


# SOUTHEAST WATER RESOURCES: MANAGEMENT AND SUPPLY ISSUES SYMPOSIUM REPORT



CHATTANOOGA, TENNESSEE  
AUGUST 24-26, 1998

## SPONSORS AND ORGANIZERS

*Appalachian Regional Commission*  
*Chattanooga Institute of Sustainability*  
*Gulf of Mexico Program Office*  
*Oak Ridge National Laboratory*  
*River Valley Partners, Inc.*  
*Southern States Energy Board*  
*Stewart, Wright & Associates*  
*Tennessee Valley Authority*  
*U. S. Environmental Protection Agency*  
*U. S. Geological Survey, and*  
*The University of Tennessee*

## AUTHORS

David Lewis Feldman,  
*Senior Research Scientist*

Ruth Anne Hanahan,  
*Senior Research Assistant*



Energy, Environment and Resources Center  
and Water Resources Research Center  
The University of Tennessee-Knoxville  
May, 1999

## Preface

In August 1998, over 180 private and public-sector professionals convened for the *Southeast Water Resources: Management and Supply Symposium* to build a foundation for 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 discussed, and attendees participated in six “issue assemblies” (i.e., break-out sessions) that addressed issues significantly affecting water management.

This report is intended to convey the essence of this symposium and to serve as a springboard for discussion for a follow-on meeting, the “Atlanta Water Management Dialogue,” scheduled for November, 1999. The report’s main body summarizes the overall framework and process used in the Chattanooga Symposium, describes the Symposium’s major conclusions, and provides policy recommendations. These recommendations are those of the authors *alone*, and are primarily intended to serve as food for thought for attendees of the “Atlanta Water Management Dialogue.” For those interested in more detail about the Symposium, the appendices contain summaries of the presentations and results of the six issue assemblies, as well as information on water use trends in the region, the case studies, and the symposium’s participants.

The concise summary format of this report was employed to encourage its use. Our intention is that it be a working document that the reader may easily move through and to avoid the report from becoming another “shelf dust-collector.” More importantly, we hope the report will be thought-provoking, inspire comments, and prove useful as the basis for the follow-on Atlanta Water Management Dialogue, and for further regional collaborative efforts.

## **INTRODUCTION**

The Southeast's rich cultural and economic heritage is inextricably linked to its natural resources. Abundant water has historically provided the basis for agriculture, transportation, energy production, and recreation. It has also endowed the region with a priceless diversity of flora and fauna. Despite these assets, our region has begun to experience conflicts over water use and supply comparable in their potential scope to those found in other areas of the country. The sources of these conflicts include actual or contemplated interbasin diversion, difficulties in reconciling multiple water uses during drought, and challenges in balancing instream and offstream demands.

These conflicts are beginning to take center-stage among policymakers and the media, particularly because they are increasingly becoming entwined in economic development and environmental protection issues. However, a systematic examination of how to address them has not yet been undertaken. The *Southeast Water Resources: Management and Supply Symposium* was an initial attempt at charting a path for addressing these conflicts.

## **GOAL**

The goal of the symposium was to build 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.

## **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, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia and Washington D.C. (See Appendix A for further description of attendees).

## **FRAMEWORK AND PROCESS--A REGIONAL APPROACH**

The Chattanooga Symposium was the first of two regional gatherings 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 will be a follow-on meeting aimed at decision-makers, the Atlanta Water Management Dialogue, which will be held in November, 1999. It is anticipated that this regional approach to managing water will ultimately entail long-term partnership-building processes and mechanisms aimed at furthering regional dialogues on water management problems and their solutions.

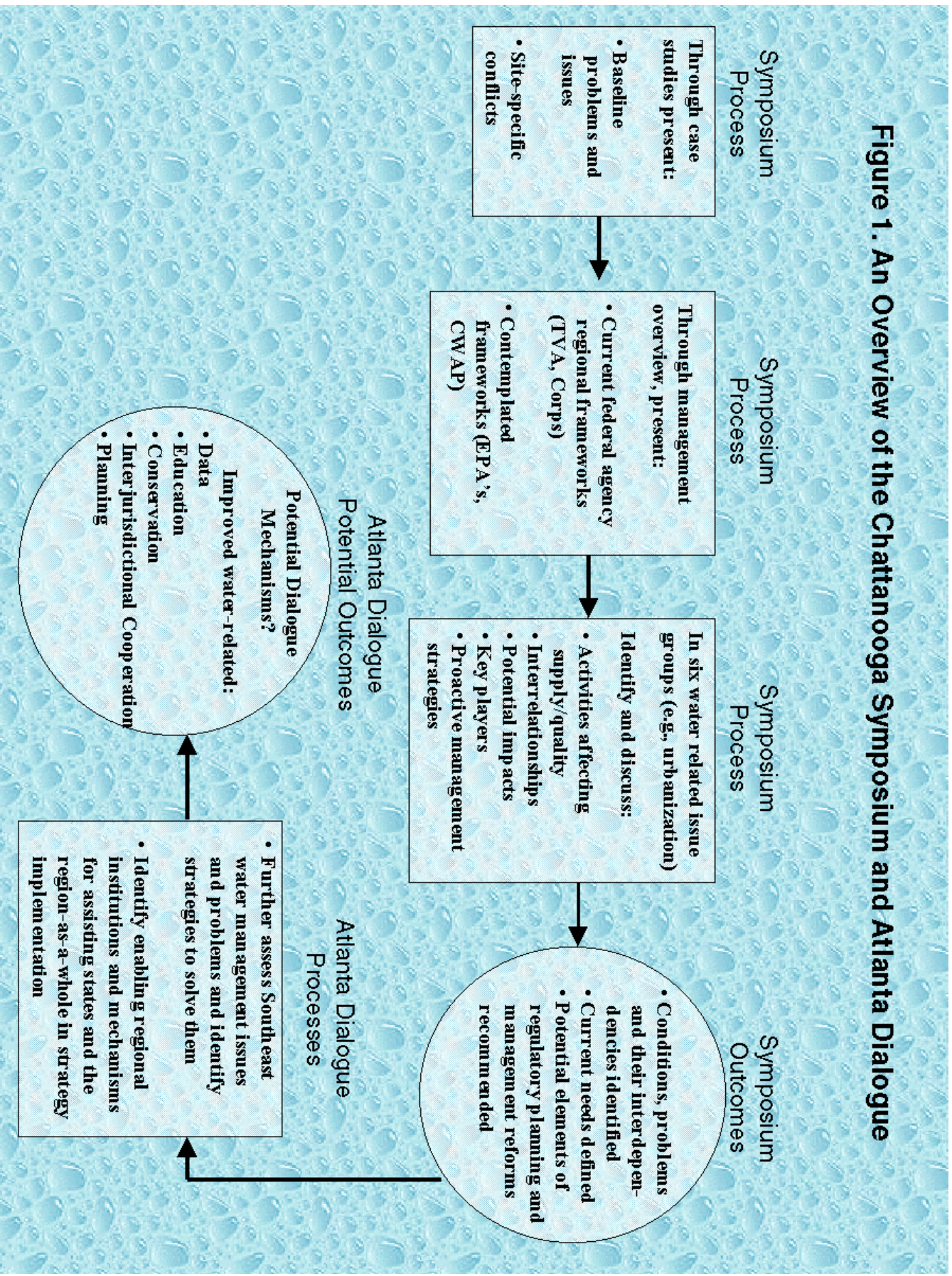
Figure 1 illustrates the processes used in, and outcomes achieved from, the Chattanooga Symposium and those anticipated for the Atlanta Water Management Dialogue. The Symposium analyzed current Southeast water supply problems, management frameworks, and needs for reform, thus setting the stage for the Atlanta Water Management Dialogue. The purpose of the Atlanta Dialogue is to further evaluate the problems and issues identified in the Chattanooga Symposium and develop collaborative regional mechanisms and institutions for addressing them. These mechanisms may include, but are not limited to:

- ◆ Regional meetings, open to all stakeholders, for discussing water conflicts;
- ◆ Technical assistance with 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 to facilitate exchanges of water management and planning information and experiences and promote water policies that are effective, efficient, and sustainable.

The *Chattanooga Symposium* was structured as follows:

- ◆ **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 over 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 (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 anticipated challenges to their continuation. The third presentation addressed EPA's Clean Water Action Plan -- a new framework for national water management based on reform and revitalization of the so-called "watershed approach" to public involvement, planning, and decision-making.
- ◆ **Third, each symposium participant was "self-assigned" 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:

**Figure 1. An Overview of the Chattanooga Symposium and Atlanta Dialogue**



- ◆ *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 involved in these factors?
- ◆ *What* strategies may be used to more proactively address these factors and their impacts?
- ◆ *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. Assembly 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. Summaries of both the symposium presentations and issue assembly results are provided in Appendix C.

## ***CONCLUSIONS AND RECOMMENDATIONS***

During the two and one-half day symposium, the presenters and issue assembly participants *together* came to a number of significant conclusions about the current and future status of water management in the Southeast. These are discussed under three categories: regional conditions/problems; current needs; and potential management approach elements. The authors of this report then provide a series of recommendations based on these conclusions. These recommendations are solely those of the authors and are intended to serve as a springboard for decision-maker discussions at the Atlanta Water Management Dialogue.

### ***Conclusions***

#### ***Southeast Region -- Conditions/Problems***

Two principal problems facing the management of water in the Southeast are: 1) a growing regional population; and 2) changing land use towards more urban/suburban development and sprawl. A subsidiary problem is a general lack of public and decision-maker awareness of how both trends affect water supply. A challenge for decision-makers will be conveying to the public how these issues are related while building political support for regionally managing them.

- ◆ While surface supply alternatives are nearly fully developed, population, 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 which are becoming increasingly divergent.
- ◆ There is a general lack of awareness and understanding of water supply and quality issues among decision-makers and the public.
- ◆ 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.
- ◆ A lack of surface water withdrawal policies in the region limits effective long-term water management planning.

#### *Southeast Region -- Current Needs*

Policy needs for better managing water on a regional basis are wide-ranging. They 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 satisfy these regional needs.

- ◆ Reliable and consistent water quality and quantity data, germane to decision-maker needs, is required as a basis for sound policy. These data may serve to promote a productive dialogue, leverage needed resources, and help 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 price charged for water should reflect the costs its use imposes on society and the environment, thus providing an incentive to conserve it and use it efficiently.
- ◆ Laws, regulations, and policies need to be enacted that encourage interagency and interjurisdictional cooperation as well as public involvement in water management.
- ◆ Water managers need improved planning 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 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 broadly weigh the benefits and costs of using alternative methods (e.g., mediation, litigation) for resolving inter/intrabasin conflicts.

- ◆ Joint studies by different sets of water users can facilitate these users' efforts to resolve conflicts 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***

We recommend that the principal water management issues and problems facing the Southeast, identified in the Chattanooga Symposium, be the basis for five key items of inquiry -- or "action items" -- to be addressed by participants at the Atlanta Water Management Dialogue:

- ◆ How can the acquisition and dissemination of high-quality, compatible water-related data for decision-makers be improved?
- ◆ How can public and decision-maker awareness of water supply issues be enhanced 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 can water conservation be encouraged through various economic incentive programs and/or economic sanctions?
- ◆ What, if any, laws, regulations, and policies are needed to encourage interagency and interjurisdictional cooperation as well as public involvement in water management?; and,
- ◆ How can fragmented and poorly organized planning processes be improved?

These items of inquiry may be evaluated in four ways. First, how well do individual states, and the region as-a-whole, currently address these issues? Second, what strategies are available, at the local, state, regional, and national level for addressing them better? Third, at what level(s), and by whom, should these strategies be implemented? Finally, what new or improved regional institutions and other mechanisms are needed to facilitate implementing these strategies? The latter suggests the need for a permanent regional dialogue across disciplines and jurisdictions. We hope the Atlanta Water Management Dialogue will provide an opportunity to determine how this permanent dialogue may be established and sustained.

