2001

Georgia Water Resources Conference

March 26 and 27, 2001
The University of Georgia
Athens, Georgia U.S.A.

Edited by
Kathryn J. Hatcher

Sponsored and Organized By

U.S. Geological Survey
Georgia Department of Natural Resources
Natural Resources Conservation Service
The University of Georgia
Georgia State University
Georgia Institute of Technology
Proceedings of the

2001
Georgia Water Resources Conference

March 26 and 27, 2001
Athens, Georgia

Sponsored by:
U.S. Geological Survey
Georgia Department of Natural Resources
Natural Resources Conservation Service
The University of Georgia
Georgia State University
Georgia Institute of Technology

Editor
Kathryn J. Hatcher

Institute of Ecology
The University of Georgia
Athens, Georgia U.S.A.
Related Publications:

Hatcher, Kathryn J. (editor):

Proceedings of the 1989 Georgia Water Resources Conference
May 16 and 17, 1989
ISBN: 0-935835-01-6    LOC# 89-84386    (245 pages)

Proceedings of the 1991 Georgia Water Resources Conference
March 19 and 20, 1991
ISBN: 0-935835-02-4    LOC# 91-70247    (356 pages)

Proceedings of the 1993 Georgia Water Resources Conference
April 20 and 21, 1993
ISBN: 0-935835-03-2    LOC# 92-76060    (412 pages)

Proceedings of the 1995 Georgia Water Resources Conference
April 11 and 12, 1995
ISBN: 0-935835-04-0    LOC# 95-68015    (412 pages)

Proceedings of the 1997 Georgia Water Resources Conference
March 20, 21 and 22, 1997
ISBN: 0-935835-05-9    LOC# 97-71355    (550 pages)

Proceedings of the 1999 Georgia Water Resources Conference
March 30 and 31, 1999
ISBN: 0-935835-06-7    LOC# 99-61857    (604 pages)

Hatcher, Kathryn J. (editor). 1950 -
Proceedings of the 2001 Georgia Water Resources Conference

2001
Library of Congress Control Number: 2001087837
Printed in United States of America.

This book was published by the Institute of Ecology, The University of Georgia, Athens, Georgia 30602-2202. The views and statements advanced in this publication are solely those of the authors and do not represent official views or policies of The University of Georgia, the U.S. Geological Survey, the Georgia Water Research Institute as authorized by the Water Research Institutes Authorization Act of 1990 (P.L. 101-397) or the other conference sponsors.
Georgia Water Resources Conference
Steering Committee

Robert R. Pierce, Hydrologist, U.S. Geological Survey (conference co-chair)
Kathryn J. Hatcher, Public Service Faculty, Institute of Ecology, The University of Georgia
(conference co-chair and proceedings editor)
Nolton Johnson, Chief of Water Resources Management Branch, Georgia DNR Environmental
Protection Division (conference publicity)
Jimmy Bramblett, Resource Conservationist, Natural Resources Conservation Service (Posters
and Exhibits coordinator)
Zhi-Ying Yin, Associate Professor, Department of Anthropology and Geography, Georgia State
University (conference student awards)
Aris Georgakakos, Professor, Georgia Water Research Institute and School of Civil Engineering,
Georgia Institute of Technology

Assistant Editor:
Sandra L. Crismon, Degree Program Assistant, Environmental Ethics Certificate Program, The
University of Georgia

Conference Co-Sponsors

American Water Resources Association, Georgia Section
American Water Works Association, Georgia Section
Association County Commissioners of Georgia
Georgia Soil and Water Conservation Commission
Georgia Water & Pollution Control Association
Georgia Well Drillers Association
Georgia Ground Water Association
Georgia Lake Management Society
Georgia Municipal Association
Georgia Rural Water Association
Georgia Water Wise Council
National Weather Service, Southeast River Forecast Center
Natural Resources Conservation Service (SCS)
Soil and Water Conservation Society
Soil Science Society of Georgia
The Georgia Conservancy
Upper Chattahoochee River Keeper
U.S. Army Corps of Engineers: South Atlantic Division, Mobile, Savannah
U.S. Environmental Protection Agency, Region IV
U.S. Fish and Wildlife Service
## TABLE OF CONTENTS

### Luncheon and Dinner Speakers:

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Location</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles (Chip) G. Groat, Director, U.S. Geological Survey, Reston, Virginia</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>James E. Kundell, Carl Vinson Institute of Government, Univ. of Georgia</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Mitch Lawson, Coosa River Basin Initiative Coordinator</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

### CONCURRENT SESSIONS:

#### TRACK I: GEORGIA WATER POLICY AND LEGISLATION

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgia Water Issues (Background for Panel Discussion)</td>
<td>5</td>
</tr>
<tr>
<td>Water Management Activities of the Georgia Department of Community Affairs</td>
<td></td>
</tr>
<tr>
<td>Joseph A. Krewer, Georgia Dept. of Community Affairs, Office of Environmental Management</td>
<td>5</td>
</tr>
<tr>
<td>Metro Atlanta Water Resources Overview</td>
<td>9</td>
</tr>
<tr>
<td>Pat Stevens, Environmental Planning, Atlanta Regional Commission</td>
<td>5</td>
</tr>
<tr>
<td>The Myth of Markets for Water</td>
<td>15</td>
</tr>
<tr>
<td>Joseph Dellapenna, Villanova University Law School</td>
<td>15</td>
</tr>
<tr>
<td>Metro Atlanta’s Clean Water Initiative</td>
<td>27</td>
</tr>
<tr>
<td>Kevin Green, Metro Atlanta Chamber of Commerce</td>
<td>27</td>
</tr>
<tr>
<td>PANEL: Georgia Water Policy and New Legislation</td>
<td>31</td>
</tr>
<tr>
<td>Moderator: Michelle Fried, Upper Chattahoochee Riverkeeper</td>
<td>31</td>
</tr>
<tr>
<td>Essential Elements for an Effective Georgia Water Policy</td>
<td></td>
</tr>
<tr>
<td>Stephen E. Draper, The Draper Group</td>
<td>31</td>
</tr>
<tr>
<td>Statewide Water Management Issues</td>
<td></td>
</tr>
<tr>
<td>Harold Reheis, Director, Georgia Environmental Protection Division</td>
<td>35</td>
</tr>
<tr>
<td>A Green Perspective on the 2001 General Assembly</td>
<td></td>
</tr>
<tr>
<td>Michelle Fried, Upper Chattahoochee Riverkeeper</td>
<td>35</td>
</tr>
<tr>
<td>Panel Discussion: Georgia Water Policy and New Legislation</td>
<td>35</td>
</tr>
<tr>
<td>Julie Mayfield, Turner Environmental Law Clinic, Emory University; Stephen Draper, The Draper Group; Joseph Dellapenna, Villanova Law School; Kevin Green, Metro Atlanta Chamber of Commerce; Harold Reheis, Director, Georgia Environmental Protection Division; Sally Bethea, Upper Chattahoochee Riverkeeper; Pat Stevens, Chief of Environmental Planning, Atlanta Regional Commission; and a Representative of downstream, south Georgia interests</td>
<td>35</td>
</tr>
<tr>
<td>Planning for Drought</td>
<td></td>
</tr>
<tr>
<td>Nolton G. Johnson, Georgia DNR, Environmental Protection Division, Water Resources Branch</td>
<td>41</td>
</tr>
<tr>
<td>Drought Contingency Planning in Action</td>
<td>49</td>
</tr>
<tr>
<td>Stephen L. Simpson and Pamela P. Kenel, Black &amp; Veatch</td>
<td>49</td>
</tr>
</tbody>
</table>
State Strategies for Water Conservation .................................................. 54
Katherine Baer, Upper Chattahoochee Riverkeeper

