas Water Development Board (TWDB) and each is required to organize a planning group to develop a comprehensive management plan by September 1, 2000. Seventy-five percent of SB1 costs are covered by the state while the remainder is provided by the regions. State legislators generally view this funding formula as equitable because it provides the majority of funding for regional plan development by local governments displeased with the state's plan. Many local governments, however, view SB1 as another 'unfunded mandate.'

- ◆ One impetus for SB1 was a series of droughts in the 1990s that taught decision makers that cities with comprehensive water management plans were most able to withstand the droughts' effects.
- ◆ A primary SB1 objective is to develop regional water plans that 1) encompass a 50 year planning period; and 2) determine existing supplies and needs, project future water demands, evaluate water supply scenarios, and identify strategies for managing them.
- ◆ Regional planning groups are locally-nominated and selected by the TWDB. Each member represents one stakeholder group and has a single vote, ensuring that neither political influence nor disproportionate resources will affect the group process outcomes.
- ◆ TWDB sanctions for not participating in the regional planning process include exclusion from securing 1) low-interest loans from TWDB for water development projects; and 2) surface water rights for municipal use from the Texas Natural Resource Conservation Commission.

Recommendation: Regional water planning offers multiple benefits including site-specific planning, greater cooperation among water users, and an increased likelihood that plans will be locally accepted. However, these benefits do not come without a price. If considering regional planning, the merits and drawbacks to a range of funding scenarios should be evaluated. Local governments may consider mandated local water planning as "another unfunded mandate" if they are required to pay a portion of its costs. By having the regions share the costs, the state will not only be relieved from the burden of funding the plan in its entirety, but local ownership and loyalty to the plan may be increased.

WATER MANAGEMENT PRESENTATION SUMMARIES

Managing the Tennessee River System

Presenter: Janet C. Herrin, Tennessee Valley Authority, Knoxville, TN

Summary: TVA's primary water management goal is to take a regional approach to managing water resources in order to satisfy present-day needs while providing a foundation for regional growth. Although river flow currently appears to be ample, projected water demands are dramatically increasing, underscoring that water is a finite resource that must be responsibly and cooperatively managed.

- ◆ Supply deficits are becoming more apparent throughout the region prompting a search for new sources. Two examples of areas that are currently looking at alternative sources of supply to meet growth are Tennessee's Cumberland Plateau and Northeast Mississippi.
- ◆ TVA operates the Tennessee River as an integrated system in order that water-related benefits can be balanced among all competing demands. This also means that while all water users may be

- satisfied part of the time, none of them are satisfied all of the time.
- ◆ TVA's Clean Water Initiative (CWI) uses a non-regulatory approach and a unique delivery system called River Action Teams (RATs). RATs' approach is to build local community capacity so that citizens may implement projects that will help them achieve their water quality goals.
 - ◆ The Southeast Watershed Forum is a recently established cooperative effort among agencies and nonprofits to improve watershed management. It serves as an effective regional planning model.

Recommendation: To use water responsibly in the Southeast, a broad regional planning approach should be taken. Key elements of this approach include maintaining a productive dialogue among water users and forming partnerships among government, nonprofit and private sector entities that cut across political boundaries.

Water Supply Policies of the Corps of Engineers in the Southeast

Presenter: William Barron, U. S. Army Corps of Engineers, Nashville District, Nashville, TN

Summary: The Water Supply Act of 1958 authorizes the U.S. Army Corps of Engineers (COE) to provide water supply from its managed reservoirs. Prior to this Act, COE reservoirs were managed only for hydroelectricity, navigation, fish and wildlife, recreation, and water quality. As a result, the COE now has to balance the impacts of water supply against these other purposes. In particular, the COE assesses how water volume reductions affect hydropower benefits.

- ◆ Entities requesting water supply must provide a needs analysis, examine other water supply alternatives, and obtain appropriate COE permits and real estate easements.
- ◆ The COE assesses water supply requests by determining their impact on hydropower benefits, reviewing the environmental impacts of withdrawal, and soliciting public review and comment.
- ◆ Water storage charges are primarily based on hydropower benefits and lost revenues to the U.S. Treasury.
- ◆ The costs of COE reservoir water storage and supply need to be recognized by water users. One source of misunderstanding is that, until recently, many communities and other entities have not been charged for these services.