## **APPENDICES**

- APPENDIX A:** Chattanooga Symposium Participant Affiliation
- APPENDIX B:** "Southeast Water Resources: Management and Supply Symposium Program," August 24-26, 1998
- APPENDIX C:** Chattanooga Symposium Presentation and Issue Assembly Results Summaries
- APPENDIX D:** Symposium Media Clippings
- APPENDIX E:** Water Use Trends in the Southeast
- APPENDIX F:** Southeastern Case Studies

**APPENDIX A.2**  
List of Chattanooga Symposium Attendees

Mr. William L. Andreen  
University of Alabama/Alabama Rivers Alliance  
Tuscaloosa, AL

Mr. Jeff Armbruster  
U.S. Geological Survey  
Norcross, GA

Mr. Wayne Averett  
Three Rivers Planning and Development District  
Pontotoc, MS

Ms. Jennifer Backer  
University of Tennessee-Chattanooga  
Chattanooga, TN

Mr. Rich Bailey  
Chattanooga News Bureau  
Chattanooga, TN

Mr. Morgan T. Baldwin  
CREATE Foundation  
Tupelo, MS

Dr. Mary V. Ball  
Carson-Newman College  
Jefferson City, TN

Mr. Don P. Barger  
National Parks and Conservation Association  
Norris, TN

Dr. Jack Barkenbus  
Energy, Envir & Res Ctr, Univ of TN  
Knoxville, TN

Mr. Charles G. Barnes  
Chattahoochee-Flint Regional Development Center  
Franklin, GA

Mr. William R. Barron Jr.  
U.S. Army Corps of Engineers  
Nashville, TN

Mr. Robert C. Benfield  
TDEC, Solid Waste Management  
Johnson City, TN

Dr. George W. Benz  
Southeast Aquatic Research Institute  
Chattanooga, TN

Mr. Jaron Bergin  
University of Tennessee at Chattanooga  
Chattanooga, TN

Mr. Dennis H. Block  
Alabama Water Resources Research Institute  
Auburn University, AL

Mr. Todd H. Boatman  
Corps of Engineers-Nashville  
Nashville, TN

Mr. Hale C. Booth  
Southeast Tennessee Development District  
Chattanooga, TN

Mr. Jeff Bostick  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Debbie Bower  
Energy, Environment and Resources Center  
University of Tennessee  
Knoxville, TN

Mr. Jerry L. Boyd  
TDEC, Division of Water Supply  
Johnson City, TN

Mr. David Brill  
Energy, Environment and Resources Center  
University of Tennessee  
Knoxville, TN

Mr. Gary W. Brock  
Tennessee Valley Authority  
Knoxville, TN

Mr. James C. Brown  
Tennessee River Gorge Trust  
Chattanooga, TN

Mr. Hobson Bryan  
Dept. of Geography Regional & Urban  
Planning The University of Alabama  
Tuscaloosa, AL

Mr. Edmund B. Burkett  
U.S. Army Corps of Engineers  
Mobile, AL

Ms. Patricia Ann Cahill  
University of Tennessee-Chattanooga  
Chattanooga, TN

Ms. Berdelle T. Campbell  
League of Women Voters and Cumberland  
River Compact  
Nashville, TN

Mr. Randy E. Carroll  
East MS Electric Power Assn.  
Meridian, MS

Mr. Andy Carroll  
Chattanooga, TN

Mr. Larry R. Clark  
TVA  
Chattanooga, TN

Mr. Donald B. Clark  
Network for Environmental & Economic  
Responsibility United Church of Christ  
Pleasant Hill, TN

Ms. Jean Clark  
Friends of the OBED/Cumberland County  
Pleasant Hill, TN

Mr. Howard A. Clonts  
Auburn University Environment Institute &  
AL Water Resources Research Institute  
Auburn University, AL

Mr. Richard E. Cochran  
TDEC, Division of Water Pollution Control  
Nashville, TN

Ms. Patrice Cole  
University of Tennessee at Knoxville  
Knoxville, TN

Ms. Leslie Colley  
The Nature Conservancy  
Chattanooga, TN

Ms. Jennifer Conner  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Catherine Ann Coulter  
Chattanooga/Hamilton County Regional Planning  
Agency  
Chattanooga, TN

Ms. Rachel Craig  
University of Tennessee at Knoxville  
Knoxville, TN

Mr. Lee Creech  
Water Resource Development Commission  
Frankfort, KY

Mr. Evan Crews  
University of Tennessee at Chattanooga  
Chattanooga, TN

Mr. David Crockett  
The Chattanooga Institute  
Chattanooga, TN

Mr. Allen Culp  
The Nature Conservancy  
Chattanooga, TN

Mr. Larry Curtis  
Auburn University  
Auburn, AL

Mr. Robert M. Davenport  
The Trust for Public Land  
Chattanooga, TN

Mr. Ronald D. Davis Sr.  
Tennessee Valley Authority  
Knoxville, TN

Mr. James A. Deal  
Corps of Engineers-Nashville District  
Nashville, TN

Mr. Glenn R. Delfish  
Georgia Environmental Organization, Inc.  
Smyrna, GA

Mr. John Doty  
Freelance Writer  
Andersonville, TN

Ms. Danielle C. Droitsch  
NPCA, Southeast Office  
Norris, TN

Mr. Marshall Glenn Duckworth  
Union Co. Development Assoc.  
New Albany, MS

Mr. David Duhl  
TDEC, Division of Water Pollution Control  
Nashville, TN

Mr. Jeff Duncan  
Water Resources Research Center  
University of Tennessee  
Knoxville, TN

Ms. Connie Eilbeck  
The Chattanooga Institute  
Chattanooga, TN

Mr. Jeffrey C. Elledge  
St. Johns River Water Management District  
Palatka, FL

Mr. Michael P. Farrell  
Center for Global Environmental Studies Oak  
Ridge National Laboratory  
Oak Ridge, TN

Ms. Gail Farris  
Energy, Environment and Resources Center  
University of Tennessee  
Knoxville, TN

Dr. David Feldman  
Energy, Envir & Res Ctr, Univ of TN  
Knoxville, TN

Mr. Daniel H. Ferry  
Tennessee Valley Authority  
Knoxville, TN

Ms. Dawn Ford  
Biological & Environmental Sciences Univer-  
sity of Tennessee-Chattanooga  
Chattanooga, TN

Mr. Paul Freeman  
University of Tennessee at Chattanooga  
Chattanooga, TN

Mr. Jim Frierson  
Tennessee World Trade Center  
Chattanooga, TN

Mr. Doug Fritz  
City of Chattanooga Stormwater Management  
Chattanooga, TN

Mr. George Dodd Galbreath  
Environmental Policy Office,  
TN Dept of Env & Con  
Nashville, TN

Mr. Tim Gangaware  
Energy, Envir and Res Ctr, Univ of TN  
Knoxville, TN  
Dr. Hari P. Garbharran

Middle Tennessee State University  
Murfreesboro, TN

Mr. Keith Graham  
U. S. Army Corps of Engineers  
Mobile, AL

Ms. Barbara Griffith  
Water Resources Research Center University  
of Tennessee  
Knoxville, TN

Mr. Pem Guerry  
River Valley Partners, Inc.  
Chattanooga, TN

Mr. Charles Gulotta  
The Alliance  
Corinth, MS

Mr. James R. Hagerman  
TVA Clean Water Initiative  
Knoxville, TN

Mr. Billy Ray Hall  
North Carolina Rural Economic Development  
Center  
Raleigh, NC

Ms. Ruth Anne Hanahan  
Water Resources Research Center University  
of Tennessee  
Knoxville, TN

Mr. Jim Harless  
TDEC DOE/D  
Oak Ridge, TN

Ms. Linda B. Harris  
Tennessee Valley Authority, Clean Water  
Initiative  
Chattanooga, TN

Mr. Aaron B. Head  
Sierra Club  
Moody, AL

Mr. Wayne Henson  
East MS Electric Power Assn.  
Meridian, MS

Mr. Robert L. Herbst  
Global Environment & Technology Foundation  
Annandale, VA

Ms. Janet C. Herrin  
Tennessee Valley Authority  
Knoxville, TN

Mr. John M. Higgins  
Tennessee Valley Authority  
Chattanooga, TN

Mr. Jim Hill  
River Valley Partners  
Signal Mountain, TN

Ms. Linda K. Hixon J.D.  
North Chickamauga Creek Conservancy  
Hixson, TN

Mr. Joe E. Holland  
TN Division of Water Pollution Control  
Nashville, TN

Ms. Lisa J. Hollingsworth  
Chattahoochee-Flint RDC  
Franklin, GA

Ms. Jennifer Hooper  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Kristen Howertin  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Constance E. Hunt  
World Wildlife Fund  
Washington, DC

Ms. Susan Hutson  
U.S. Geological Survey  
Memphis, TN

Mr. George Ivey  
Nature Conservancy  
Chattanooga, TN

Mr. Olin M. Ivey  
Georgia Environmental Organization, Inc.  
Smyrna, GA

Ms. Susan R. Jacks  
TVA  
Knoxville, TN

Mr. John J. Jenkinson  
TVA  
Chattanooga, TN

Ms. Carolyn S. Jenkinson  
EnviroLink Magazine  
Signal Mountain, TN

Mr. Matthew C. Kales  
The Georgia Conservancy  
Atlanta, GA

Dr. Philip Kazemersky  
University of Tennessee at Chattanooga  
Chattanooga, TN

Prof. Doug S. Kenney  
Natural Resources Law Center,  
University of CO School of Law  
Boulder, CO

Mr. Randall Z. Kerr  
Tennessee Valley Authority  
Knoxville, TN

Mr. G. Robert Kerr  
Georgia Dept. of Natural Resources, Pollution Prevention Assist. Div.  
Atlanta, GA

Ms. Beverly King  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Nancy Knight  
Appalachian Regional Office  
Tupelo, MS

Dr. Tommy Knowles  
Office of Planning, Texas Water Development Board  
Austin, TX

Ms. Sandra L. Kurtz  
South Chickamauga Creek Greenway Alliance  
Chattanooga, TN

Mr. Robert B. Lake  
West Alabama Planning & Development Council  
Northport, AL

Mr. Berton Lee Lamb  
Midcontinent Ecological Science Center USGS  
Fort Collins, CO

Ms. Frances Lamberts  
League of Women Voters of Tennessee  
Jonesborough, TN

Mr. Dick Larkin  
Consultant  
Carrollton, GA

Mr. James H. Layton  
Coosa Valley Regional Development Center  
Rome, GA

Mr. Larry Lewis  
Tennessee Association of Utility Districts  
Jackson, TN

Mr. Ronald E. Lilly  
City of Corinth Gas & Water Department Corinth,  
MS

Mr. Mike Linger  
Tennessee River Gorge Trust  
Chattanooga, TN

Mr. Philip E. Luce  
Arcadis Geraghty & Miller  
Chattanooga, TN

Mr. Charles H. Martin  
Virginia Department of Environmental  
Quality  
Richmond, VA

Ms. Lillian T. Mashburn  
Office of Federal Relations, Univ of TN  
Knoxville, TN

Mr. Tom Mayberry  
Rural Development, USDA  
Nashville, TN

Ms. Elizabeth M. McClendon  
Chattahoochee-Flint RDC  
Franklin, GA

Mr. Daniel J. McGlothlin  
National Parks Service  
Fort Collins, CO

Mr. Brad McLane  
Alabama Rivers Alliance  
Birmingham, AL

Mr. Hugh Mitchell  
Hiawassee River Watershed Coalition  
Hiawassee, GA

Dr. David H. Moreau  
University of NC-Chapel Hill, Dept of City  
& Regional Planning  
Chapel Hill, NC

Mr. John N. Morris  
North Carolina Division of Water Resources  
Raleigh, NC

Mr. Charles M. Morrissey  
Lockheed-Martin Energy Research  
Kingston, TN

Mr. Tom Moss  
TN Division of Water Supply  
Nashville, TN

Mr. Clint Moye  
GA EPD  
Atlanta, GA

Mr. Philip J. Mummert  
TVA  
Knoxville, TN

Mr. Woodley Murphy  
The Chattanooga Institute  
Chattanooga, TN

Mr. Kenneth J. Nemeth  
Southern States Energy Board  
Norcross, GA

Ms. Amy Nicolson  
Hiawassee River Watershed Coalition  
Hiawassee, GA

Mr. Gilbert Nicolson  
Hiawassee River Watershed Coalition  
Young Harris, GA

Ms. Larinda Norton  
Gulf of Mexico Program  
Stennis Space Center, MS

Mr. Charles A. Padera  
St. Johns River Water Management District  
Palatka, FL

Ms. Erlinda L. Patron  
Virginia Department of Environmental Quality  
Richmond, VA