Successful Water Efficiency Programs for Industrial, Commercial, and Institutional Facilities .............. 58
Judy Adler, Georgia Dept. of Natural Resources, Pollution Prevention Assistance Division, and Joel Dicks, Southwire Company

PANEL: Drought Monitoring and Management
Moderator: Katherine Baer, Upper Chattahoochee Riverkeeper and Debbie Warner, U.S. Geological Survey

Ground-water Monitoring and Effects of the 1998-2000 Drought on Ground-water Levels in Georgia ............. 61
Kristen B. McSwain and Nancy Barber, US Geological Survey

Overview of Georgia’s Drought Planning Process ........................................ 64
Nolton Johnson, Georgia DNR, Environmental Protection Division, Water Resources Branch

Panel Discussion: Drought Monitoring and Management ................................ 68
Nancy Barber, U.S. Geological Survey, Georgia District; Nolton Johnson, Georgia Environmental Protection Division; Bill Couch, Georgia DNR Wildlife Resources Division; and Frank Stephens, A Municipal View of the Drought Planning Process

Environmental Impacts of Reservoirs
Moderator: Mary Davis, National Wildlife Federation

Ecological Considerations for Reservoir Planning in North Georgia .................................................. 62
Mary C. Freeman, USGS Patuxent Wildlife Research Center and Institute of Ecology; Michael D. Merrill, Institute of Ecology, Univ. of Georgia; and Byron J. Freeman, Institute of Ecology and Museum of Natural History, Univ. of Georgia

Stream Loss and Fragmentation Due to Impoundments in the Upper Oconee Watershed ...................... 66
Michael D. Merrill, Mary C. Freeman, Byron J. Freeman, Elizabeth A. Kramer, and Lee M. Hartle, Institute of Ecology, Univ. of Georgia

Building New Water Supply Capacity: What Works and What Doesn’t .................................................. 70
Jim Ryan, Troutman Sanders Inc., Virginia (not confirmed)

Water Resources of the Upper Suwannee River Watershed .................................................. 74
Mary M. Davis, National Wildlife Federation, and David W. Hicks, J.W. Jones Ecological Research Center

PANEL: Reservoirs
Moderator: Ellen J. Sutherland, Georgia River Network

The Proliferation of Reservoir Construction in Georgia: A Panel Discussion Exploring the Roles of Federal and State Agencies in the Permitting Process and an Examination of the Need for a Programmatic Environmental Impact Statement .................................................. 75
Ellen J. Sutherland, Georgia River Network

Panel Discussion: Reservoirs ................................................................. 78
Robert Lord, U.S. Environmental Protection Agency, Region 4, Wetlands Section; Robin Goodloe, US Fish & Wildlife Service; Nolton Johnson, Chief, Water Resources Branch, Georgia EPD; Kathryn J. Hatcher, Institute of Ecology, Univ. of Georgia; Mark LaRue, Redwing Environmental; Mary Maclean Asbill, Southern Environmental Law Center; and Representative, U.S. Army Corps of Engineers (invited)
TRACK II. A.C.F. WATER ISSUES

Regulation of Agricultural Water Use

Mapping Irrigated Lands in the ACF River Basin .................................................. 79
  Thomas Litts, Heather Russell, Adrian Thomas, and Roy Welch, Center for Remote Sensing and
  Mapping Science, Dept. of Geography, University of Georgia

Estimating Irrigated Acres with Missing Data ...................................................... 84
  Irfan Y. Tareen, Dept. of Agriculture and Applied Economics, Univ. of Georgia, Charles E. Rose,
  Dept. of Forest Biometrics, Univ. of Georgia, and Jimmy R. Bramblett, USDA-NRCS

An Economic Analysis of Alternative Agricultural Water Use Reduction Programs in the Flint
  River Basin ............................................................................................................. 88
  Brigid A. Doherty and John C. McKissick, Center for Agribusiness and Economic Development,
  Univ. of Georgia

The Effect of Water Use Regulations on Net Returns and Marginal User Costs ................ 92
  Nancy A. Norton and Virgil Norton, Flint River Water Planning and Policy Center, Albany State
  University; Richard T. Clark, Univ. of Nebraska-Lincoln; and Joel P. Schneekloth, Central Great
  Plains Research Station, Colorado State Univ.

Georgia Riparianism and Irrigation ............................................................................ 96
  Brandon L. Bowen, School of Law, Univ. of Georgia

Estimating Agricultural Water Use in Southwestern Georgia
  Moderator: James E. Hook, National Environmentally Sound Production Agricultural Laboratory, Univ. of Georgia

Status of Agricultural Water Pumping: A Program to Determine Agricultural Water Use
  in Georgia ................................................................................................................ 101
  Daniel L. Thomas and K.A. Harrison, Dept. of Biological and Agricultural Engineering (BAE), Univ.
  of Georgia, Tifton Campus; J.E. Hook, National Environmentally Sound Production Agricultural
  Laboratory (NESPAL), Univ. of Georgia; G. Hoogenboom, BAE, Univ. of Georgia, Griffin Campus;
  L. Wheeler, BAE, Univ. of Georgia, Athens; W.I. Segars, Dept. of Crop and Soil Sciences, Univ. of
  Georgia; J. Mallard, BAE, Statesboro; G. Murphy and M. Lindsay, BAE, Tifton; D.D. Coker, BAE,
  Griffin; T. Whitley, BAE, Tifton; J. Houser, BAE, Griffin; S. Cromer, NESPAL, Tifton; and C.
  Myers-Roche, Utah State University

Mapping Agricultural Withdrawal Permits and Irrigated Area in the Lower Flint Basin .......... 105
  James E. Hook, National Environmentally Sound Production Agricultural Laboratory, Univ. of Georgia, and Elizabeth R. Blood, J.W. Jones Ecological Research Center

Using a Small Sub-sample to Project State-wide Agricultural Irrigation Water Use in 2000 .......... 110
  James B. Houser and G. Hoogenboom, Dept. of Biological and Agricultural Engineering (BAE),
  Univ. of Georgia, Griffin Campus; J.E. Hook, National Environmentally Sound Production Agricultural
  Laboratory, Univ. of Georgia; D.L. Thomas, BAE, Univ. of Georgia, Griffin Campus; and K.A. Harrison,
  BAE, Univ. of Georgia, Tifton Campus

Agricultural Irrigation Trends in Georgia .................................................................... 114
  Kerry A. Harrison, Cooperative Extension Service, Dept. of Biological and Agricultural Engineering,
  Univ. of Georgia, Tifton Campus

Groundwater Issues in the Lower A.C.F. River Basin

Effects of Drought on Stream Discharge and Ground-water Levels Near Lake Seminole,
  Southwestern Georgia and Northwestern Florida, October 1999 - August 2000 .................. 118
  Melinda S. Mosner, US Geological Survey
Physical and Hydrochemical Evidence of Surface-water/Ground-water Mixing in and near Lake Seminole, Southwestern Georgia and Northwestern Florida ................................. 122
Lynn J. Torak, US Geological Survey

Comparison of Pre- and Post-impoundment Ground-water Levels near the Jim Woodruff Lock and Dam Site, Jackson County, Florida ........................................... 127
Phillip N. Albertson, US Geological Survey

Simulated Effects of Pumpage and Climatic Conditions on Stream-aquifer Flow in Streams Harboring Federally Protected Mussel Species, Northwestern Florida and Southwestern Georgia (Poster) 129
Phillip N. Albertson, US Geological Survey

The Effect of a Groundwater Well on the Outflow of a River ........................................... *
Mark Bakker, Dept. of Biological and Agricultural Engineering, Univ. of Georgia