Recommendation: The public and decision makers need to understand that there is a cost attached to providing reservoir water storage for municipal and other supply needs. These uses must be balanced against other legally-mandated purposes affecting the COE.

Problem Solving in California

Presenter: William W. Wade, Foster Associates, Inc., San Francisco, CA

Summary: CALFED is a collaborative consensus-building effort to resolve water conflicts among federal and state agencies and agricultural, urban, and environmental stakeholder groups. It was born out of the frustration of 20 years of "water wars" which produced no enduring resolution of these conflicts. These wars were precipitated in the early 1970's when the state's last major water supply projects were completed at the same time the state's population continued to grow. CALFED's advent was also prompted by federal court decisions supporting the importance of instream use.

- ◆ Major California water supply projects were initiated in the early 1900's, with the construction of

the Los Angeles aqueduct, and continued through the 1960's. These projects crisscrossed the state with dams, reservoirs, and aqueducts to hold, control, and deliver water. For example, the Central Valley Project consists of 20 dams and reservoirs and the State Water Project encompasses 400 miles of aqueducts and 22 dams and reservoirs.

- ◆ As California's population continues to increase so do competing water demands. The state is growing by 1,500 people per day. Demand forecasts for 2020 indicate that the allocation of the state's water among urban, agricultural, and instream uses will be 15%, 39% and 46% respectively. Forecasts also indicate that average yearly supplies will fall 3 million acre feet (MAF) short of 2020 water demands, and 7 MAF short during dry years.
- ◆ In the mid-1980s, two landmark court decisions supported instream use as beneficial and held that it should be protected equally with consumptive uses. These decisions overturned the 1978 Water Rights Decision that had allowed Delta water quality standards to be set without considering instream use. In 1987, the standard-setting Bay-Delta hearings were conducted, bringing major stakeholder groups together for the first time in a collaborative problem-solving process.
- ◆ CALFED involves a three-phased approach: 1) defining problems through a consensus-building process (completed in 1996); 2) conducting a programmatic environmental impact statement to identify alternative solutions and recommend one for adoption (completed in 1998); and 3) implementing site-specific programmatic elements (to be completed over the next 20-30 years).

Recommendation: Resolving complex transboundary problems among Southeast stakeholders hinges on developing a collaborative consensus-building process that identifies mutually-beneficial goals. These goals should include resolving a common set of problems among stakeholders and making decisional processes agreeable to all. Achieving these goals requires strong leadership, sound technical information, and public education. Solutions should encompass adaptive management; the use of water markets and tradable water rights; conservation; reuse; conjunctive use; and habitat restoration.

An Overview of the Clinton Administration's Clean Water Action Plan

Presenter: Nikos Singelis, U.S. Environmental Protection Agency, Washington, D.C.

Summary: The U.S. EPA is charting a new course to restore the nation's waterways and protect public health through the Clean Water Action Plan (CWAP). CWAP's approach recognizes each watershed as a unique entity with different problems that require locally-driven, collaborative solutions. CWAP also emphasizes strengthening core clean water programs including those that protect public health, conserve and restore natural resources, reduce polluted runoff and expand citizens' rights-to-know.

- ◆ Much progress has been made nationwide in improving water quality. The number of waterways safe for swimming and fishing have doubled; industrial pollutant discharges have been reduced by billions of pounds per year; the rate of wetland loss has been cut by 75%; and duck populations have rebounded. However, much remains to be done. Nearly 40% of the nation's waterways still do not meet state water quality standards; nitrogen and phosphorus runoff have led to a 6,000 square-mile hypoxic zone in the Gulf of Mexico; and about 100,000 acres of wetland continue to be lost each year.
- ◆ The CWAP is using the "watershed approach" to: encourage states and tribes to assess the health of their watersheds and prioritize their watershed restoration strategies; encourage the building of strong local partnerships through grants and other incentive programs; and develop a watershed management framework under which a National Watershed Forum will be created.
- ◆ CWAP goals are ambitious and include creating 2 million miles of riparian buffer to reduce runoff,

achieving a net increase of 100,000 wetland acres a year by 2005, increasing the number of waterways that meet state water quality standards by 80%, and improving water quality protection for 2,000 miles of roads.