Ms. Samantha A. Pearson  
Foundation for Global Sustainability  
Knoxville, TN

Dr. Wayne L. Poppe  
Tennessee Valley Authority  
Chattanooga, TN

Mr. Steven R. Potter  
University of Tennessee, Knoxville Ag &  
Biosystems Engineering  
Knoxville, TN

Ms. Donna J. Pridmore  
CASI, Inc.  
Oak Ridge, TN

Ms. Gini Reed  
Energy, Environment and Resources Center  
University of Tennessee  
Knoxville, TN

Ms. Debra Ressler  
University of Tennessee at Chattanooga  
Chattanooga, TN

Mr. Terry D. Reynolds  
Arcadis Geraghty & Miller  
Chattanooga, TN

Mr. Samuel Z. Rose  
Chattanooga-Hamilton County Health  
Department  
Chattanooga, TN

Mr. Richard J. Ruane  
Reservoir Environmental Management, Inc.  
Chattanooga, TN

Dr. Michael Sale  
Oak Ridge National Laboratory  
Oak Ridge, TN

Mr. Chris Schaefer  
University of Tennessee at Chattanooga  
Chattanooga, TN

Mr. David A. Shaw  
East Alabama Regional Planning and Development  
Commission  
Anniston, AL

Mr. Chris Sheffield  
Appalachian Regional Commission  
Tupelo, MS

Mr. Dan M. Sherry  
Tennessee Wildlife Resources Agency  
Nashville, TN

Mr. Nikos Singelis  
US EPA Headquarters  
Washington, DC

Mr. Reid Sisson  
University of Tennessee-Chattanooga  
Chattanooga, TN

Mr. Mohamad Sleiman  
Top of Alabama Regional Council of Governments  
(TARCOG)  
Huntsville, AL

Mr. Bob Smira  
MS Department of Economic and Community  
Development  
Jackson, MS

Dr. George F. Smith  
UTK, Agricultural Extension Service  
Knoxville, TN

Ms. Pam Sohn  
Chattanooga Times  
Chattanooga, TN

Mr. Wayne B. Solley  
USGS  
Reston, VA

Dr. Henry G. Spratt  
University of Tennessee-Chattanooga  
Chattanooga, TN

Mr. Bill W. Stacy  
University of Tennessee-Chattanooga  
Chattanooga, TN

Ms. Pat Stevens  
Atlanta Regional Commission  
Atlanta, GA

Mr. John Stewart  
Stewart, Wright & Associates, LLC  
Knoxville, TN

Ms. Nancy Stewart  
Stewart, Wright & Associates, LLC  
Knoxville, TN

Mr. Michael R. Sullivan  
Tombigbee River Valley Water Management District  
Tupelo, MS

Mr. Richard T. Sullivan  
Tennessee American Water Company  
Chattanooga, TN

Mr. Tim Summerlin  
University of Tennessee-Chattanooga  
Chattanooga, TN

Mr. Thomas Taylor  
Mount Rogers Planning District Commission  
Marion, VA

Mr. Tom Teets  
S. Florida Water Management District  
W. Palm Beach, FL

Ms. Molly Theobald  
Appalachian Regional Commission  
Washington, DC

Ms. Julie S. Tindell  
University of Tennessee  
Maynardville, TN

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

Mr. Bowman Townsend  
IJAMS Nature Center  
Knoxville, TN

Mr. John C. Tucker J.D.  
University of Tennessee at Chattanooga  
Chattanooga, TN

Ms. Leslie A. Turrini-Smith  
TDEC  
Nashville, TN

Mr. Christopher D. Ungate  
TVA Hydro Operations  
Chattanooga, TN

Mr. Larry E. Vanden Bosch  
North Georgia Regional Development Center  
Dalton, GA

Mr. William W. Wade  
Foster Associates, Inc.  
San Francisco, CA

Hon. Zach Wamp  
Member of Congress Third District, Tennessee  
Chattanooga, TN

Mr. Randy Weatherington  
TVA-Resource Group-Environmental Re-  
search and Services  
Knoxville, TN

Mr. Harry West  
Atlanta Regional Commission  
Atlanta, GA

Mr. Lawrence Wetherby III  
Water Resource Development Commission  
Frankfort, KY

Mr. Jesse L. White Jr.  
Appalachian Regional Commission  
Washington, DC

Ms. Laura Wilks  
Water Resources Research Center University of  
Tennessee  
Knoxville, TN

Mrs. Caroline Williams  
League of Women Voters-Chattanooga  
Chattanooga, TN

Mr. Chad Wilson  
The Trust for Public Land  
Chattanooga, TN

Mr. Brown Wright  
Stewart, Wright & Associates, LLC  
Knoxville, TN

Ms. Anne Zimmermann  
Cherokee National Forest, USDA-Forest Service  
Cleveland, TN

Dr. Victor L. Zitta  
Mississippi State University  
Mississippi State, MS

**APPENDIX B**  
Chattanooga Symposium Program

# SYMPOSIUM PROGRAM

**August 24, 1998**

<b>REGISTRATION</b>	3:30 - 4:30 p.m. Tennessee Aquarium
<b>PLENARY</b>	4:30 - 6:00 p.m. Tennessee Aquarium Auditorium

## Welcome

*Rep. Zach Wamp (TN), U.S. House of Representatives*

## Why Are We Here?

*Jim Hill, Board Member, River Valley Partners*

## Facts: Status and Trends of Water Use in the Southeast

*Wayne Solley, U.S. Geological Survey*

## Water Availability and Quality in the Southeast

*Jeff Armbruster, U.S. Geological Survey*

## What's at Stake: The Challenge of the West

*Douglas Kenney, Natural Resources Law Center, University of Colorado, Boulder*

## Summary

*David L. Feldman, University of Tennessee*

<b>RECEPTION &amp; BUFFET</b>	6:00 - 8:00 p.m. Tennessee Aquarium
-----------------------------------	--

**Case I: Apalachicola/Chattahoochee/Flint River Basin**  
*Keith Graham, U.S. Army Corps of Engineers, Mobile District*

## Case II: Lake Gaston-Virginia Beach Diversion Controversy

*Charles Martin and Erlinda Patron, Virginia Department of Environmental Quality*

## Case III: Lessons of the Central and Southern Florida Project and Comprehensive Review Study

*Tom Teets, South Florida Water Management District*

**BREAK** 10:00 - 10:15 a.m.

*This break is sponsored by Southern States Energy Board.*

## Case IV: The Case of the Conasauga

*George Benz, Southeast Aquatic Research Institute*

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

*Tommy Knowles, Texas Water Development Board*

**LUNCHEON** Noon - 2:00 p.m.  
Plaza Ballroom B & C - 2nd floor

*This lunch is sponsored by River Valley Partners, Inc.*

This is a "working lunch." To allow adequate time for questions and discussions, presentations will begin while the lunch is being served.

## Managing the Tennessee River System

*Janet Herrin, Tennessee Valley Authority*

## Water Supply Policies of the Corps in the Southeast

*William Barron, U.S. Army Corps of Engineers, Nashville District*

**AFTERNOON  
SESSION** 2:30 - 5:45 p.m.

## Issues Assemblies:

Each assembly will be asked to explore four "items of inquiry" for their respective topics:

- ◆ *What are the major problems or driving forces that are shaping reality?*
- ◆ *What more do we need to know to deal proactively with the assigned topic?*
- ◆ *What are the issues that must be resolved by elected representatives and agency heads?*
- ◆ *How do we achieve a positive outcome?*

**BREAK** 3:45 - 4:00 p.m.

*This break is sponsored by Southern States Energy Board.*

**August 25, 1998**

**ALL SESSIONS TO BE HELD IN THE  
CHATTAHOOGA MARRIOTT HOTEL**

**REGISTRATION** 7:00 - 5:00 p.m.  
Plaza Ballroom Lobby - 2nd floor

**CONTINENTAL  
BREAKFAST** 7:00 - 8:00 a.m.  
Plaza Ballroom Lobby - 2nd floor

*This Continental Breakfast is sponsored by The University of Tennessee, Chattanooga, Biological and Environmental Sciences Department and College of Arts and Sciences*

**BREAKFAST  
WORKSHOP** 7:30 - 8:30 a.m.  
Plaza Ballroom B - 2nd floor

**North Carolina Water Needs Assessment**  
*Billy Ray Hall, North Carolina Rural Center*

**PLENARY** 8:30 - 11:45 a.m.  
Plaza Ballroom A - 2nd floor

The morning plenary features five case studies and their lessons that illustrate the challenges in developing and carrying out an effective strategy for management and use of water.

The six Issue Assemblies are:

## I Urbanization/Community Sprawl

### Plaza Ballroom A - (North End)

What do we know about the growth of metropolitan areas in the Southeast during the next quarter century? Can we estimate the impact of this growth on available water supplies?

*Leader: David Moreau, University of North Carolina, Chapel Hill*

## II Water Quality/Aquatic Ecology

### Plaza Ballroom A - (South End)

To what extent will improved water quality be an essential element in an adequate water supply? What are the imperatives that will determine future water quality in urban and rural areas?

*Leader: Larinda Norton Tervelt, Gulf of Mexico Program Office*

## III Economic Growth/Industrial Development

### East Room

How is future economic growth in the southeast dependent on an adequate supply of clean water? From an environmental perspective, is abundant and clean water underpriced in the Southeast? What impact would "fair value" pricing have on economic growth?

*Leader: Louis Tornatzky, Southern Technology Council*

## IV Legal/Institutional Change

### West Room

What is the role of the U.S. Congress and state legislatures in ensuring an adequate supply of clean water? What new laws, if any, are needed? Are the Southern states likely to experience something akin to the water wars of the U.S. Southwest and West? Will politics be the decisive element in resolving these issues?

*Leader: Berton Lee Lamb, Mid-Continent Ecological Science Center*

## V Inter/Intrastate Conflict and Cooperation

### Lookout Room

To what extent is inter/intrastate conflict and cooperation an important issue in achieving an adequate water supply across the southeast? Are institutional mechanisms in place to achieve cooperation? If not, what would these mechanisms look like and how can they be put in place?

*Leader: John Morris, Department of Environment and Natural Resources, North Carolina*

## VI Agricultural/Land Use/Other National Resource Issues - Signal Room

How can the legitimate demands of agriculture for adequate supplies of clean water be balanced with the growing needs of metropolitan areas? How can these trade-offs be determined? How is controlling non-point pollution from agriculture a key requirement in achieving clean water?

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

## RECEPTION & BUFFET

6:30 p.m.

*Reception and special showing at the Tennessee Aquarium IMAX 3-D Theater sponsored by The Tennessee Valley Authority — welcoming remarks by Ike Zeringue, Chief Operating Officer, TVA*

---

**August 26, 1998**

REGISTRATION 7:30 - 9:00 a.m.

CONTINENTAL 7:00 - 8:00 a.m.

BREAKFAST Plaza Ballroom Lobby

*This Continental Breakfast is sponsored by Oak Ridge National Laboratory.*

BREAKFAST 7:30 - 8:30 a.m.

WORKSHOP Plaza Ballroom B - 2nd floor

### Problem Solving in California

*Bill Wade, Foster Associates, Inc.*

PLENARY 8:30 - 11:45 a.m.

Plaza Ballroom A

*Moderator: David Feldman, University of Tennessee*

### Reports of Issue Assemblies

The leaders of the six Issues Assemblies will participate in a panel discussion of assembly topics and issues. Also, all symposium participants will have an opportunity to "vote" on the findings of the issue assemblies, which will be displayed in the Plaza Ballroom.

BREAK 10:00 - 10:15 a.m.

*This break is sponsored by Southern States Energy Board.*

LUNCHEON Noon - 1:30 p.m.

Plaza Ballroom B & C

*This luncheon is sponsored by Chattanooga Institute for Sustainability.*

This is also a "working lunch" to allow ample time for comments, questions and discussion.

### The Entrepreneurship Initiative: Water and Economic Development in Rural America

*Jesse White, Federal Co-Chair, Appalachian Regional Commission*

### Clean Water Action Plan

*Nikos Singelis, Coordinator, Clean Water Action Plan, U.S. Environmental Protection Agency*

ADJOURN 1:30 p.m.