Reservoir Operation in the A.C.F. River Basin

Multi-year Drought in Apalachicola-Chattahoochee-Flint River Basin ................................. 131
Memphis Vaughan, Jr., US Army Corps of Engineers, Mobile District

Conceptual Use of Storage Accounting to Assure Compliance with Allocation Formulas ........ *
Edmund B. Burkett, US Army Corps of Engineers, Mobile District

Developing a Water Supply/Water Quality Guide Curve for Lake Sidney Lanier .................. 134
Martha C. Jackson and Edmund B. Burkett, US Army Corps of Engineers, Mobile District

Conservation Advocacy in the Apalachicola-Chattahoochee-Flint (ACF) Water Allocation Process 136
Matthew Kales, Upper Chattahoochee Riverkeeper

Community Water Management

Local Government Implementation of the Environmental Planning Criteria .................... 140
Deborah A. Miness, Georgia Dept. of Community Affairs

Planning Approach for the Chattahoochee River National Recreation Area General Management Plan/EIS 145
Alyse Getty, Parsons Engineering Science Inc.; Kevin Cheri and William Carroll, Chattahoochee River National Recreation Area; Bill Koning, National Park Service, Denver, Colorado; David Libman, Chattahoochee River National Recreation Area; David Ek, National Park Service, Southeast Regional Office, Atlanta; and Steven Bach and Kevin Johns, Parsons Engineering Science Inc.

NEMO - A National Outreach Program to Educate Municipal Officials about the Relationships Between Water Quality and Land Use ........................................ 149
Aimee Gaddis and Keith Gates, Marine Extension Service, Univ. of Georgia

WaterSmart Community Manual: Tools for Decision Makers ........................................ *
Ross King, Association County Commissioners of Georgia

PANEL: Formative Steps in Regional Water Management

Moderators: Gail M. Cowie, Community and Regional Development Division, Carl Vinson Institute of Government, Univ. of Georgia; and Elizabeth R. Blood, Joseph W. Jones Ecological Research Center (paper)

Panel Discussion: Formative Steps in Regional Water Management ................................. 152
Jimmie Withrow, Conasauga River Alliance; Elizabeth Blood, Southwest Georgia Water Resources Task Force; Ron Papaleoni, Lake Allatoona Preservation Authority; Kevin Green, Metro Atlanta Clean Water Initiative; and Harry Jue, Upper Floridan Technical Advisory Committee

Water Data and Monitoring

Managing Information About the Failure of Drinking Water Sources: Identifying a Baseline for the Development of the Next Generation of Water Management Information Systems 155
New Technologies in River Forecasting
Moderator: Brad Gimmestad, National Weather Service, Southeast River Forecast Center
Sponsor: Southeast River Forecast Center of NOAA

Drought in Southwest Georgia and the Use of Ensemble Streamflow Prediction
Todd Hamill* and Regina Garza, National Weather Service, Southeast River Forecast Center

Hydrometeorological Analysis and Support Function at the Southeast River Forecast Center
Jack S. Bushong, Judith Stokes Bradberry, and Kent D. Frantz, National Weather Service, Southeast River Forecast Center

Multisensor Precipitation Estimates Produced by National Weather Service River Forecast Centers for Hydrologic Applications

PANEL: Effective Communication of Critical Hydrometeorological Information to Key Decision Makers
Moderator: J. John Feldt, National Weather Service, Southeast River Forecast Center

Panel Discussion: Effective Communication of Critical Hydrometeorological Information to Key Decision Makers
J. John Feldt, Hydrologist in Charge, Southeast River Forecast Center; Lans Rothfusz, Meteorologist in Charge, Atlanta; Ed Martin, Georgia District Chief, U.S. Geological Survey; and Memphis Vaughan, Jr., Water Manager, U.S. Army Corps of Engineers, Mobile District

TRACK III. WATERSHED PROTECTION

Non-point Sources
Best Management Practices for Georgia Urban Gardeners to Reduce Nonpoint Source Pollution
Susan M. Varlamoff, Center for Urban Agriculture, and Robert R. Westerfield, Cooperative Extension Service, College of Agricultural and Environmental Sciences, Univ. of Georgia

Results of the Initial Water Quality Monitoring Plan for an Audubon International Signature Course
Parshall B. Bush, Agricultural and Environmental Service Labs, CAES Cooperative Extension Service (CES), Univ. of Georgia; Buck Workman, Cateechee Golf Club, Hartwell; Paul F. Vendrell, CAES, CES, Univ. of Georgia; William I. Segars, Dept. of Crop and Soil Sciences, Univ. of Georgia; C. Rhett Jackson, Warnell School of Forest Resources, Univ. of Georgia; and Robert Perkins, Water Quality Specialist

Leaching of Phosphate and Nitrate from Simulated Golf Greens (Poster)
Larry M. Shuman, Dept. of Crop and Soil Sciences, Univ. of Georgia

Water Quality in the Headwaters of the Upper Oconee Watershed
Dwight S. Fisher and Anthony L. Dillard, USDA-ARS-JPCSNRCC; E. Lynn Usery, Dept. of Geography, Univ. of Georgia; Jean L. Steiner, USDA-ARS-JPCSNRCC; and Constance L. Neely, Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program
Funding of Non-point Source Program's "Stormwater Utilities": The Griffin Experience (Poster) .................................................. 201

Brant D. Keller, Georgia Association of Stormwater Management Agencies

Stormwater Utilities in Georgia ................................................................. 206

A. Thomas Brown, Boyle Engineering Corporation

City of Griffin Stream Bank Restoration Program ..................................... 210

Lee Phillips, Integrated Science and Engineering; and J. Erik Alford and M. Brad McLeod, Ecological Solutions Inc.

North Griffin Regional Detention Pond: Wetlands Filtration for Non-point Source Pollution Control and Abatement ................................................................. 215

Richard A. Greuel and Ronald A. Feldner*, Integrated Science and Engineering

Watershed Planning in a NPDES Phase II Community .................................. 220

Richard A. Greuel and Charles D. Absher*, Integrated Science and Engineering

Land Use Change and Stream Ecosystems - Part 1

Moderator: Michael J. Paul, Institute of Ecology, Univ. of Georgia

Overview of Land Cover and Geomorphic Indicators of Biotic Integrity in the Etowah River Basin, Georgia ................................................................. 225

David S. Leigh, Dept. of Geography, Univ. of Georgia; Byron J. Freeman, Mary C. Freeman, Elizabeth A. Kramer, Catherine M. Pringle, Amy D. Rosemond, Michael J. Paul, and David M. Walters, Institute of Ecology, Univ. of Georgia; and C.P. Lo, Dept. of Geography, Univ. of Georgia

Effects of Changing Land Use on Macroinvertebrate Integrity: Identifying Indicators of Water Quality Impairment ................................................................. 229

Allison H. Roy and Amy D. Rosemond, Institute of Ecology, Univ. of Georgia; David S. Leigh, Dept. of Geography, Univ. of Georgia; and Michael J. Paul, Institute of Ecology, Univ. of Georgia

Bed Texture and Turbidity as Indicators of Fish Biotic Integrity in the Etowah River System ................................................................. 233

David M. Walters, Institute of Ecology, Univ. of Georgia; M.C. Freeman, Institute of Ecology and USGS Patuxent Wildlife Research Center; D.S. Leigh, Dept. of Geography, Univ. of Georgia; and B.J. Freeman, M.J. Paul and C.M. Pringle; Institute of Ecology, Univ. of Georgia

Benthic Algal Biomass in the Etowah Basin and Implications to Establishing Nutrient Criteria in Streams ................................................................. 237