Recommendation: While CWAP is an aggressive water quality management plan that challenges federal, state, and local entities to meet lofty goals, it also offers new and exciting opportunities for those involved in protecting water quality. These include grants and technical assistance for initiating watershed partnerships and projects, expanded funding for states to implement restoration strategies, and access to national watershed/water quality data compiled under CWAP auspices. These and other opportunities should be explored to determine how they can best be used by those who strive to improve water quality.

ISSUE ASSEMBLY RESULTS

Urbanization/Community Sprawl

Leader: David Moreau, City and Regional Planning Program, University of North Carolina, Chapel Hill

Summary

Urbanization issues affecting water supply management largely revolve around growth pressures and a lack of planning infrastructure. Unplanned growth has led to water use inefficiencies and subsidies which, in turn, have resulted in extensive, adverse societal and ecological impacts. Strategies for addressing these problems revolve around a series of growth management policies.

Primary Urbanization Factors Affecting Water Supply

Inadequate attention to burgeoning population growth and its regional pattern has resulted in a lack of policies addressing land use, transportation, and natural resource protection. This policy void includes a lack of government agency coordination within and across jurisdictions, a lack of private sector incentives to use water efficiently, and a lack of public awareness initiatives to prevent wasteful water use. Finally, this void has also included a lack of attention to long-term adequacy of water infrastructure.

Key Players

A distinctive characteristic of these unplanned growth and development patterns is that virtually every public organization and agency, as well as private sector entity, shares some responsibility for them.

Consequences for Water Supply and Quality

Unplanned growth and development has led to managing water supplies reactively as opposed to proactively. This has produced three consequences for Southeast water supplies. The first is neglect of water supply infrastructure. An aging and poorly maintained infrastructure has resulted in excessive water loss through leakage and occasional water outages. A second consequence is inefficient water use and growing rates of consumption. A third is adverse impacts to aquatic ecological systems (e.g., wetlands, lower-order streams). This results, in part, from the misperception that building in rural areas is less costly than redeveloping urbanized ones due to failure to account for the costs associated with ecological losses.

Unplanned growth and development has also led to a deterioration of water quality through increased nonpoint source loads, loss of riparian buffers, increased water temperatures, and increased groundwater pollution. In addition, as a result of a reduction of water supplies to aquatic ecological systems, these systems have either been lost and/or increasingly contaminated. As with water supply, failure to manage proactively has exacerbated these problems.

Strategies to be Taken

Strategies for addressing unplanned growth and development include devising and implementing growth management policies that emphasize watershed-level planning and coordination, particularly for land use, transportation, and natural resource protection. They also include developing economic incentives that lead to better water conservation and full-cost pricing of water services. Finally, better public education is needed to enhance awareness of the relationship between development and water use as well as personal responsibility for water conservation.

Water Quality/Aquatic Ecology

Leader: Larinda Tervelt Norton, Gulf of Mexico Program Office, Stennis Space Center, MS

Summary: Critical issues facing the protection of water quality in the Southeast include maintaining critical minimum in-stream flow, reducing non-point sources, and making equitable trade-offs. Maintaining minimum in-stream flow is necessary to ensure adequate water supply of suitable quality and to sustain aquatic habitat. Non-point sources that must be reduced include agricultural and urban runoff. Finally, social and ecological issues must be analyzed in order to better determine how to make equitable trade-offs (e.g., protecting jobs versus protecting habitat).

Adverse impacts from failure to address these issues will have ecological effects and ultimately impact economic, social, and cultural activities that affect all of us. Strategies to address these issues should include improved research, public education, inspiring the public to demand better water quality, and empowering communities to address site-specific water quality problems.

Key Players

Water quality problems and strategies for resolving them involve all levels and agencies of government, private sector entities, nonprofit/advocacy organizations, scientists, and the general public.

Impacts/Use Impairments

A failure to address water quality issues has adverse ecological, economic, social, and cultural impacts. Ecological consequences include alterations to the physical, biological, and chemical characteristics of water bodies (e.g., temperature, dissolved oxygen, geomorphology, species composition and diversity). Economic, social, and cultural impacts include, but are not limited to, public health dangers, loss of fisheries, loss of hydropower potential, loss of recreational amenities and/or aesthetic attributes, and a loss of resources important to cultural cohesion and stability.