## APPENDIX C SYMPOSIUM PRESENTATION AND ISSUE ASSEMBLY SUMMARIES

### ***Baseline Conditions and Case Study Presentations***

#### **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 in the U.S. 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. 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, surface water diversions and groundwater pumping in Arizona have resulted in the loss of over 90% of riparian areas.
- ◆ Western water policies have particularly adversely affected native American and rural communities. Federal and 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 evolved to protect the investments and rights of existing users, but in the process, established a set of incentives encouraging excessive consumption and ensuring future conflicts. For example, the Prior Appropriation doctrine states that the first person to use surface and/or groundwater for some "beneficial use" (for agriculture or municipal use) claims a perpetual right to it. The result has been the creation of an attitude 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 use efficiency. To achieve these objectives, the following should be done:

- ◆ 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 management and planning.

**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**

*Presenter: Charles H. Martin, Virginia Department of Environmental Quality, Richmond, VA*

---

**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 state's fastest growing city. 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) effects of drainage caused by the existing Central and South Florida Project on sensitive ecosystems; 2) inadequate quality, quantity, and timing of water flow to sensitive ecosystems; and 3) population growth along the urban southeast coast of Florida.
- ◆ 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 component configuration. Two Restudy Project technical teams evaluated nine configurations encompassing water quality improvement as well as storage, 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 multi-disciplinary teams. 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 (TNC) is currently working with the Conasauga River Alliance (CRA) -- a coalition composed of conservationists, biologists and resource managers, business people, landowners, and interested others on an initiative aimed at protecting and improving the Conasauga Watershed. The initial trajectory of this initiative was detailed in an action plan developed jointly by TNC, CRA, and others. While TNC and CRA have made long-term commitments to implementing this action plan, its ultimate success will in large part be determined by the fate of partnerships that must endure over generations.

- ◆ The Conasauga River stretches about 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, aquatic habitat, and biodiversity 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 are thought to be linked to three socioeconomic and land use trends: a growing population that has driven ever-increasing development; a decrease in farming that has opened land for development; and growth in the manufacturing sector that has helped to drive population growth and development.
- ◆ The Conasauga Action Plan has identified four subwatershed regions based largely on aquatic biota: upper, middle and lower watershed sections and a multifocal region comprised of separate darter springs and streams scattered throughout the watershed. Threats within each subwatershed region were ranked "high," "medium," and "low" according to relative impacts. The Action Plan identifies the upper and middle regions as top priorities for intervention because most of the system's original biodiversity persists there. It is also where mitigation to restore habitat seems most feasible.

**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. The ratio of state to local funding for the regional planning effort was 75 vs 25 %. Significant resentment to this formula led to the phrase "unfunded mandate" to describe it. Because of these complaints, the state's belief that local groups would be unable to raise the required match, and the added cost of reporting local in-kind expenses to the state, state government leaders agreed to a change. In December, 1998, the TWDB Governing Board changed the funding formula to a "100/100" plan. The state pays 100 percent of the planning costs and the locals provide 100 percent of the administrative expenses. While this increases costs to the state, total program cost is reduced because local groups do not have to report their administrative expenses to the state.

- ◆ One impetus for SB1 was a series of droughts in the 1990s that taught decision makers that cities with comprehensive water management plans were better 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. Examples of areas that are currently looking at alternative sources of supply to meet growth are Tennessee's Cumberland Plateau, Northeast Mississippi, and the Duck River basin counties of Marshall, Maury, and Williamson in Tennessee where a regional water supply analysis is taking place.
- ◆ 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). The 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 nonprofit groups to improve watershed management that 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 uses 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 1970s when the state’s last major water supply project was completed at the same time the state’s population continued to grow. CALFED’s advent was prompted by federal court decisions supporting the importance of instream use for fisheries and habitat.

- ◆ Major California water supply projects were initiated in the early 1900s, with the construction of the Los Angeles Aqueduct, and continued through the 1960s. 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 in dry years.

- ◆ In the mid-1980s, two landmark court decisions supported instream use as beneficial use to 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 a collaborative problem-solving process; however, problems worsened.
- ◆ CALFED sought to restore an ordered decision process comprised of three-phases: 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 decision 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; water 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, NC*

---

#### **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 patterns 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, higher water temperatures, and more 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 should 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 should 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, and 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 instream flow, reducing non-point sources, and making equitable trade-offs. Maintaining minimum instream flow is necessary to ensure adequate water supply of suitable quality and to sustain aquatic habitat. Agricultural and urban non-point sources must be reduced. 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 public.

## **Impacts/Use Impairments**

A failure to address water quality issues has adverse ecological, economic, social, and cultural impacts. Ecological impacts 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 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. Fourth, communities must be involved 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. Data 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;
- ◆ charging 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, costly litigation, one or more conflict resolution mechanisms should also be established, including:

- ◆ 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 inhibited 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*

From a legal perspective, a primary problem in water management 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 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. Finally, there is a lack of comprehensive state water management planning encompassing 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. There are also 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, face-to-face 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)*

Decisionmaking regarding funding and implementation of water management policies should be open to debate by the public. 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, Director, 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 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.

## REFERENCES AND SUGGESTED READINGS

Anderson, D.L., and P.C. Rosendahl. 1998. "Development and Management of Land/Water Resources: The Everglades, Agriculture, and South Florida," *Journal of the American Water Resources Association* 34 (2) April: 235-248.

Berndt, Marian P., et. al., 1998. *Water Quality in the Georgia-Florida Coastal Plain, Georgia and Florida, 1992-96*. U. S. Geological Survey Circular 1151, National Water Quality Assessment (NAWQA) Program. Denver, Colorado: USGS.

"Congress Passes Tri-state Compact," *Upper Chattahoochee RiverKeeper* -- River Chat -- Fall, 1997 (url: <http://www.chattahoochee.org>).

Drew, Douglas. 1999. "Everglades -- Water Board Approves Letter of Intent Endorsing Army Corps Restoration Plan," *Environment Reporter* 29 (41) February 19: 2082.

"Federal Allocation and Control of Water Resources." 1993. in *Water Resource Management: A Casebook in Law and Public Policy, 4th Edition*, edited by A. Dan Tarlock, James N. Corbridge, Jr., and David H. Getches. Westbury, New York: The Foundation Press.

Fradkin, Philip L. 1996. *A River No More: The Colorado River and the West*. Berkeley: University of California Press.

Frederick, Kenneth D. 1995. "America's Water Supply: Status and Prospects for the Future," *Consequences: The Nature and Implications of Environmental Change* 1 (1) Spring): 14-23.

Freeman, Byron J., Benz, George W., Collins, David E. 1996. *A Stakeholder's Guide to the Conasauga River of Georgia and Tennessee*. Conservation Bulletin no. 1. Chattanooga, Tennessee: Southeast Aquatic Research Institute.

Frick, Elizabeth A., et. al. 1998. *Water Quality in the Apalachicola-Chattahoochee-Flint River Basin, Georgia, Alabama, and Florida, 1992-95*. U. S. Geological Survey Circular 1164, National Water Quality Assessment (NAWQA) Program. Denver, Colorado: USGS.

Grigg, Neil S. *Water Resources Management: Principles, Regulations, and Cases*. New York; McGraw Hill, 1996.

Hillyer, Theodore M., and Hofbauer, Germaine A. 1996. *Water Supply Handbook: A Handbook on Water Supply Planning and Resource Management*. IWR Report 96-PS-4. Alexandria, Virginia: Institute for Water Resources, Water Resources Support Center, U.S. Army Corps of Engineers, December.

H. J. Res. 91, *Joint Resolution Granting the Consent of Congress to the Apalachicola-Chattahoochee-Flint River Basin Compact*, January 7, 1997. U. S. House of Representatives, 105th Congress, 1st Session.

"Hopes Dimming for Pact to Settle Gaston Dispute." 1995. *Waterweek*, June 19: 7.

Jaffe, Greg. 1996. "Water Deal May Settle Old Dispute," *Wall Street Journal*, September 11: S-1, 4.

Kundell, James E. 1998. "Georgia's Water Resources: The Dawning of A New Day, Part I," *Georgia Water Management Campaign (Report)*. Atlanta: GWMC.

Kundell, James E., and Diana Tetens. 1998. *Whose Water Is It? Major Water Allocation Issues Facing Georgia*. Public Policy Research Series, Richard W. Campbell, Series Editor. Athens, Georgia: Carl Vinson Institute of Government, The University of Georgia.

Leahy, Thomas. 1998. "Lake Gaston Project Resolves Water Supply Shortage," *Public Works: Engineering, Construction, and Maintenance* 129 (7) June: 44-48.

Poppe, Wayne, Hurst, Renee, and Burks, Becky. 1997. "Bringing in Partners and Dollars: TVA's River Action Teams Share Their Strategies," *Water Environment and Technology* 9 (9) September: 67-72.

Schaake, John, Miller, Barbara, and Tisdale, Todd. 1997. "Climate Impacts — Major Findings and Recommendations, Section G: Water Resources," *Summary Report of the Workshop on Climate Variability and Water Resource Management in the Southeastern United States, Vanderbilt University, June 25-27, 1997*. Sponsored by USGS, NASA, and NOAA, August.

Solley, W. B., Pierce, R. R., and Perlman, H. A. 1998. *Estimated Use of Water in the United States in 1995*. U. S. Geological Survey Circular 1200, 71 p.

"Spotlight on the River South of Atlanta," *Upper Chattahoochee RiverKeeper -- River Chat -- Summer 1997* (url: <http://www.chattahoochee.org>).

Spruill, Timothy B., et. al. 1998. *Water Quality in the Albemarle-Pamlico Drainage Basin, North Carolina and Virginia, 1992-95*. U. S. Geological Survey Circular 1157, National Water Quality Assessment (NAWQA) Program. Denver, Colorado: USGS.

Sheridan, Thomas E. 1998. "The Big Canal: The Political Ecology of the Central Arizona Project," pp. 163-186, in *Water, Culture, and Power: Local Struggles in a Global Context*, edited by John M. Donahue and Barbara Rose Johnston. Washington, D.C.: Island Press.

**APPENDIX D:**  
Symposium Media Clippings

Electronic version of the 1198 Symposium Report does not contain a complete selection of all media coverage. Following are links to a selection:

Chattanooga Times

<http://207.69.235.40/news/today/Tuesday/August251998/CTStorym3wat082.html>

UT News Release

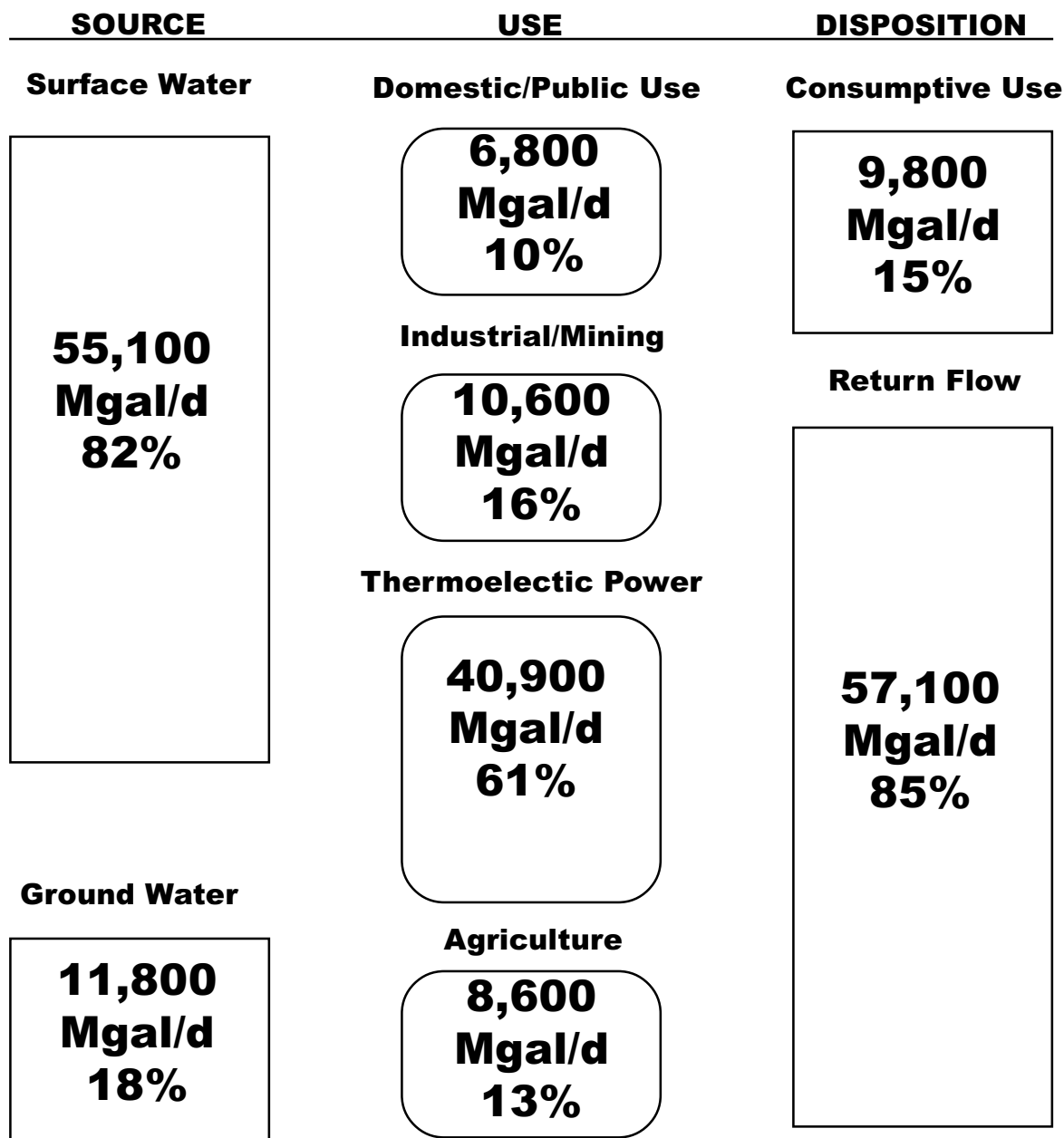
<http://ur.utenn.edu/news/aug98/water.htm>