Amy D. Rosemond, Holly S. Weyers, Michael J. Paul and Jennifer L. Greenwood, Institute of Ecology, Univ. of Georgia; and David S. Leigh, Dept. of Geography, Univ. of Georgia

Land Use Change and Stream Ecosystems - Part 2

Moderator: David S. Leigh, Dept. of Geography, Univ. of Georgia

Urbanization in the Etowah River Basin: Effects on Stream Temperature and Chemistry ................................................................. 241

Michael J. Paul, Institute of Ecology, Univ. of Georgia; and David S. Leigh and C.P. Lo, Dept. of Geography, Univ. of Georgia

Urbanization Effects on Streamflow in the Atlanta, Georgia Area ................................................................. 246

Norman E. Peters, US Geological Survey, and Seth Rose, Georgia State University

Evaluation of the Long-term Impacts of Urbanization on the Physical Characteristics of Piedmont Headwater Streams: Interim Results ................................................................. 250

Ted Mikalsen, Georgia Environmental Protection Division; and Robert L. Bourne and Adam Sukenick, Cobb County Water System

Land Cover and Stream Morphology Indicators of Variation in Riparian Forest Patches of the Etowah River Basin, Georgia ................................................................. 255

Rebecca L. Cifaldi and E.A. Kramer, Institute of Ecology, Univ. of Georgia; and D.S. Leigh, Dept. of Geography, Univ. of Georgia
Watershed Assessments
Moderator: Mike Thomas, Clayton County Water Authority
Sponsor: American Water Resources Association - Georgia Section

Estimate TSS Loads for Urbanized Stream Health ........................................ 259
You Jen Tsai, Parsons Engineering Science, Inc.
The Use of In-house Resources by a Municipality to Conduct a Detailed Watershed Assessment ........................................ 262
Robert L. Bourne and Adam Sukenick, Cobb County Water System
GIS Aids Atlanta Stormwater, Watershed Planning ........................................ 265
John Miller, Sharon Wright, Carolina Brundage and John Evans, HDR/WLJorden Inc.
Development of Watershed Scale Management Plans using Standardized Software Tools ........................................ 268
Klaus Albertin and Henry Manguerra, Tetra Tech Inc.; and Matt Meyers, Fairfax County, Virginia

Source Water Assessment - Part 1
Moderator: Mike Thomas, Clayton County Water Authority
Sponsor: American Water Resources Association - Georgia Section

Metro Atlanta Source Assessment Project .................................................... 272
Cindy Daniel and Mark Witcher, Atlanta Regional Commission
The Use of GIS Technology in Source Water Assessment ................................ 275
Paul DiGirolamo and Cindy Daniel, Atlanta Regional Commission
Source Water Assessment in Georgia ............................................................ 279
Wayne R. Fuller, SWAP Unit, Drinking Water Compliance Program, Georgia Environmental Protection Division
Presence of Pharmaceuticals in Wastewater Effluent and Drinking Water, Metropolitan Atlanta, Georgia, July-September 1999 .................................................. 282
Elizabeth A. Frick, US Geological Survey

Source Water Assessment - Part 2

Source Water Protection in the Soque River Watershed .................................... 283
Kristin Costley and Katherine Baer, Upper Chattahoochee Riverkeeper
The Alcovy Protection Plan: A Regional Approach to Watershed Protection ........ 286
Melanie Ruhlman, Brown and Caldwell, and Seth Wenger, Univ. of Georgia
Development of a Sustainable Water Resource for the Big Creek Watershed ........ 291
Robert W. Brashear, Camp, Dresser & McKee Inc.; James M. Santo, Atlanta Regional Commission; and Thomas A. Stanko, Golder and Associates
The Broad River Community Watershed Project .......................................... 293
Susan R. Crow, Carl Vinson Institute of Government, Univ. of Georgia

Watershed Management
Moderator: Mike Thomas, Clayton County Water Authority
Sponsor: American Water Resources Association - Georgia Section

Creative Watershed Performance Requirements for New Development ................ 296
Dale Jones, CH2M HILL; James H. Scarbrough and David Chastant, Gwinnett County Dept. of Public Utilities; and Ken C. Hall and Farhan Shaikh, CH2M HILL
Incorporating Existing Development into Nonpoint Plans: The Missing Link ........ 302
David B. Nichols, School of Environmental Design, Univ. of Georgia
A Model for Effective Stakeholder Education and Involvement in Support of Water Resources Management Goals ............................................................ 305
JoAnn J. Macrina, Jordan Jones & Goulding Inc.

vii
Watershed Assessments for Georgia Counties and Municipalities ................................................. 308
Matt C. Smith, David K. Gattie, F. Wes Byne and Hillary M. Smith, Biological and Agric. Engineering,
Univ. of Georgia

Stormwater Management
Moderator: Mike Thomas, Clayton County Water Authority
Sponsor: American Water Resources Association - Georgia Section

Protecting Riparian Buffers: Incentives versus Restrictions ...................................................... 312
Mike Thomas, Kim Zimmerman and Tim Gilliam, Clayton County Water Authority
What Does it Take to Retrofit an Urban Watershed to Meet Water Quality Standards and TMDLs? .......... 316
Roger Copp, Brown and Caldwell, and Nick Ammons, Surface Water Management, Fulton County
Georgia Stormwater Management Manual ................................................................. 319
Steven M. Haubner, Atlanta Regional Commission
Asset Management: What It Is and What It Means for the Municipal Manager ................................ 319
* Duncan Rose, Parsons Engineering Science

TRACK IV. WATER QUALITY

Wetland Ecosystems

Invertebrate Communities of Twenty Ditched Carolina Bay Wetlands Scheduled for Restoration .............. 321
Susan E. Dietz and Darold P. Batzer, Dept. of Entomology, Univ. of Georgia; and Barbara E. Taylor
and Adrienne E. DeBiase, Savannah River Ecology Laboratory
Okefenokee Swamp Macroinvertebrates ..................................................................................... 325
Erika E. Bilger, D.P. Batzer and J.V. McHugh, Dept. of Entomology, Univ. of Georgia
Invertebrates as Bioindicators of Mercury in the Okefenokee Swamp of Southeast Georgia .................. 329
Bagie Mariam George and D.P. Batzer, Dept. of Entomology, Univ. of Georgia
Aquatic Macroinvertebrates and Water Quality Characteristics in Five Wetland Types: Preliminary
Results on Biomonitoring ......................................................................................................... 333
Juliann Battle, Stephen W. Golladay and Brian Clayton, J.W. Jones Ecological Research Center
Does the Chickasawhatchee Swamp Influence Water Quality? (Poster) ........................................ 337
Stephen W. Golladay and Juliann Battle, J.W. Jones Ecological Research Center