Recommendations

Strategies to address water quality issues fall into four major categories. The first is improving research into the relationship between water quality and quantity and ecological and economic health. The second is providing sound scientific and economic information that decision makers can use to evaluate policy alternatives. This information may be obtained from ongoing research and, in part, through compiling and more effectively disseminating existing information. The third category of strategies is to educate the public, particularly youth, regarding water quality and quantity issues and their relationship to health, safety, and community welfare. Education should be aimed at changing attitudes and behaviors so that people will value clean water, act to conserve it, and demand that their leaders provide it. The fourth

category is involving communities in water quality issues by providing them with the opportunity to work directly with decision makers (e.g., through citizen advisory boards and environmental oversight bodies).

Economic Development/Industrial Growth

Leader: Louis G. Tornatzky, Southern Technology Council, Research Triangle Park, NC

Summary: Two problems related to the integration of economic development and water management are poor planning and confusion regarding how the concepts of “costs” and “values” are conceptualized and applied to water policy. Planning processes tend to be fragmented and poorly organized for resolving conflicts and not devised to cross agency or jurisdictional boundaries. The result is poor communication and difficulty in pooling resources or common experiences. Agencies and jurisdictions tend to operate by a “law of the jungle” in which each seeks self-preservation. The terms “cost” and “value” are commonly used by water resource and economic development experts without clear definition or consistent application to problems (e.g., How does one reflect the value of clean water through cost?)

Source of Problems

These problems have been caused and exacerbated by a lack of adequate data. The collection of valid data may be one means of solving these problems. For example, valid data can help determine which management practices and policies best ensure that water management goals are being met. Data is also needed to assess the “true” costs of water. The data collected should be compiled at an appropriate scale (e.g., encompassing regions, watersheds) and be accessible to a wide range of users (e.g., scientists, policy makers, general public) for multiple uses.

Strategies for Solving Problems

The problem of poor planning may be partially addressed by Congress creating trans-boundary regional entities. These entities should:

- ◆ designate specific agencies and other stakeholders for involvement;
- ◆ be adequately funded;
- ◆ go beyond political jurisdictions by encompassing watersheds, economic regions, and other units-of-analysis;
- ◆ make explicit the policy responsibilities of agencies and other stakeholders; and
- ◆ ensure long-term responsible management.

Poor planning may also be addressed through implementing “smart growth” strategies. This involves identifying ways to manage sprawl while maintaining economic vitality. In order to operationalize this concept, economic development and water agencies should more closely align their efforts by:

- ◆ integrating economic development and water management strategies;
- ◆ establishing rates to encourage efficient use of water and conservation; and
- ◆ recruiting “clean” businesses and industries.

In order to avoid multi- or cross-jurisdictional planning impasses that may result in lengthy and costly litigation, one or more conflict resolution mechanisms should also be established. These may include:

- ◆ defining ground rules and procedures for resolving disagreements about interstate projects; or
- ◆ utilizing federal or interstate memoranda of understanding (MOUs).

Finally, with federal funding decreasing and rural areas less able than urban ones to fund bonds, it will be difficult to obtain adequate funding for water management. Special rural initiatives may be needed.

Legal/Institutional Change

Leader: Berton Lee Lamb, Midcontinent Ecological Science Center, USGS., Ft. Collins, CO

Summary: Both institutional and legal issues need to be addressed to ensure an adequate supply of clean water in the Southeast. Related problems and potential solutions may be divided into six categories.

Problems

Data Gaps

Currently there are two major data problems regarding water management: first, there has not been a comprehensive evaluation conducted to determine data gaps. Second, protocols for collecting and analyzing data are commonly incompatible, inhibiting communication and use by decision makers.

Pricing/Conservation

Currently, water conservation is limited by three problems: 1) most water use is subsidized; 2) the price charged for water does not adequately reflect the costs (including externalities) of providing it; and 3) water prices do not truly reflect supply and demand.

Watershed Management

A primary problem in water management from a legal perspective is that because political and watershed boundaries often do not match up, natural resource management decisions often are not based on a local watershed perspective. As a result, interbasin transfer issues are often difficult to resolve.

Enforcement

There are four challenges to enforcing water quality standards. First, there is the ongoing challenge of enforcing the Clean Water Act regulations (e.g., NPDES). Second, it is particularly difficult to manage non-point sources. Third, the legacy of past pollution makes it difficult to attribute responsibility for pollution to a particular polluter. And finally, there is a lack of comprehensive state water management planning which encompasses quality and quantity issues.