Insites

<http://eerc.ra.utk.edu/insites/ins6-4.htm#protect>

**APPENDIX E:**  
Water Use Trends in the Southeast  
(Courtesy: Wayne Solley, USGS)

Figure 1



Source, use, and disposition of an estimated 66,900 Mgal/d of freshwater in the Southeast, 1995

Figure 2

# WATER USE AND POPULATION IN THE SOUTHEAST

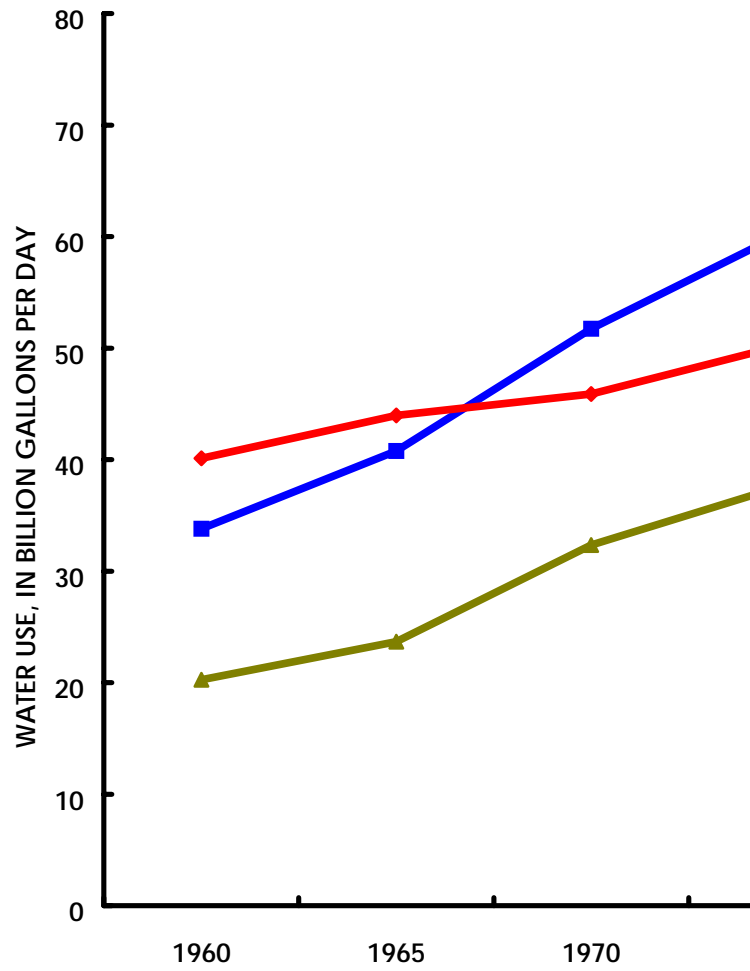
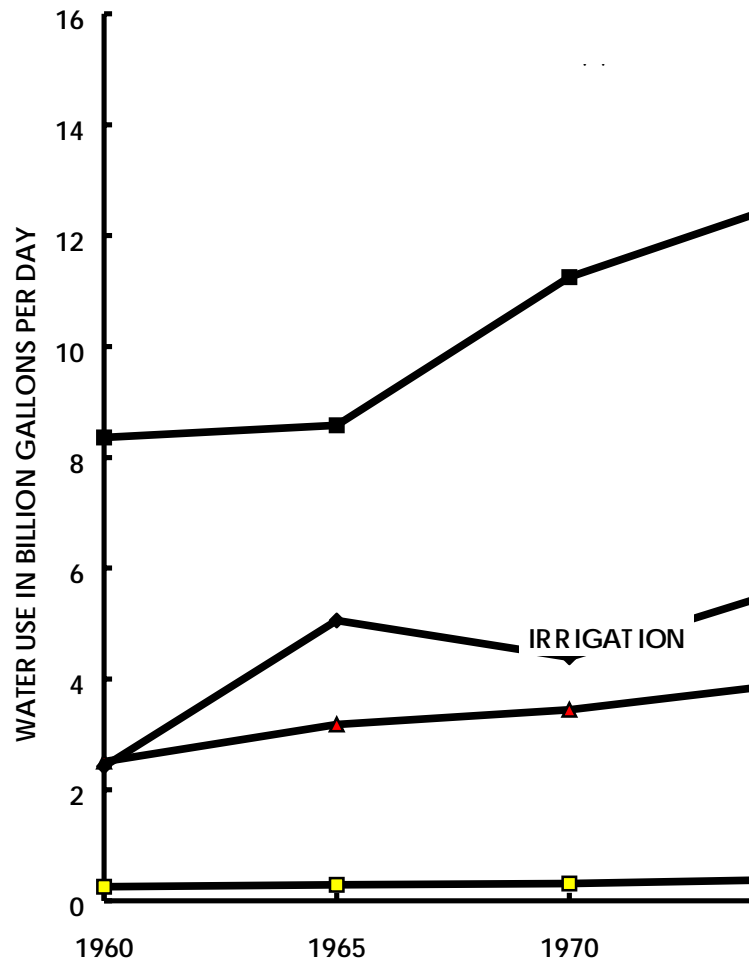