Restoration of Streams and Wetlands

Stream Channel Post-restoration Monitoring of the Soque River, Georgia ........................................ 341
Tony Able, US Environmental Protection Agency; Katherine Baer, Upper Chattahoochee Riverkeeper;
and Morris Flexner, Bruce Pruitt, Jennifer Derby and Pete Kalla, US Environmental Protection Agency
An Innovative Method for Restoring Forested Wetlands .................................................................. 345
Steven D. Bach, Parsons Engineering Science Inc.; Laurie Ashmore, Rockdale County Water Resources;
Bruce C. Bongarten, Timothy B. Harrington and Lawrence A. Morris, Warnell School of Forest Resources,
Univ. of Georgia; and John Maddox and LeighAnn Valetti, Parsons Engineering Science
Partnering Opportunities with the U.S. Army Corps of Engineers for Ecosystem Restoration ............... 349
Jeffrey S. Morris, US Army Corps of Engineers, Savannah District
Southeastern Ecological Framework: A Planning Tool for Managing Ecosystem Integrity .................. 352
B. Richard Durbrow, Neil B. Burns, John R. Richardson and Cory W. Berish, US Environmental
Protection Agency, Region 4, Office of Policy and Management

viii
Riparian and Aquatic Ecosystems

Do Forest-dwelling Bird Communities Care about Stream and Floodplain Geomorphology? ........................................ 358
   Stephanie Hyder, C. Rhett Jackson and Robert J. Cooper, Warnell School of Forest Resources, 
   Univ. of Georgia
Effects of Habitat Degradation on Biological Endpoints in the South Fork Broad River Basin, Georgia .......... 362
   Brenda Raskeigh, US Environmental Protection Agency
An Index of Biotic Integrity for Wadeable Streams in the Apalachicola and Atlantic Slope 
   Drainage Basins in the Piedmont Ecoregion of Georgia ................................................................. 366
   Brian L. Shaner, Georgia DNR Wildlife Resources Division, Fisheries Management Section
Effects of Substrate Embeddedness on Behavior of the Gilt Darter (Percina evides) ........................................... 370
   Andrew B. Sutherland, Institute of Ecology, Univ. of Georgia
Introduction to the Biology and Conservation of Crayfishes ................................................................. 373
   Christopher E. Skelton, Georgia Dept. of Natural Resources, Georgia Natural Heritage 
   Program

Stream Monitoring and QA/QC

Web-based Environmental Database ................................................................. *
   Michael L. Gleason, Biological and Environmental Sciences, Georgia College and State University
Recommendations to Citizen Groups for Chemical Monitoring of Streams and Rivers ........................................ 375
   David B. Wenner, Dept. of Geology, Univ. of Georgia, and William P. Miller, Dept. of Crop and Soil 
   Sciences, Univ. of Georgia
Quality Control for Regulators and Consultants: Laboratory Methods ............................................................. 379
   William P. Miller, Dept. of Crop and Soil Sciences, Univ. of Georgia, and David B. Wenner, Dept. 
   of Geology, Univ. of Georgia
Comparison of Different Methods of Measuring Turbidity for Estimation of Total Suspended 
   Sediments (Poster) ......................................................................................................................... 383
   Dorcas H. Franklin, J.L. Steiner and G. Wheeler, Dept. of Crop and Soil Sciences, Univ. of Georgia

Animal Waste Management - Cost Share Programs

Georgia Cost-share Program: Needs and Considerations ................................................................. 387
   Jimmy R. Bramblett, USDA-Natural Resources Conservation Service, Athens
Agricultural Cost Share Programs in Kentucky and North Carolina ............................................................. 391
   David Radcliffe, Dept. of Crop and Soil Sciences, Univ. of Georgia
Maximizing Returns from State Investments in Nutrient Management and Manure Utilization ................. 394
   L. Mark Risse, Dept. of Biological and Agricultural Engineering, Univ. of Georgia, and Gary J. Gascho, 
   Dept. of Crop and Soil Sciences, Univ. of Georgia
An Economic Analysis of Broiler Litter Application to Selected Row Crops in Southwest Georgia ............. 399
   Jeffrey D. Mullen, Dept. of Agricultural and Applied Economics, Univ. of Georgia
Riparian Buffers for Conservation and Environmental Protection in Georgia ............................................ 404
   Dana G. Poole, Georgia Stream Buffer Initiative, Univ. of Georgia

Animal Waste Management

Nitrogen and Phosphorus Losses from No-till Cotton Fertilized with Poultry Litter in the Southern 
   Piedmont ............................................................................................................................................ 408
   Dinku M. Endale, USDA-ARS; M.L. Cabrera and D.E. Radcliffe, Dept. of Crop and Soil Sciences, 
   Univ. of Georgia; and J.L. Steiner, USDA-ARS
Ampicillin Resistance in Fecal Coliforms of Canoochee River .................................................................. 412
   Michael L. Gleason, Biological and Envir. Sciences, Kenneth C. McGill, Chemistry, and Lee P. Owen, 
   Biological and Envir. Sciences, Georgia College and State Univ.
Beef Cattle Production Impacts on Water Quality ........................................ 416
   Julia W. Gaskin, L. Mark Risse and L. Britt Faucette, Biological and Agric. Engr., Univ. of Georgia;
   William I. Segars, Dept. of Crop and Soil Sciences, Univ. of Georgia; and Phil C. Worley, NW Georgia
   Experiment Station
Supporting a State Assistance Program Using the Georgia Farm*A*Syst Program .......... 420
   Tina W. Pagan and L. Mark Risse, Cooperative Extension Service, Univ. of Georgia
Addressing Pollution from Animal Feeding Operations .................................. 424
   Terence J. Centner, Dept. of Agric. and Applied Economics, Univ. of Georgia

Justice and Water Law

The Clean Water Act NPDES Program: How Citizens Can Use the Law to Protect their Watershed ................................................................. 428
   Justine Thompson, Georgia Center for Law in the Public Interest
United States Environmental Protection Agency Municipal Enforcement Activities ........ 432
   Susan H. Richardson and Richard A. Horder, Kilpatrick Stockton LLP
A Proposal for Using Peer Review in the Environmental Permitting Process ............. 437
   David C. Kyler, Center for a Sustainable Coast
A Critique of the Clean Water Initiative Proposals in Light of the Georgia Water Bill of Rights ............................... 421
   Maggie M. Kelly, Georgia Public Interest Research Group

Lake Water Quality

Lake Seminole Hydrilla Action Plan: Development and Implementation ................. 445
   Michael J. Eubanks, US Army Corps of Engineers, Mobile District, and Donald M. Morgan, US Army Corps of Engineers, Lake Seminole
Observing and Understanding the Dynamics of Algal Photosynthesis and Respiration ...... 449
   ZhuLu Lin and M.B. Beck, Warnell School of Forest Resources, Univ. of Georgia
Phosphorus Binding by Iron-rich Soil in the Southeastern Piedmont: Implications for Point and Non-point Sources of Phosphorus ........................................... 453
   Mary Mayhew, Todd Rasmussen and Amanda Parker, Warnell School of Forest Resources, UGA
Phosphorus Cycling in Southeastern Piedmont Lakes: An Alternative Pathway .......... 457
   Amanda K. Parker and Todd C. Rasmussen, Warnell School of Forest Resources, UGA

Lake Lanier Watershed

Accurate Land Cover Development for Rapidly Growing Watersheds ...................... 461
   Heather H. Dyke, CH2M HILL
Analysis of Uncertainty in Model Predictions for Lake Lanier ............................. 468
   Olufemi O. Osodele and M.B. Beck, Warnell School of Forest Resources, Univ. of Georgia
Lake Lanier Non-point Source Improvement Project ......................................... 472
   Rob Rivers, Hall County Public Utilities, and Laurie Hawks, Brown and Caldwell
Watershed Management for Lake Lanier: Perspectives on Inter-governmental Implementation ............................... 474
   Douglas S. Baughman and Mary E. Horton, CH2M HILL; Tim Merritt, City of Gainesville; and Robert R. Rivers, Public Works and Utilities, Hall County