New Laws Needed

There is a lack of comprehensive federal oversight of water supply and resource issues because current mission-centered agencies and institutions have fragmented roles and responsibilities. In addition, there are inconsistencies among these agencies and institutions in how water supply and water resource issues are addressed. A prime example is management of instream flow values.

Who Decides

Current decision-making processes regarding water management lack planning foresight and are often undemocratic. Consequently, decisional outcomes are often inequitable and shortsighted. Examples of inequities and shortsightedness include a precedence given to property rights over public interests and adoption of imprudent policies driven by profit-motives (e.g., flood plain development).

Strategies

Education

Water management problems may, in large part, be addressed by educating professionals, decision makers, and citizens. The objective of educating professionals is to facilitate their ability to communicate with decision makers and citizens. This education should be interdisciplinary and provided through multiple media (e.g., Internet, workshops). The objective of educating decision makers is to ultimately help them understand the environmental consequences of policies. Field trips are one way to instill this understanding. Citizen education initiatives should be accessible, community-based, and aim to enhance understanding of the basic principles of water science as well as imparting techniques for its responsible management.

Water Planning

Sound planning should encompass a watershed approach that is based on valid scientific data, directly involves citizens in decision-making and environmental monitoring, and encourages closer coordination among scientists and decisionmakers.

Pricing

Reforms in water pricing could draw on a range of techniques, as appropriate, to encourage water conservation. These techniques include negative sanctions that discourage water use (e.g., rationing, price controls) as well as incentives that reward efficient use.

Mediation (Alternative Dispute Resolution)

Decision-making regarding funding and implementation of water management policies should be open to the public for debate. Furthermore, parties should be rewarded for seeking cooperative means of resolving disputes. These disputes may be resolved equitably and democratically by applying alternative dispute resolution techniques.

Legislative/Political

Efforts to improve water quality should aim to encourage cooperation among different agencies and organizations and encourage responsible, preventive practices. For example, state environmental protection agencies could be encouraged to work cooperatively in order to establish compatible goals and benchmarks. Likewise, communities and the private sector could be encouraged to implement best management practices to minimize nonpoint pollution. Finally, new laws may be required to force highway departments and other agencies to be environmentally sensitive and to modify zoning measures and building codes to discourage practices that diminish water quality.

New Laws

Additional reforms should begin with state-level prioritization of water use values including instream uses. These reforms should be followed with improvements to the planning process that make possible better intra- and interstate cooperation on a watershed and basin-wide level. This planning process should also more fully involve the public. Specific initiatives should include eliminating property tax assessment practices that encourage inappropriate land use developments (e.g., floodplain development) and mandating that water supply and sewer use applicants demonstrate water conservation. Finally, water and land-use regulations should be evaluated for loopholes that encourage wasteful and inefficient consumption and permits to withdraw from, or impound, streams should be subject to explicit instream flow needs.

Inter/Intrastate Conflict and Cooperation

Leader: John N. Morris, Water Resources Division, North Carolina Department of Environment and Natural Resources, Raleigh, NC

Summary: Inter/intrastate conflict in relation to future water management in the Southeast may be described by examining: 1) the primary sources of conflict within and among Southeastern states; 2) the consequences of failing to resolve these conflicts; 3) strategies for overcoming or avoiding these conflicts; and, 4) obstacles to implementing such strategies. Following are discussions of each.

Sources of Conflict

Three primary sources of conflict are: competing interests, human factors, and economic factors. Causes of competing interests include:

- ◆ the failure of jurisdictions to match up with problems (e.g., river basins do not coincide with political boundaries);
- ◆ demands for satisfying new water needs (e.g., instream flow);
- ◆ lack of agreement on the value of water resources (e.g., conflicts over the dollar value of externalities);
- ◆ increasing divergence between the economic “haves” and “have nots” on the individual and regional level; and
- ◆ an increasing combativeness among special interests resulting in stalemate and difficulty in reaching compromise.

Human factors leading to conflict encompass political posturing and short-term outlook. The former is exemplified by elected officials who avoid compromise for political gain. The latter is exemplified by a failure to look beyond the next election when making policy. Economic factors leading to conflict are the failure of the market to address all water values and to take into account the costs of environmental impacts which are shrouded in uncertainty.