FIGURE 3

# WATER USE IN THE SOUTHEAST



**ACRES IRRIGATED BY :**

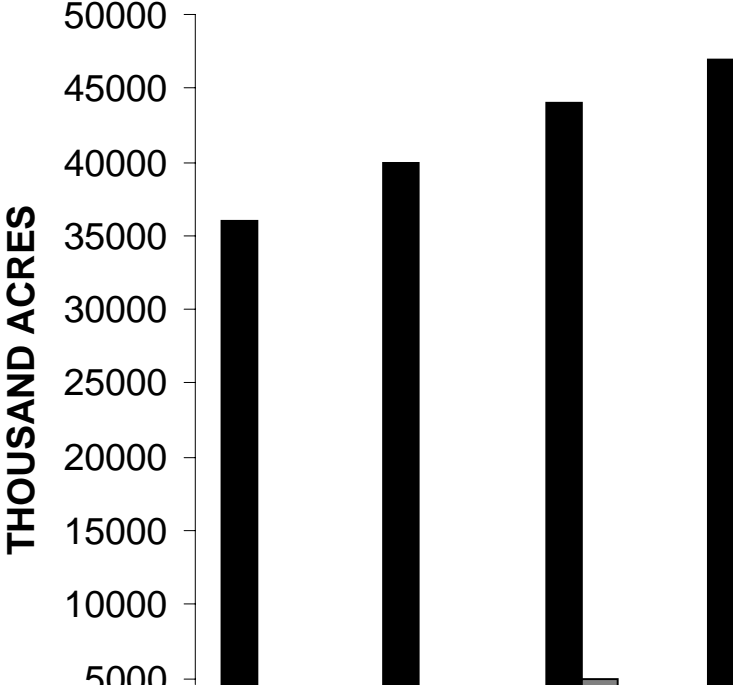


FIGURE 5

# WATER USE AND POPULATION TRENDS AND PROJECTIONS

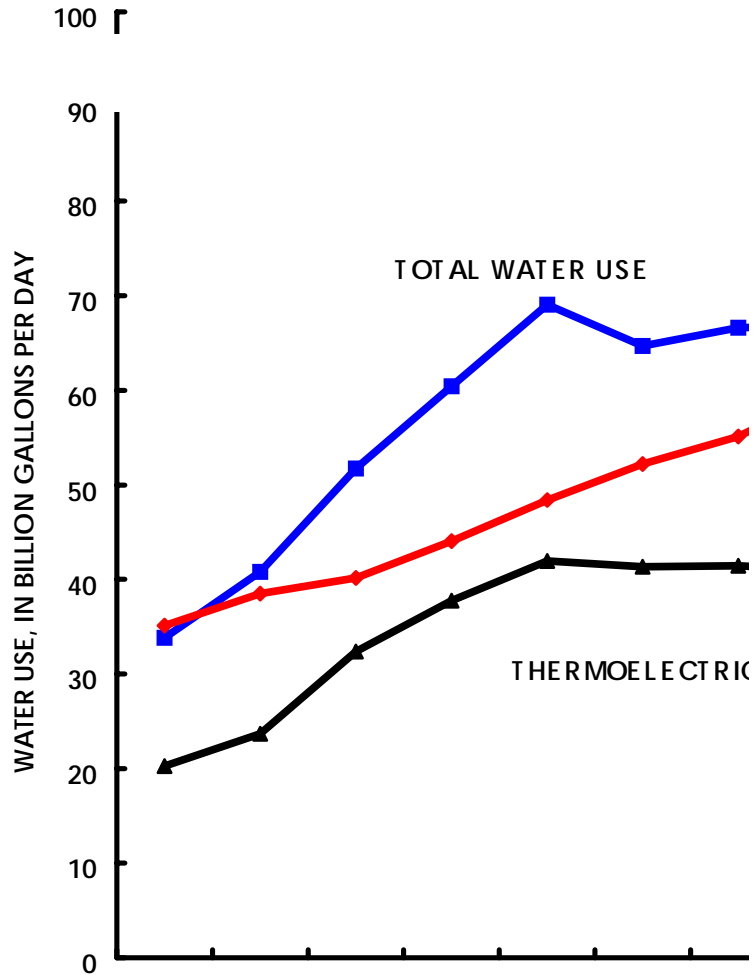


Figure 6

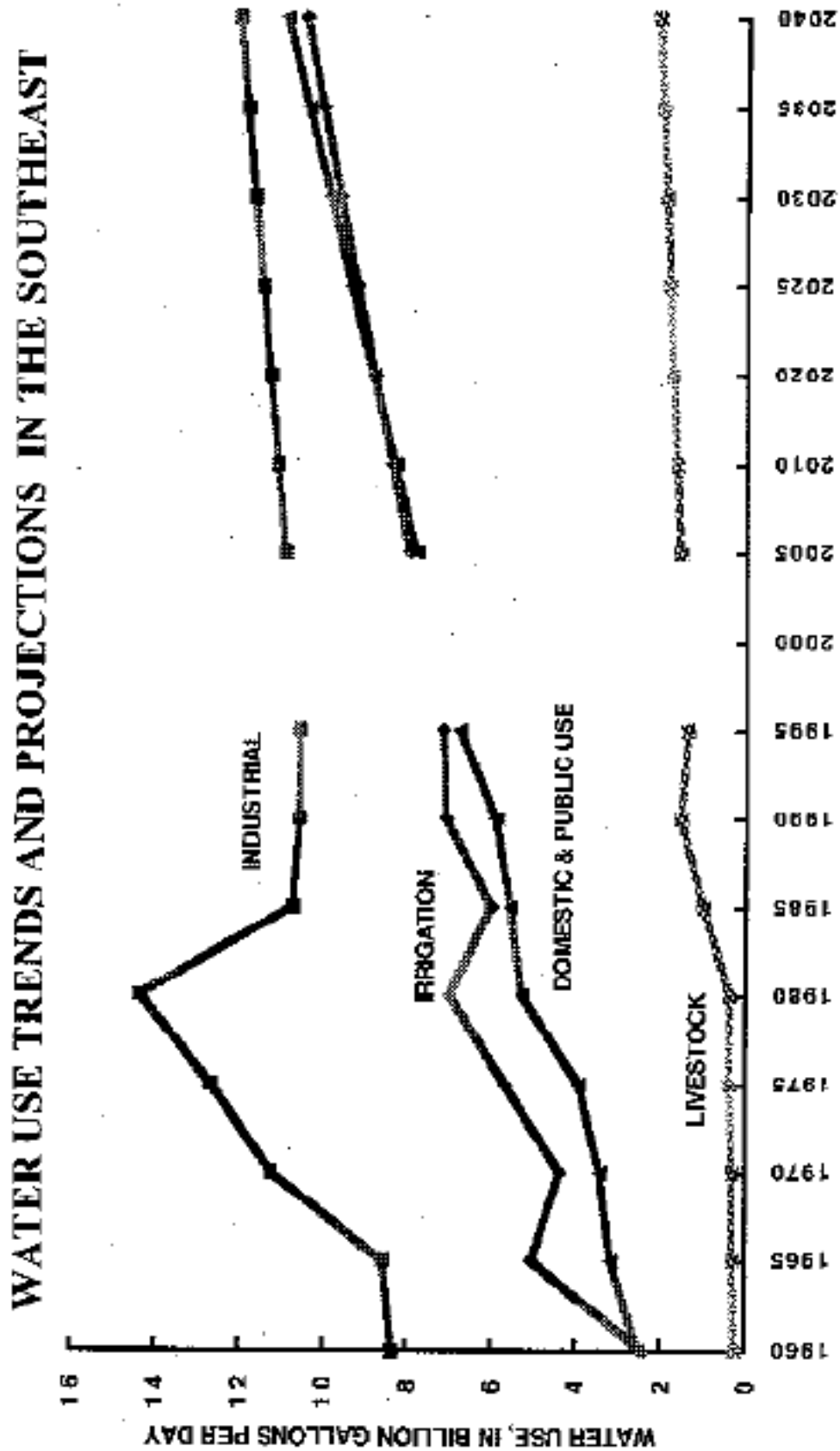


FIGURE 7

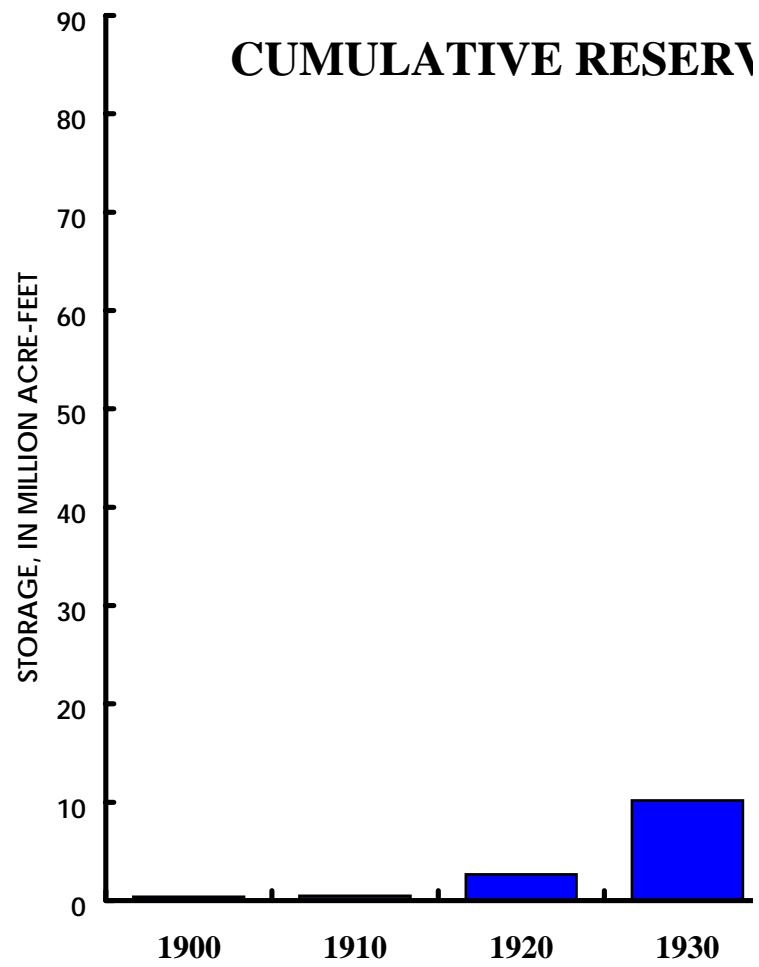
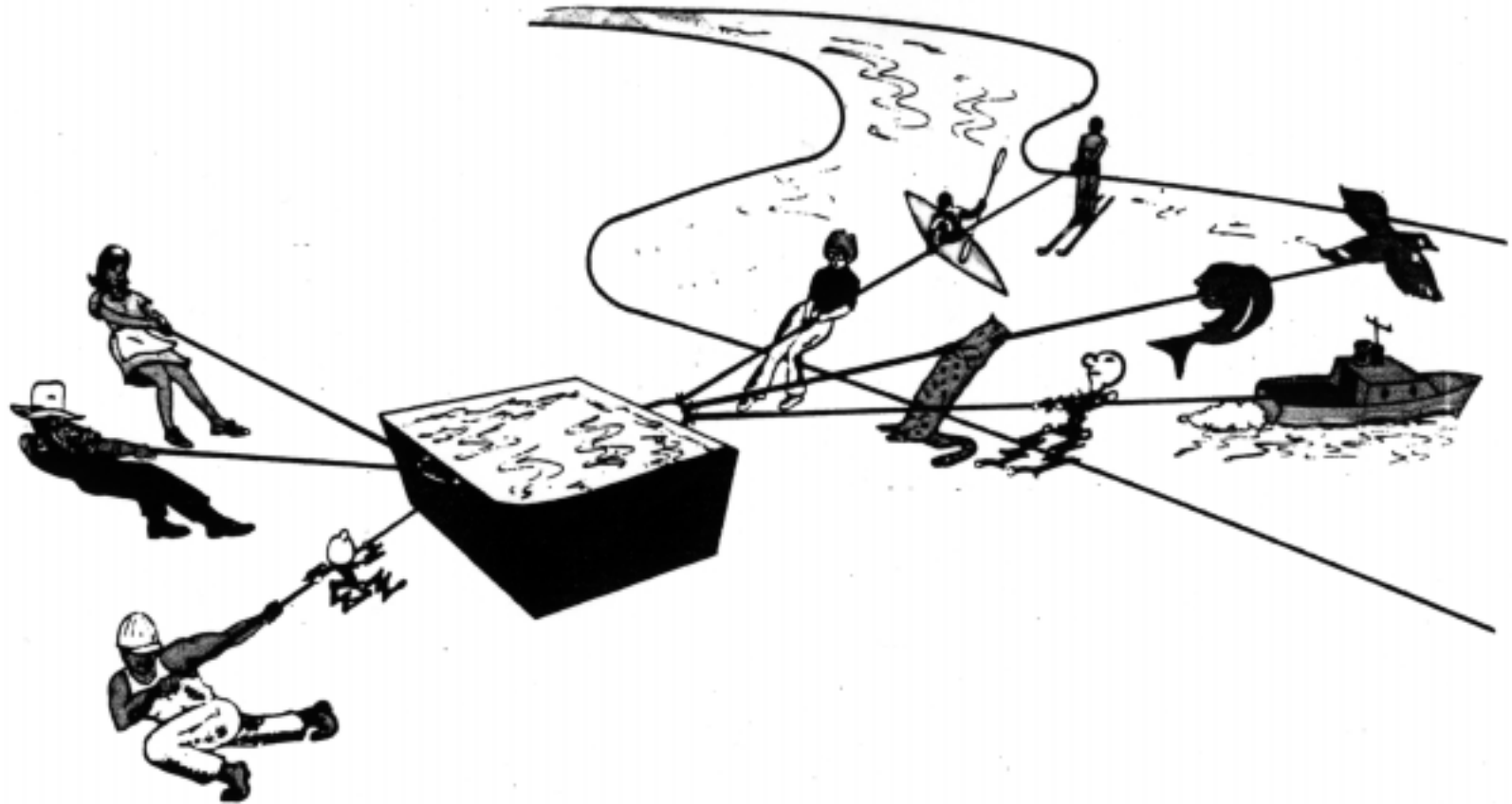