GEORGIA LAKE SOCIETY — ANNUAL MEETING
TRACK V. ATLANTA WATER QUALITY, WASTELOAD ALLOCATION - TMDL

Water Quality and Atmospheric Deposition

Trace Metal Variation in Atlanta Region Streamflow and Street Runoff ........................................ 479
   Seth Rose, Danielle Sheheen, Melinda Crean and A. Mohamad Ghazi, Dept. of Geology, Georgia State University
Composition and Changes in Atmospheric Deposition near Atlanta, Georgia, 1986-99 .......................... 483
   Norman E. Peters and Brent T. Aulenbach, US Geological Survey; and Tilden P. Meyers, National Oceanic and Atmospheric Administration
Tracing Germanium Contamination from Coal-fired Power Plants Down the Chattahoochee-Apalachicola System: Implications for the Toxic Metalloids Arsenic and Selenium .................................................. 488
   Philip N. Froelich and Patrick Lesley, School of Earth and Atmospheric Sciences, Georgia Institute of Technology
Radionuclides in Sediment at Nuclear Facilities in Georgia ............................................................. 492
   Robert Rosson, Jeff Lahr and Ramon Garcia, Environmental Resources Center, Georgia Institute of Technology; Cliff Blackman, Georgia Dept. of Natural Resources; and Bernd Kahn, Environmental Resources Center, Georgia Institute of Technology

Stream Quality in Atlanta Area - Part 1

A Conceptual Program for Water-quality Monitoring in the Upper Chattahoochee River Basin in Georgia ............................................................ 497
   Brian E. McCallum and Arthur J. Horowitz, US Geological Survey
Estimating Chattahoochee River Tributary Stream Temperatures in the Vicinity of Atlanta, Georgia 501
   Thomas R. Dyar and S.J. Alhadeff, US Geological Survey, Georgia Institute of Technology; R.C. Burke III and P.D. Lamarre, Georgia DNR, Environmental Protection Division, Water Protection Branch; and R.W. Olson, Law Engineering and Environmental
Ecosystem Services in a Regulated River: Variability in Nutrient Uptake and Net Ecosystem Metabolism in the Chattahoochee River .................................................. 502
   Cathy A. Gibson and J.L. Meyer, Institute of Ecology, Univ. of Georgia
Phosphorus Assimilation Below a Point Source in Big Creek ......................................................... 506
   Jeff B. Pollock and Judy L. Meyer, Institute of Ecology, Univ. of Georgia

Stream Quality in Atlanta Area - Part 2

Indicator-bacteria Concentrations in Streams of the Chattahoochee River National Recreation Area, March 1999-April 2000 .................................................. 510
   M. Brian Gregory and Elizabeth A. Frick, US Geological Survey
The Effects of Sand Dredging on Channel Morphology, Habitat, and Water Quality in Urban DeKalb County Streams .................................................. 514
   Jennifer Keyes, C. Rhett Jackson and Ben Jackson, Warnell School of Forest Resources, Univ. of Georgia
Field Monitoring of Bridge Scour in Georgia .................................................................................. 518
   Anthony J. Gotvald and Mark N. Landers, US Geological Survey
Water-quality Monitoring in Gwinnett County .............................................................................. 521
   Paul D. Ankorn and Mark N. Landers, US Geological Survey; and Janet P. Vick, Gwinnett County Department of Public Utilities
**Water Quality Models for T.M.D.L. Development**

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews of Georgia Water Resources Scientists and Managers</td>
<td>525</td>
</tr>
<tr>
<td>Bobbie A. Vallotton and Todd C. Rasmussen, Warnell School of Forest Resources, UGA</td>
<td></td>
</tr>
<tr>
<td>Development of a Pathogen Loading Estimation Tool for TMDL Development in the Southeast</td>
<td>528</td>
</tr>
<tr>
<td>Andrew Parker and Mohammed Lahlou, Tetra Tech Inc.</td>
<td></td>
</tr>
<tr>
<td>Modeling Tools Used for Mercury TMDLS in Georgia Rivers</td>
<td>532</td>
</tr>
<tr>
<td>Robert B. Ambrose, Jr. and Tim A. Wool, US Environmental Protection Agency</td>
<td></td>
</tr>
<tr>
<td>EFDC/WASP a Multidimensional Hydrodynamic and Water Quality Model System for TMDL Development</td>
<td>*</td>
</tr>
<tr>
<td>Tim Wool, US Environmental Protection Agency</td>
<td></td>
</tr>
</tbody>
</table>

**T.M.D.L. Implementation Assurance**

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance of Georgia's Silvicultural BMPs Determined from Systematic Reconnaissance of Piedmont Clearcut and Site Preparation Units</td>
<td>*</td>
</tr>
<tr>
<td>C. Rhett Jackson, Warnell School of Forest Resources, Univ. of Georgia</td>
<td></td>
</tr>
<tr>
<td>The Little River Watershed Assessment: Water Quality in a Rapidly Developing Suburban Atlanta Watershed</td>
<td>536</td>
</tr>
<tr>
<td>Mike Morrissey, Cherokee County Water and Sewerage Authority, and Anthony Pelliccia, Welker and Associates Inc.</td>
<td></td>
</tr>
<tr>
<td>Demonstrating that Management Objectives will be Achieved in Rockdale County, Georgia</td>
<td>540</td>
</tr>
<tr>
<td>Trevor Clements, Jon Butcher and Kimberly Brewer, Tetra Tech Inc.</td>
<td></td>
</tr>
<tr>
<td>Local Government Perspective on Georgia’s TMDL Process</td>
<td>*</td>
</tr>
<tr>
<td>Chris DeVinney, Association County Commissioners of Georgia</td>
<td></td>
</tr>
</tbody>
</table>

**T.M.D.L. Development in Georgia**

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury TMDLS in Georgia: A Recent Case Study</td>
<td>544</td>
</tr>
<tr>
<td>John David Dean and Mahalingam Ravichandran, AMEC Earth and Environmental; and Frederic P. Andes, Attorney, Barnes &amp; Thornburg</td>
<td></td>
</tr>
<tr>
<td>Defining Away Metal Contamination in Georgia Streams</td>
<td>549</td>
</tr>
<tr>
<td>Emma J. Rosi-Marshall and J.L. Meyer, Institute of Ecology, Univ. of Georgia; K. Neumann, Ball State University; and B. Lyons, Ohio State University</td>
<td></td>
</tr>
<tr>
<td>Development of a Dissolved Oxygen TMDL for Brunswick River Using a 2-D Hydrodynamic and Water Quality Model</td>
<td>553</td>
</tr>
<tr>
<td>Hugo N. Rodriguez and Steven J. Peene, Tetra Tech Inc.</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen TMDL Development in Southern Georgia</td>
<td>557</td>
</tr>
<tr>
<td>Steven Davie, Tetra Tech Inc.; James Greenfield, US Environmental Protection Agency; and Mohammed Lahlou, Tetra Tech Inc.</td>
<td></td>
</tr>
</tbody>
</table>

**Sediment Loading and T.M.D.L.s - Part 1**

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed Erosion and Sediment Load Estimation Tool</td>
<td>*</td>
</tr>
<tr>
<td>James M. Greenfield, US Environmental Protection Agency, Region 4, Water Management Division; M. Lahlou, Tetra Tech Inc.; L. Swift, Jr., USDA Forest Service, Southern Research Station; and H.B. Manguerra, Tetra Tech Inc.</td>
<td></td>
</tr>
<tr>
<td>Sensitivity of RUSLE to Data Resolution: Modeling Sediment Delivery in Upper Little Tennessee River Basin</td>
<td>561</td>
</tr>
<tr>
<td>Edward P. Gardiner and Judy L. Meyer, Institute of Ecology, Univ. of Georgia</td>
<td></td>
</tr>
<tr>
<td>Sediment TMDL Development Methodology: Stekoo Creek Example</td>
<td>*</td>
</tr>
<tr>
<td>James M. Greenfield, US Environmental Protection Agency, Region 4, Water Management Division</td>
<td></td>
</tr>
<tr>
<td>Defining a Process for Establishing Science-based Sediment TMDLs in Georgia and the Southeast</td>
<td>566</td>
</tr>
<tr>
<td>Alice Miller Keyes, The Georgia Conservancy</td>
<td></td>
</tr>
</tbody>
</table>
Sediment Loading and T.M.D.L.s - Part 2