Consequences of Not Resolving Conflicts

Three consequences of not resolving inter- and intrastate conflicts are expansion of conflict, greater expense, and diminishing quality-of-life. Because politicians often avoid compromise and turn conflicts into win-lose situations, a culture of conflict develops and sometimes spreads to other issues. This generates litigation, leads to inefficient and wasteful crisis-driven decisions, and leads to high costs when environmental remediation is required. Problem-solving stalemates may lead to irretrievable losses of environmental quality and diminished quality-of-life. It also may result in continued inequitable distribution of resources making some areas economically and environmentally suffer more than others.

Strategies for Overcoming or Avoiding Conflicts

Three sets of strategies may be used to overcome or avoid water conflicts. The first is to take a more holistic and regional approach to water conflicts that considers modifications to water demand as well as supply. The second is to generate greater participation of all interests and build better working relationships in order to achieve more consensus. The third is to provide objective, reliable and understandable data that may be used to better inform the public so it may more fully participate in discussions, and to avoid disputes over data gaps that ultimately lead to distrust.

Obstacles to Implementing Strategies

Obstacles include intra- and interagency turf wars, agencies ill-equipped to manage water holistically, lack of funding to implement proper planning and data collection, and lack of incentives for long range decision-making. They also include a public often uninformed on water issues, a lack of constructive political

leadership and an overall lack of civic mindedness on the part of politicians and public.

Agricultural/Land Use/Other Natural Resource Issues

Leader: Robert L. Herbst, Global Environment and Technology Foundation, Annandale, VA

Summary: There is a broad range of agricultural, land use, and other natural resource problems relating to water quality and quantity in the Southeast. Problems may be categorized under six trends: 1) greater and more diverse water needs; 2) farmland ownership changing from family to corporate; (3) land use patterns changing from rural to urban; (4) a lack of sufficient planning that educates key players (e.g., farmers, developers); (5) a lack of pilot projects that demonstrate “water-friendly” agricultural practices; and (6) a lack of understanding of underlying problems due to insufficient data.

Changes in Water Use

Problems

A multiplicity of rural land owners who are using the land in diverse ways is increasing water demands in order to accommodate diverse land uses.

Recommendations

Major reforms include initiating and maintaining a watershed approach to land management, promoting NRCS’ Conservation Reserve Program, more comprehensively assessing regional water demands, using education to promote voluntary best management practices (BMPs), improving the transfer of BMP technologies through Resource Conservation and Development Districts (RC&Ds), and increasing political and financial support for initiatives such as TVA’s Clean Water Initiative (CWI).

Changes in Farmland Ownership

Problem

A modern-day shift away from traditional family farming and towards corporate farming may be contributing to a net decline in water quantity and quality.

Recommendations

Efforts should be undertaken to evaluate the current structure of the farmland market to determine what mechanisms and/or incentives may promote more sustainable agricultural practices. In addition, a sustainable agriculture symposium focusing on protection of water resources should be held in the region.

Land Use Change

Problem

Economic and social pressures are producing rapid land use changes that are negatively affecting water quality and quantity.

Recommendations

Efforts should be made to evaluate tax incentives for maintaining environmentally sound land uses, to educate rural landowners on how to protect the environmental integrity of rural landscapes through estate planning, and to promote planning and growth management through “smart growth” strategies.

Need for Better Planning

Problem

Historically, the agriculture industry has lacked a comprehensive planning perspective on how to protect their water resources.

Recommendations

Efforts should be undertaken to educate farmers, developers, elected officials, and the public on the benefits of planning and how to do it. This will require ensuring that farmers and other stakeholders are “brought to the planning table.”

Need for Pilot Projects

Problem

There are insufficient pilot projects that demonstrate how water resources may be improved as agricultural land use changes.

Recommendations

Whenever possible, efforts to retain agricultural land uses in the planning of development corridors (e.g., efforts by the Chattanooga Institute for Sustainable Development to develop a Chattanooga/Atlanta Corridor) should be encouraged. The feasibility of other, comparable pilot projects should be evaluated throughout the Southeast.

Need for a Better Understanding Problems

Problem

The interface between agricultural land use and water quality and quantity problems remain insufficiently understood because of a lack of regional data. This ultimately inhibits viable solutions to these problems.

Recommendations

Current regional case studies (e.g., regional assessment effort by Southern Appalachian Man and the Biosphere project) should be assimilated and their lessons applied to agriculture and water management. Also, a regional database should be created that encompasses land use changes and their impacts on water quality and quantity.