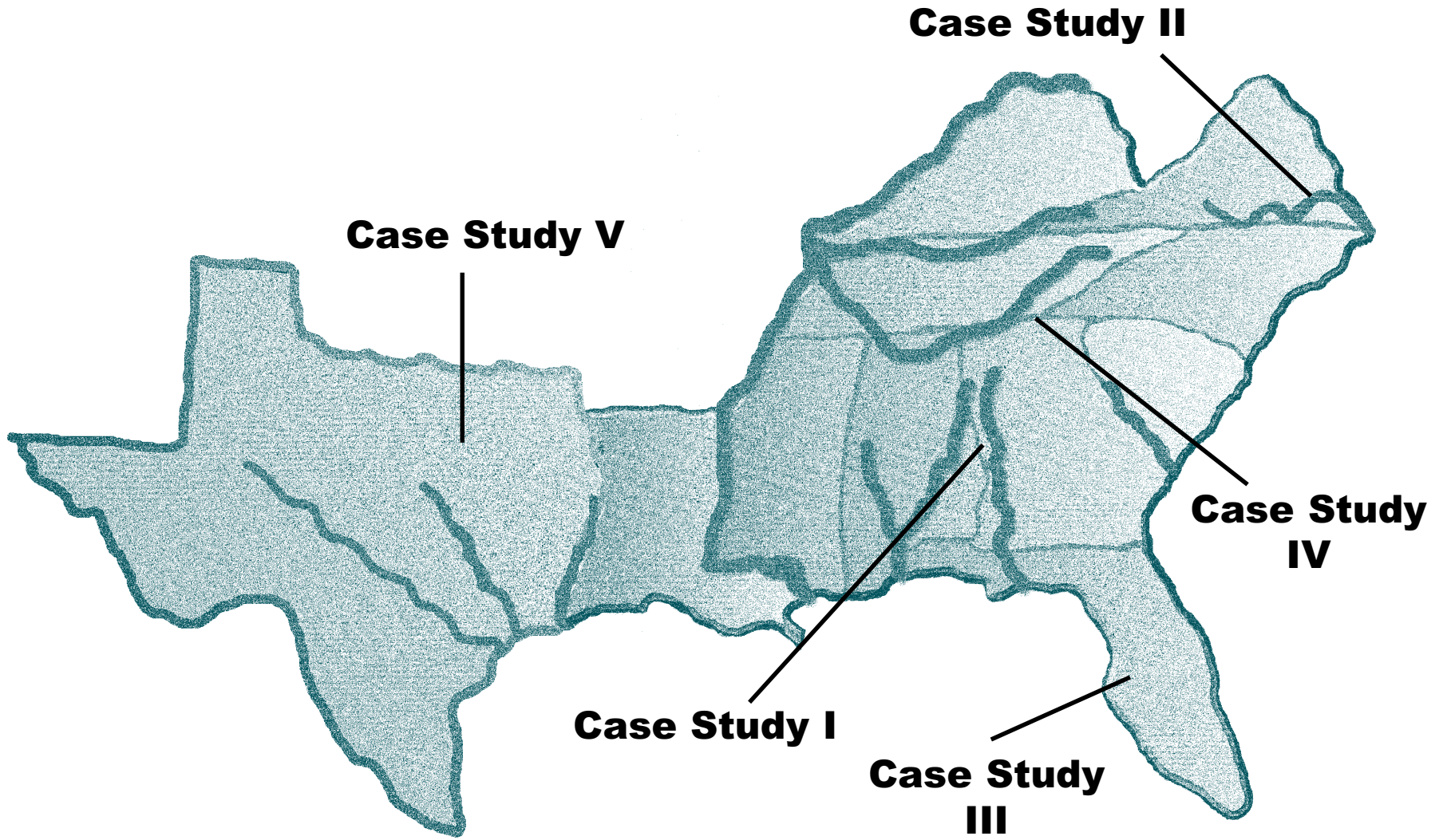
Figure 8

## Conflicts in instream vs. offstream use

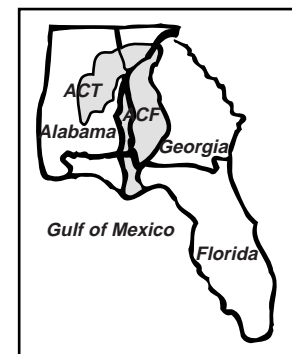
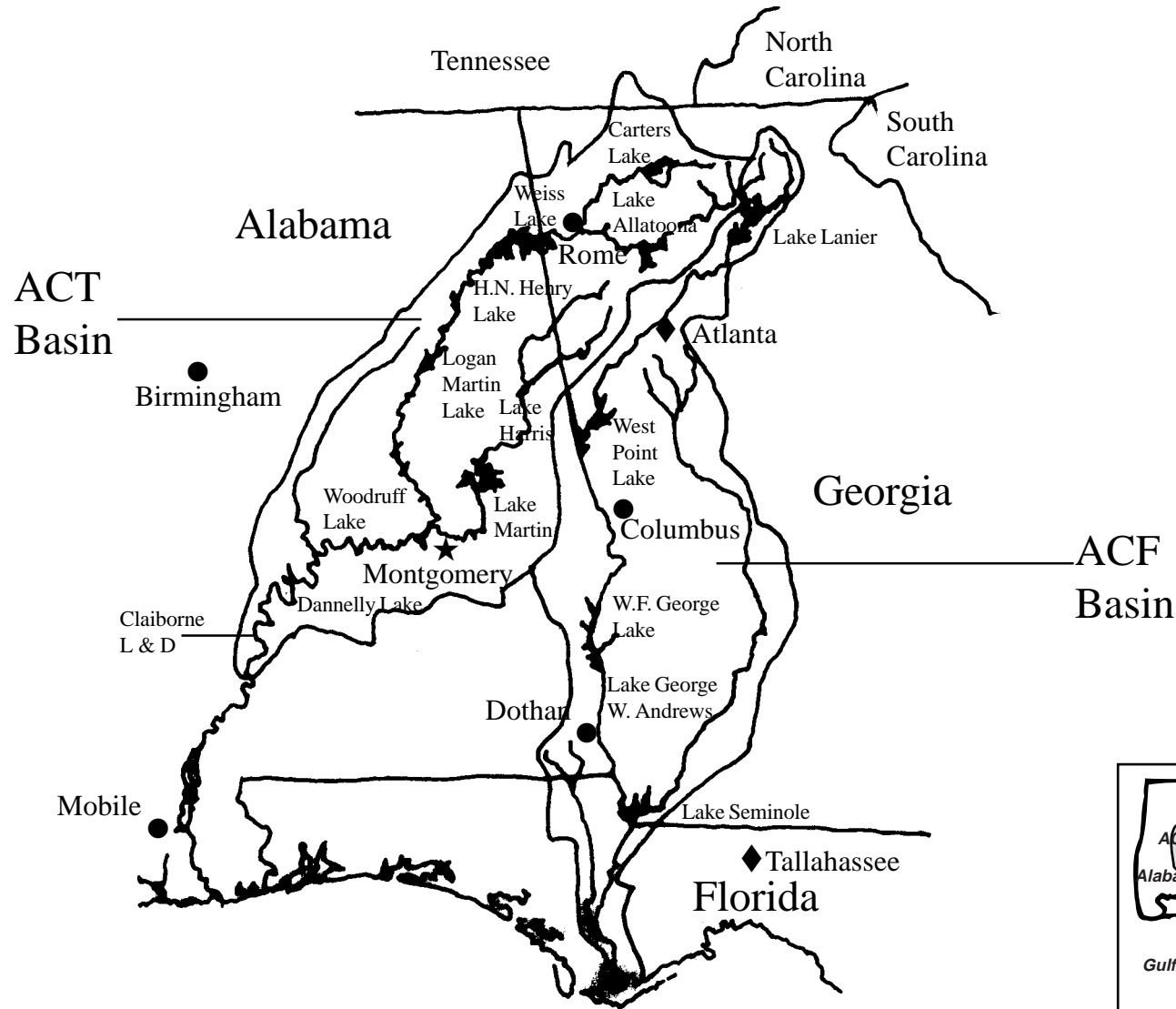