Preliminary Sediment Analysis for the Broad River ................................................................. 570
David Radcliffe, Crop and Soil Sciences Dept., Univ. of Georgia, and Todd Rasmussen, Warnell School of Forest Resources, Univ. of Georgia

Sediment Flux and Storage in a Southeastern Piedmont River System ......................................... 574
John Kirkwood Martin and C. Rhett Jackson, Warnell School of Forest Resources; David S. Leigh, Dept. of Geography; and Larry T. West, Dept. of Crop and Soil Sciences, University of Georgia

USDA Forest Service Monitoring for TMDLs, Ecosystem Management, and Restoration in the Chattooga River Watershed ................................................................. *
Charlene Neihardt, US Forest Service

TRACK VI. GROUNDWATER AND COASTAL ISSUES

Groundwater Quality

Piedmont Hydrology: Implications for Contaminated Sites ......................................................... 578
James B. Feild and John F. Dowd, Dept. of Geology, Univ. of Georgia

Evaluation of the Micropurge (Low-flow) Method to the Packer Method of Groundwater Sampling of Fractures in Crystalline Bedrock of the North Georgia Piedmont (Poster) .................................... 582
James B. Feild and John F. Dowd, Dept. of Geology, Univ. of Georgia

Trichloroethene Presence in Rottenwood Creak Near Air Force Plant 6, Marietta, Georgia, Summer 2000 ............................................................. 586
Gerard J. Gonthier and Jonathan P. Waddell, US Geological Survey

A Relationship Between Nitrate and Iron in Georgia's Groundwater ............................................ 590
Paul F. Vendrell, Parshall B. Bush, Rick Hitchcock, William C. Johnson, Jr. and David E. Kissel, Agricultural and Environmental Services Laboratories, Univ. of Georgia; William I. Segars, Dept. of Crop and Soil Sciences, Univ. of Georgia; and Kristen Bukowski McSwain, US Geological Survey

GIS Modeling of Ground-water Contamination at the Savannah River Site ..................................... 594
Silas Mathes and Todd Rasmussen, Warnell School of Forest Resources, Univ. of Georgia; and John Reed, Westinghouse Savannah River Company

Savannah River Basin

Proposed Savannah Harbor Deepening and Possible Impact on Floridan Aquifer ................................. 597
Christopher J. Schuberth, Armstrong Atlantic State University

Limits to a Consensus-based Model of Involvement ................................................................. 599
Caitlin M. Wills, Dept. of Speech Communication, Univ. of Georgia

New Savannah Bluff Lock and Dam - The Complexities of Deciding the Future of an Old Structure ................................. 603
William Bailey, US Army Corps of Engineers, Savannah District

PANEL: Savannah Basin Comprehensive Water Resources Study

Savannah River Basin Comprehensive Water Resources Management Study ................................. 606
Leroy G. Crosby, US Army Corps of Engineers, Savannah District; Napoleon Caldwell, Georgia Environmental Protection Division; and Bud Badr, South Carolina Water Resources Commission

Panel Discussion: Savannah Basin Comprehensive Water Resources Study ................................... *
Leroy Crosby, US Army Corps of Engineers, Savannah District; Napoleon Caldwell, Georgia Environmental Protection Division; and Bud Badr, South Carolina Water Resources Commission

xiii
Estuarine Water Quality Trends

A Decade of Change in the Skidaway River Estuary. I. Hydrography and Nutrients ........................................ 610
   Peter G. Verity, Skidaway Institute of Oceanography

Linking Shifts in Historic Estuarine Vegetation to Salinity Changes Using a GIS ............................................. 615
   Carrie Smith, Merryl Alber and Alice Chalmers, Dept. of Marine Sciences, Univ. of Georgia

Salinity Response of the Satilla River to Seasonal Changes in Freshwater Discharge (Poster) ......................... 619
   Jack Blanton, Skidaway Institute of Oceanography; and Merryl Alber and Joan Sheldon, Dept. of
   Marine Sciences, Univ. of Georgia

Physical, Chemical, and Biological Monitoring of the Satilla River ................................................................. 623
   Katy Austin and Keith Gates, Marine Extension Service, Univ. of Georgia

Water Management and Environmental Issues in Coastal Georgia
Moderator: John Clarke, U.S. Geological Survey

Use of Ground-water Flow Models for Simulation of Water-management Scenarios for Coastal Georgia
   and Adjacent Parts of South Carolina ................................................................. 627

Aquifer Storage Recovery in the Santee Limestone/Black Mingo Aquifer, Charleston, South Carolina,
   1993-2000 ........................................................................................................ 631
   Matthew D. Petkewich, US Geological Survey; June E. Mirecki, Dept. of Geology, College of Charleston;
   and Kevin J. Conlon and Bruce G. Campbell, US Geological Survey

Literature Survey of Methods to Control Salt Water Intrusion into the Floridan Aquifer ......................................... 635
   James F. Renner, Levy Kroitoru and Rebecka Snell, Golder Associates Inc.

Environmental Concerns in Planning for Coastal Water Supply ........................................................................... 639
   *Patricia McIntosh, The Georgia Conservancy and Ben Brewton, Coastal Georgia

Groundwater Development in the Altamaha River Watershed: Implications for Conservation of
   Aquatic Ecosystems ................................................................................................. 639
   Douglas T. Shaw, The Nature Conservancy of Georgia, Altamaha River Bioreserve (paper only)

Salt Water Intrusion into Coastal Georgia Aquifers
Moderator: Rick Krause, U.S. Geological Survey volunteer

Saltwater Contamination in the Upper Floridan Aquifer at Brunswick, Georgia ................................................. 644
   L. Elliott Jones, US Geological Survey

Using Marine Reflection Seisims to Identify Potential Seawater Intrusion Sites in the Upper Floridan
   Aquifer of Coastal Georgia and South Carolina ................................................................................................. 648
   Anthony M. Foyle and Vernon J. Henry, Applied Coastal Research Lab, Georgia Southern University;
   and Clark R. Alexander, Skidaway Institute of Oceanography

Hydrogeology and Water Quality of the Lower Floridan Aquifer, Coastal Georgia, 1999-2000 ......................... 652

Preliminary Numerical Models of Saltwater Transport in Coastal Georgia and Southeastern South Carolina .... 656

Alternative Water Sources for Coastal Georgia
Moderator: James Renner, Golder Associates Inc.

Development of Long-term Sustainable Water Supplies from the Miocene Upper and Lower Brunswick
   Aquifers, Glynn and Bryan Counties, Georgia ......................................................................................... 660
   Harold E. Gill, Jordan Jones & Goulding Inc.

Engineering Assessment of the Miocene Aquifer System in Coastal Georgia ..................................................... 665
   Jonathan S. Radke, Christopher D. Hemingway and Robert Humphries, Golder Associates Inc.
Preliminary Simulation of Pond-aquifer Flow and Water Availability at a Seepage Pond
Near Brunswick, Georgia ................................................. 669
Malek Abu-Ruman, Georgia Institute of Technology, and John S. Clarke, US Geological Survey
Southeast Georgia 24-county Alternative Water Supply Study ................................................. 673
Amy Ma* and Katherine H. Zitsch, and Dieter Franz, Camp Dresser & McKee Inc.