SYMPOSIUM OUTCOMES AND RECOMMENDATIONS

This report concludes with the major outcomes of the Chattanooga Symposium and, based on these outcomes, recommendations for the upcoming 2000 Atlanta Summit. Symposium outcomes are described under three categories: regional conditions/problems; current needs; and potential management approach elements. The recommendations are those of the authors and are intended to serve as a springboard for decision maker discussions at the 2000 Atlanta Summit.

Outcomes

Southeast Region -- Conditions/Problems

A principal problem facing the management of water in the Southeast is regional population and land use trends. A subsidiary problem is a general lack of public and decision maker awareness of how these trends affect water supply. A challenge for decision makers will be conveying to the public the relationship between these issues while building political support for regionally managing them.

- ◆ While surface supply alternatives are nearly fully developed, population growth, expected to double by 2050, continues to place increasing demands on water supplies.
- ◆ While industrial demand is declining, public, domestic, instream, and agricultural demands are growing.
- ◆ Increased population growth, urbanization, and agricultural use are resulting in continued degradation of water quality.

- ◆ Water managers often fail to recognize water supply and quality interdependencies.
- ◆ Inter/intra basin conflicts are increasing due to multiple water demands that are not only growing but are becoming increasingly divergent.
- ◆ There is a general lack of awareness and understanding of water supply and quality issues among the public and decisionmakers.
- ◆ Planning processes among agencies charged with managing water tend to be fragmented, poorly organized and lack public involvement, resulting in poor communication and difficulty in pooling resources or common experiences.

Southeast Region -- Current Needs

Policy needs for better managing water on a regional basis are wide-ranging. These include comprehensive scientific data, more proactive management tools, sound economic analyses, and innovative educational programs. A challenge for decision makers will be obtaining the resources to meet these regional needs.

- ◆ Reliable and consistent water quality and quantity data, germane to decision-maker needs, is required as a basis for sound policy. This data may serve to promote a productive dialogue, leverage needed resources, and help to avoid future conflicts.
- ◆ Public and decision maker awareness-building and educational initiatives that promote better understanding of water issues should be expanded and updated as needed.
- ◆ The true value of water needs to be reflected in its costs so that these costs can be incorporated in market incentives and pricing structures.
- ◆ Laws, regulations, and policies needs to be enacted that encourage interagency and interjurisdictional cooperation as well as public involvement in water management.
- ◆ Water managers need improved planning and growth management tools to assess supply and demand needs and to anticipate sources of conflict.

Potential Management Approach Elements

A regional approach to water management will require innovations. These include encouraging public participation, using mediation techniques to avoid litigation, fostering joint research, and rewarding water conservation. The challenge for decision makers will be identifying and/or developing models for regionally implementing these innovations.

- ◆ Water management policies that promote water consumption should be avoided and those that encourage conservation and end-use efficiency should be supported.
- ◆ Water managers should weigh the benefits and costs of using alternative tools for negotiating inter/intrabasin conflicts.
- ◆ Joint studies by different sets of water users can facilitate these users' negotiations by generating valuable baseline data, maintaining an ongoing dialogue among parties, and hastening trust and confidence.
- ◆ Water management planning should incorporate public participation from its inception, utilize multidisciplinary teams, encourage interagency cooperation, and build enduring partnerships with non-governmental organizations.

Recommendations

Atlanta Summit planners may want to consider the following Chattanooga Symposium outcomes as useful points of departure for further exploration and possible refinement.

- ◆ the need to acquire and disseminate water-related data for decisions;
- ◆ how to better enhance public and decision maker awareness of water supply issues through education and outreach programs. One particularly critical issue that should be addressed is interdependencies among economic development, environmental protection, quality-of-life, and water supply;
- ◆ how water conservation may be encouraged through various economic incentive programs and/or economic sanctions;
- ◆ the need to enact laws, regulations, and policies that encourage interagency and interjurisdictional cooperation as well as public involvement in water management; and
- ◆ how to overcome fragmented and poorly organized planning processes.

These outcomes suggest the need for a permanent regional dialogue across disciplines and jurisdictions. To sustain such a dialogue various mechanisms will be required: some to jointly acquire and exchange data, others to enhance regional education and outreach programs, and still others to engage in conjoint planning and dispute resolution. The authors of this report recommend that Summit participants consider the types of regional mechanisms appropriate for meeting these challenges.

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