**APPENDIX F:**  
Southeastern Case Studies

# Case Studies

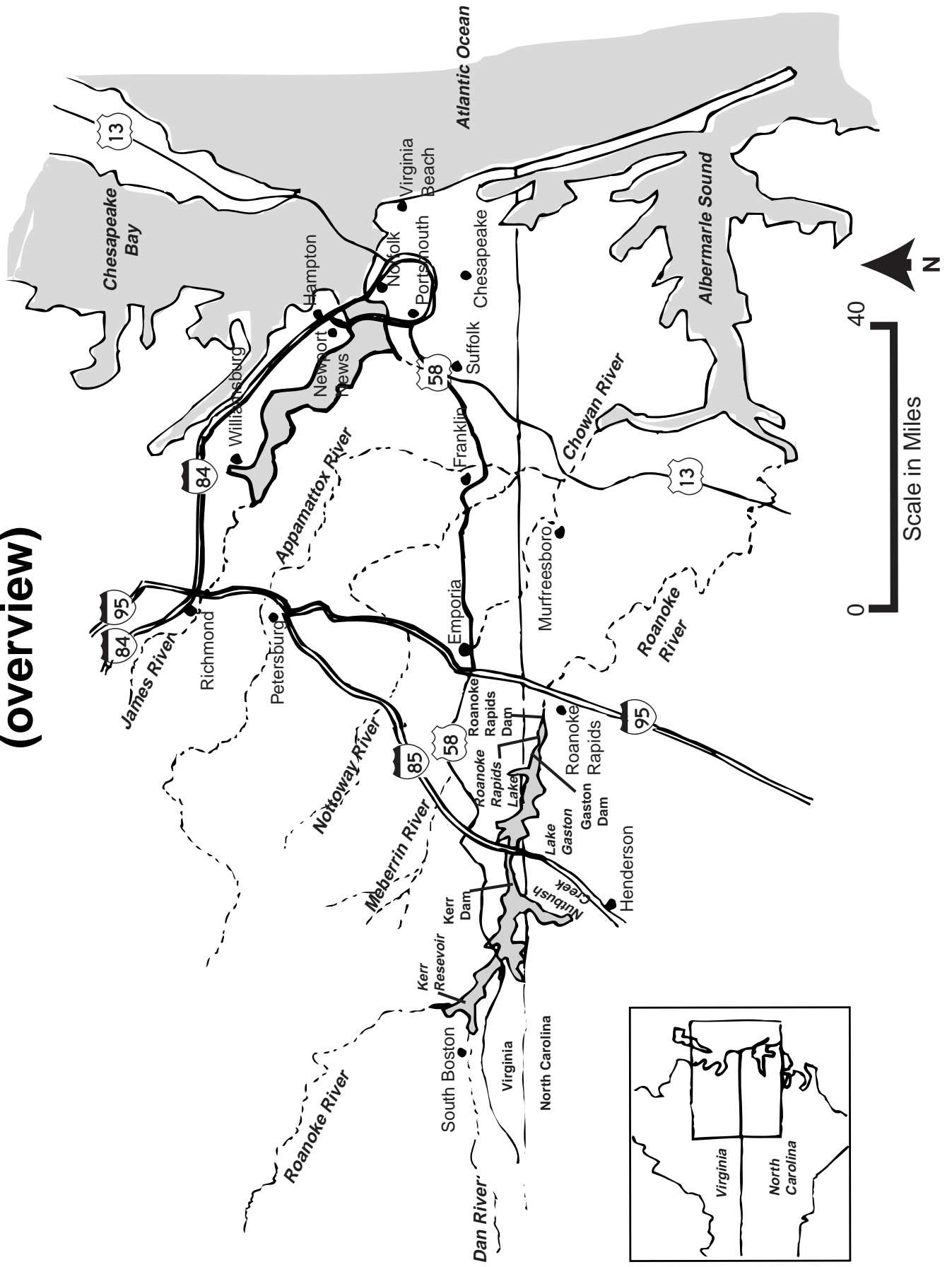


# Case Study I: Apalachicola/Chattahoochee/Flint-Alabama/ Coosa-Tallapoosa River Basins

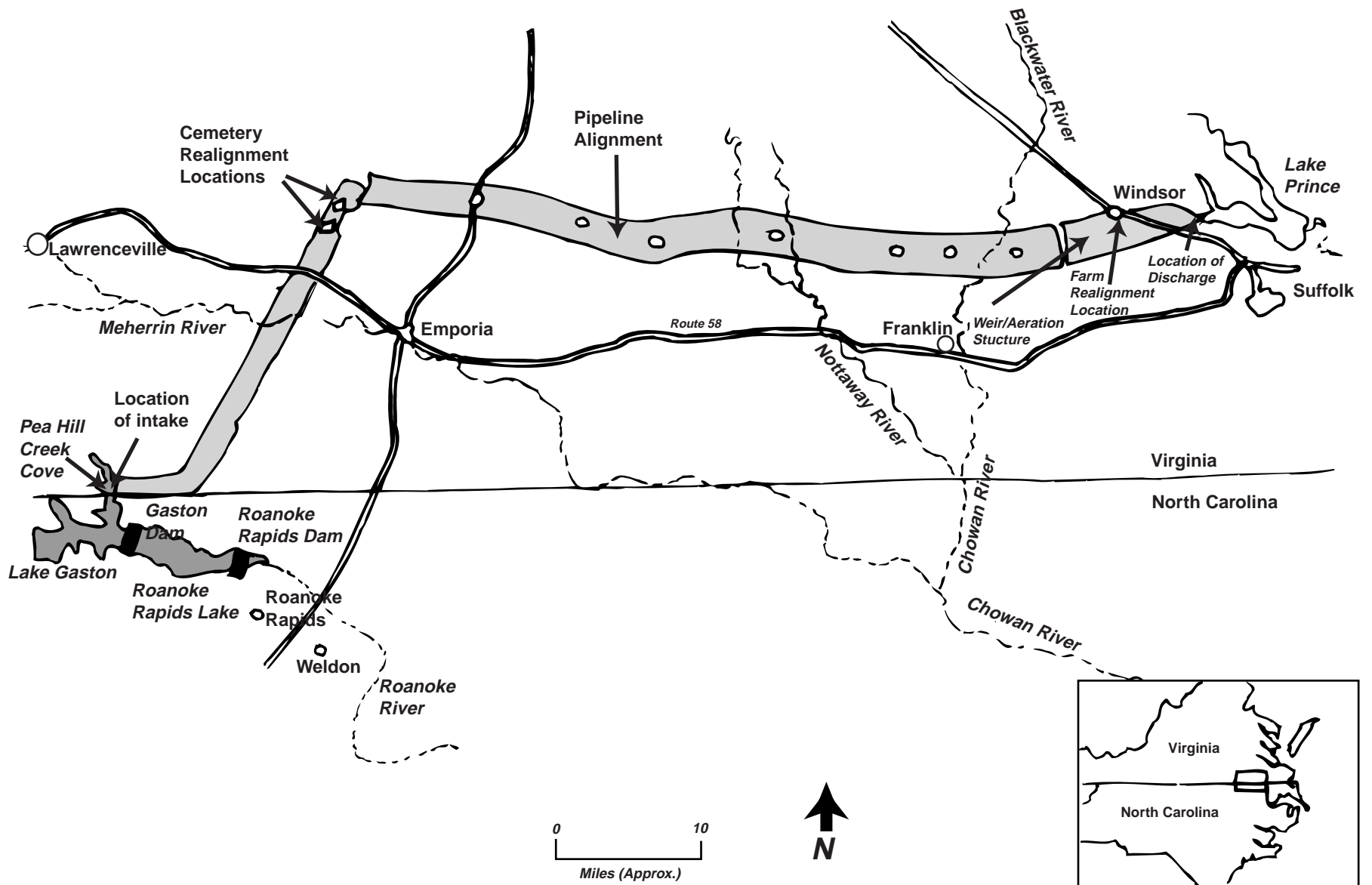


# Case Study II: Lake Gaston - Virginia Beach Project

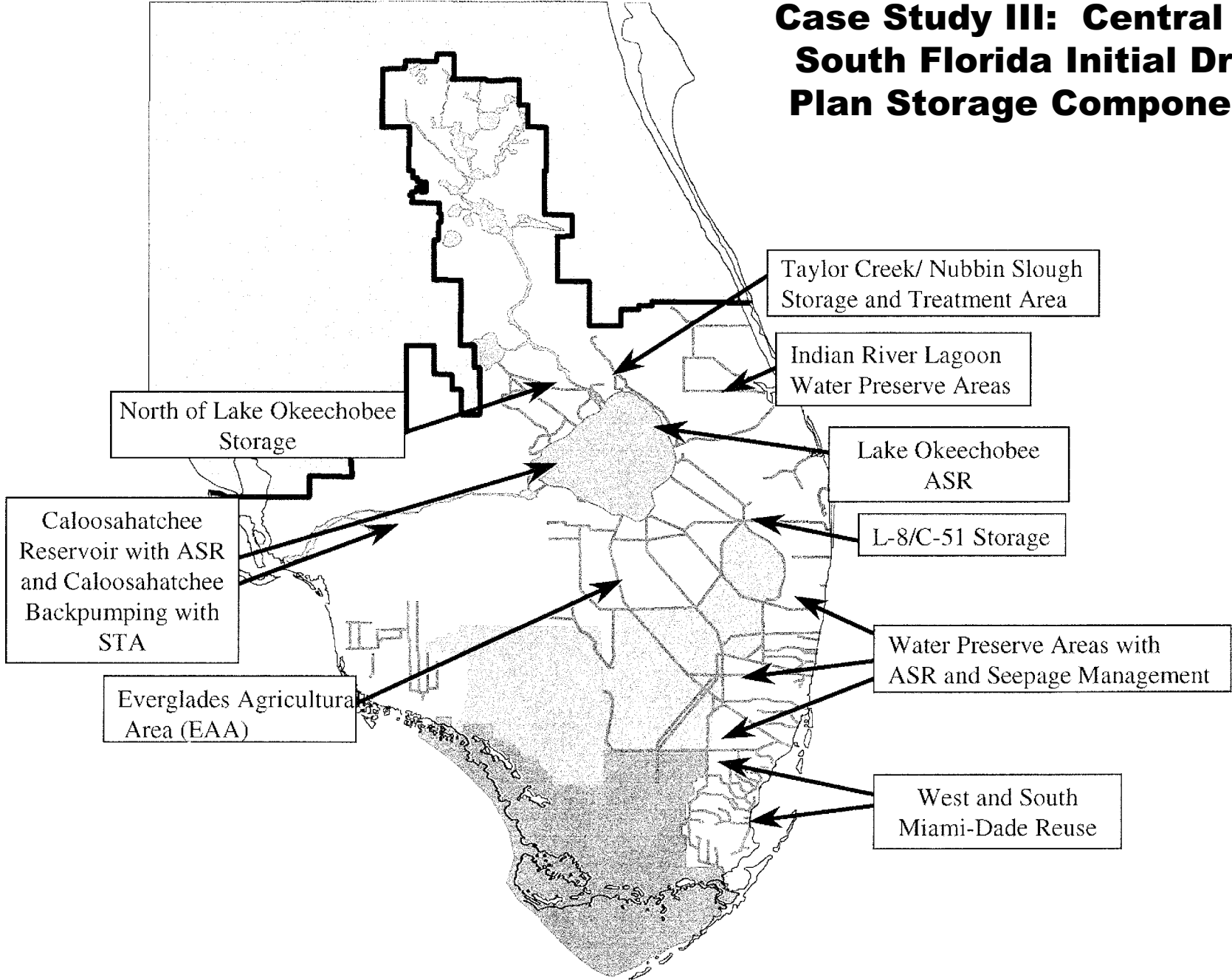
(overview)



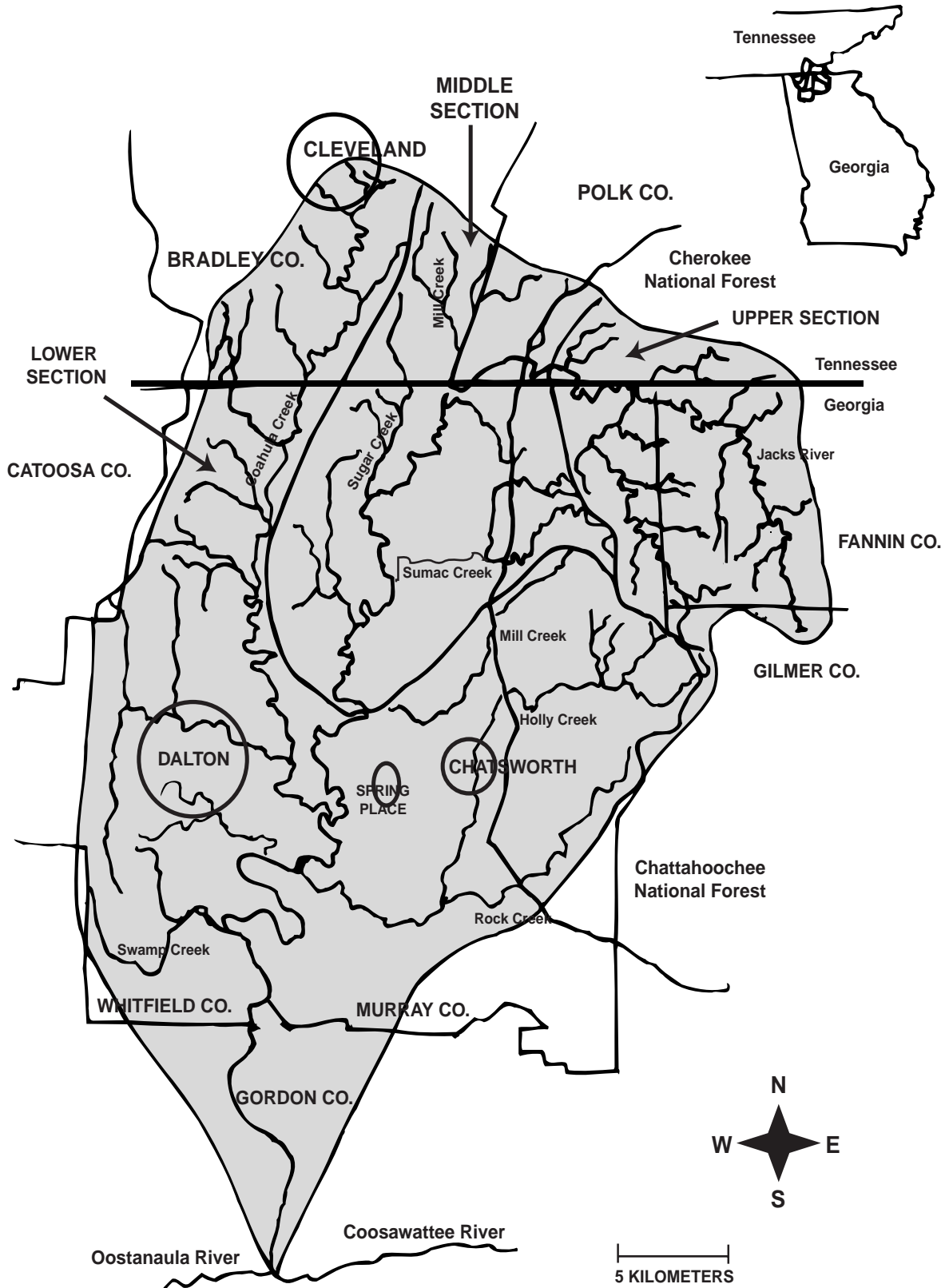
# Case Study II: Lake Gaston - Virginia Beach Project (detailed view)



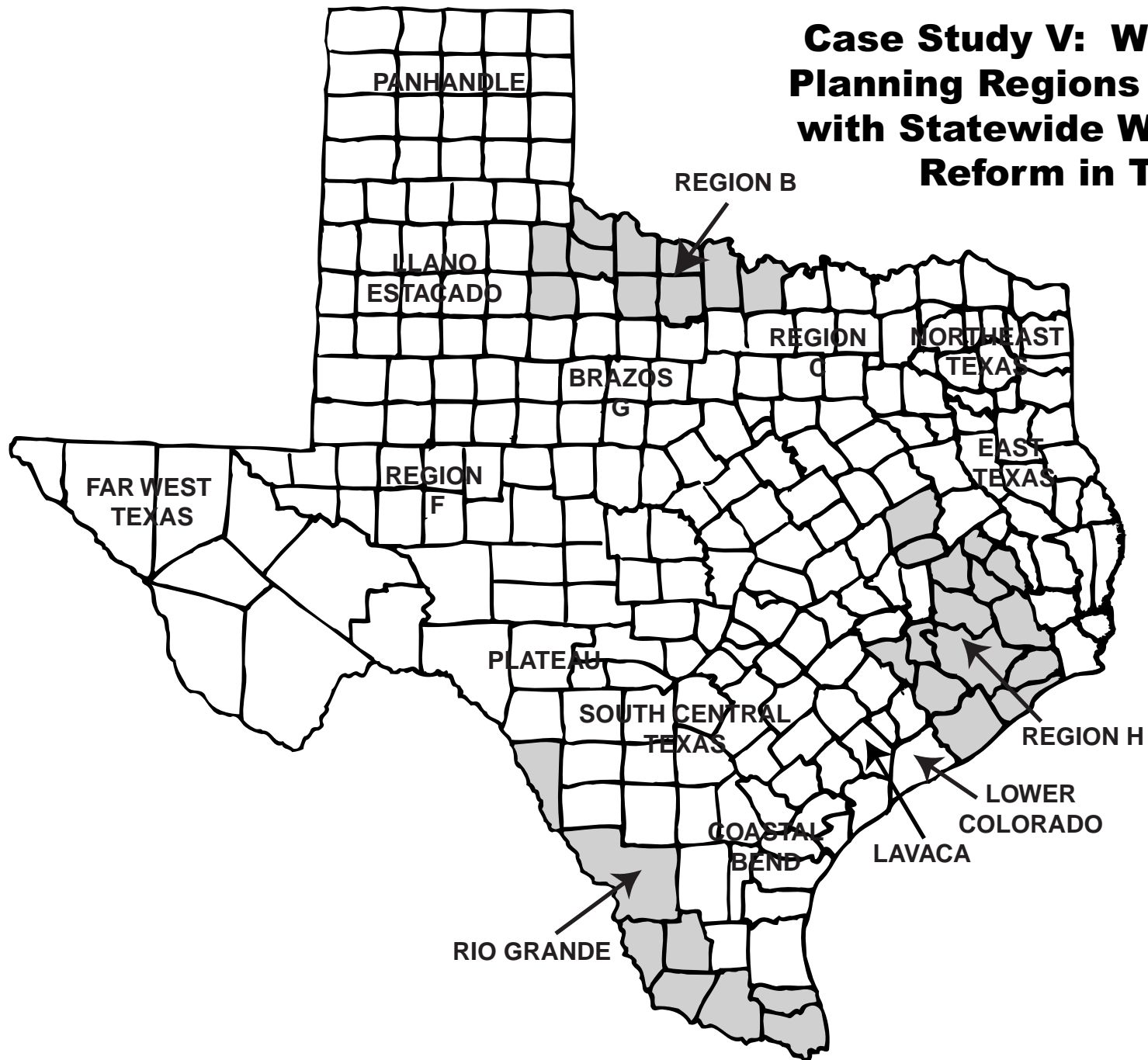
# Case Study III: Central and South Florida Initial Draft Plan Storage Components



# Case Study IV: Conasauga River System



# Case Study V: Water Policy Planning Regions Associated with Statewide Water Policy Reform in Texas



# Average Daily Surface Water Withdrawal

in the Tennessee River Valley

Millions of Gallons