POSTERS

Summary of Selected U.S. Geological Survey Water-resources Activities in Georgia ............................... 677
Steven D. Craigg and Debbie Warner, US Geological Survey

New Watershed Boundary Map for Georgia .................................................................................. 681
Mark N. Landers and Keith McFadden, US Geological Survey; and Jimmy R. Bramblett,
Dept. of Agric. and Applied Economics, Univ. of Georgia

A Watershed Scale Ranking Scheme for Evaluating Impacts of AFOs on Water Quality .................. 682
Robert K. Hubbard and W.L. Magette, Southeast Watershed Research Laboratory, USDA-ARS;
and J.M. Sheridan, University College Dublin, Ireland

Georgia Agricultural Water Quality Watershed Assessment ........................................................... 686
Jimmy R. Bramblett, USDA-NRCS

Assessment of Carolina Bays in Georgia ..................................................................................... 690
Eric Van De Genachte, Georgia DNR, Georgia Natural Heritage Program

Wildlife Habitat: An Alternative Use for Degraded Agricultural Wetlands ................................ 693
Kristin Ling Smith, USDA Natural Resources Conservation Service; Robert N. Smith, RNS Resource
Management Services; and Buster Haddock, H&H Farms

Flint River Corridor Project: A Riparian Health Analysis ............................................................... 697
Shan Cammack and Eric Van De Genachte, Georgia DNR, Georgia Natural Heritage Program

Locally Led Conservation in the Ichawaynochaway Watershed .................................................. 702
Kristin Ling Smith, USDA Natural Resources Conservation Service

Community-based Water Quality Monitoring by the Upper Oconee Watershed Network ............. 706
Deanna E. Conners, Dept. of Environmental Health Science, UGA; Susan Eggert, Institute
of Ecology, UGA; Jennifer Keyes, Forest Resources, Univ. of Georgia; and Michael Merrill, Institute
of Ecology, University of Georgia

Water Quality Assessment for Lake Blackshear, Georgia .............................................................. 710
Lisa Jan Broadhurst and Elisabeth D. Elder, Biology Dept., Georgia Southwestern State University

Short-term and Long-term Sediment and Phosphorus Inputs to Lake Lanier .................................. 714
Xiaoquig Zeng and Todd C. Rasmussen, Warnell School of Forest Resources, Univ. of Georgia

Summary of Fecal-coliform Bacteria Concentrations in Streams of the Chattahoochee River
National Recreation Area, Metropolitan Atlanta, Georgia, May-Oct. 1994 and 1995 ..................... 718
M. Brian Gregory and Elizabeth A. Frick, US Geological Survey

Hydrologic Transport of Escherichia coli Through a Piedmont Watershed .................................. 722
Demetrius Cox and Todd C. Rasmussen, Warnell School of Forest Resources, UGA

Evaluating Transport of Cryptosporidium Oocysts Through Soils Using Polystyrene
Microsphere Surrogates .............................................................................................................. 726
Dinku M. Endale, USDA-ARS; M.H. Young, Div. of Hydrologic Sciences, Desert Research Institute;
K.D. Pennell, School of Civil and Environmental Engr., Georgia Inst. of Technology; D.S. Fisher and
J.L. Steiner, USDA-ARS; and A. Amirtharajah, School of Civil and Environmental Engr., Georgia Tech.

Funding of Non-point Source Program’s “Stormwater Utilities”: The Griffin Experience ............ (201)
Brant D. Keller, Georgia Association of Stormwater Management Agencies

*The Effects of a Golf Course on Leaf Litter Breakdown Rates in a Georgia Piedmont Stream ........ 730
R. Gilmore MacGregor, Susan Herbert and Judy L. Meyer, Institute of Ecology, Univ. of Georgia;
and Kevin Armbrust, Dept. of Crop and Soil Sciences, Univ. of Georgia

*Breakdown Rates of Tulip-poplar Leaves in Streams Draining Suburban Watersheds ................. 733
The Effects of Sand Dredging on Benthic Macroinvertebrates in Two Urban Atlanta Streams

Christopher D. Decker, Warnell School of Forest Resources

A Field Trial using Low Application Rates of Polyacrylamide (PAM) to Reduce Soil Erosion from Disturbed Piedmont Soils

Rebekah L. Glazer and Daniel Markewitz, Warnell School of Forest Resources, Univ. of Georgia

The Turfgrass Water Management Program at Univ. of Georgia

Gil Landry, Dept. of Crop and Soil Science, Univ. of Georgia, Griffin

Ribotyping to Determine the Source of Fecal Coliform Contamination in Three Household Wells Near Cochran, Georgia

Jennifer L. Hill, Peter G. Hartel and William I. Segars, Dept. of Crop and Soil Sciences, Univ. of Georgia; and Parshall Bush, Agric. and Environmental Services Labs, Univ. of Georgia

The Effect of Storms on Stream Water Quality in a Karst Landscape

Elizabeth R. Blood and J. Scott Phillips, J.W. Jones Ecological Research Center

Water Use Patterns in the Watersheds of the Georgia Riverine Estuaries

Merryl Alber and Carrie Smith, Dept. of Marine Sciences, Univ. of Georgia

Saltwater Contamination of Ground Water at Brunswick, Georgia and Hilton Head Island, South Carolina

Richard E. Krause and John S. Clarke, US Geological Survey

Effects of Regional Anthropogenic Groundwater Alterations on Groundwater Levels of the Sapelo Island Complex, Georgia

Huda F. Alkaff, Institute of Ecology, Univ. of Georgia

Linkage of Offshore and Onshore Hydrogeologic Data for Coastal Georgia and Adjacent Parts of South Carolina and Florida Using a Geographic Information System

Michael T. Laitta, US Geological Survey

Hydrogeologic Conditions at Two Seepage Ponds in the Coastal Area of Georgia, August 1999 to February 2001

Michael F. Peck and John S. Clarke, US Geological Survey; Malek Abu-Ruman, Georgia Institute of Technology; and Michael T. Laitta, US Geological Survey

Use of Two-dimensional Direct-current-resistivity Profiling to Detect Fracture Zones in a Crystalline Rock Aquifer near Lawrenceville, Georgia

Lester J. Williams and Marcel Belaval, US Geological Survey

Springflow Assessment of White Sulphur Springs

Thomas H. Mirti, Suwannee River Water Management District

Weather Monitoring for Management of Water Resources

Gerrit Hoogenboom, Dept. of Biological and Agric. Engineering, Univ. of Georgia

Public-supply Water Use in the Metropolitan Atlanta, Georgia Area, 1995-2000

Julia L. Fanning, US Geological Survey

Summary of Streamflow Conditions for Calendar Year 2000 in Georgia

Timothy C. Stamey, US Geological Survey

An Analysis of Historic Flows in the Satilla River Using Two Statistical Methods

Duncan Elkins, Institute of Ecology, Univ. of Georgia

The Role of Aqueous Thin Film Evaporative Cooling on Rates of Elemental Mercury Air-water Exchange Under Temperature Disequilibrium Conditions

Nicholas T. Loux, US Environmental Protection Agency, Office of Research and Development, National Exposure Research Laboratory, Ecosystems Research Division
Adobe Spark’s free online book cover generator helps you easily create your own custom book covers that attract readers, no design skills necessary. Even though we’ve all been told since childhood to never judge a book by its cover, the fact is that book cover design does attract readers. An eye-catching design can make the difference between a book that sells and one that stalls, so don’t let your future bestseller get passed over due to a so-so cover design. Adobe Spark allows you to make your own book cover for free so your book gets all the attention it deserves. A book cover creator that saves you time. Adobe Spark is a free book cover maker that lets you craft a vision from your writing. Find book cover front stock images in HD and millions of other royalty-free stock photos, illustrations and vectors in the Shutterstock collection. Thousands of new, high-quality pictures added every day. 177,210 book cover front stock photos, vectors, and illustrations are available royalty-free. See book cover front stock video clips. of 1,773. open closed book.