

# TRIENNIAL REPORT

2003 ♦ 2004 ♦ 2005



January 2006

# Georgia Water Planning & Policy Center

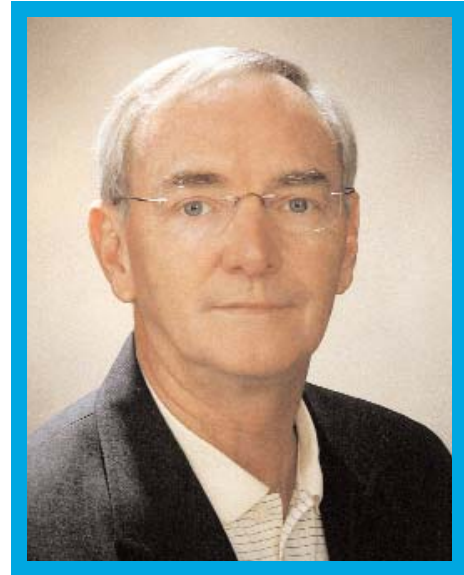
## From the Director \_\_\_\_\_

Over the past decade, Georgia has changed significantly. The combined forces of demographic change and climatic events brought us face to face with water scarcity, to an extent which we had not before encountered in this state. During this time, water quality also became a much greater concern for our economic future and quality of life. These issues are of particular importance to the farmers of our state, who seek to provide stewardship of our water resources while supporting a vibrant agricultural economy in Georgia.

Our leaders are taking notice. For the past several years, in each session, the Georgia General Assembly has considered important bills concerning the management and protection of our state's water resources. Several of these bills are of particular importance to the agricultural sector in our state. In 2000, the General Assembly passed the Flint River Drought Protection Act, which provides for the compensation of farmers to suspend agricultural acreage from irrigation during a severe drought year. In 2003, the General Assembly created the Agricultural Water Use Measurement Program, which requires meters for all agricultural water users in the state by 2009. In 2004, the General Assembly initiated a statewide water resource planning effort that is currently underway. We are beginning to accord water resources the level of planning and careful management that will be necessary to provide for a clean and adequate water supply for the future of our state.

Good water resource policy requires a foundation in research from the fields of science, economics, law, and policy. As we consider our water future, we need to know what will work and what will not work to ensure careful stewardship of our water resources. New plans, laws, and regulations that seek to manage water quantity and quality will have far-reaching effects on Georgians. These effects will be positive in the long-term if water resource policy is developed through a process informed by research that seeks to identify the most effective strategies to conserve our water resources and protect water quality.

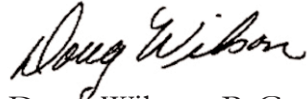
The Georgia Water Planning and Policy Center is providing information to support the important decisions that we, as Georgians, will need to make about our water resources. In particular, our work emphasizes the need for better information to support the management of water resources in the agricultural sector. This report details our activities in the areas of water resources research, education, technical assistance, and outreach over the past three years, during fiscal years 2003, 2004, and 2005. The Center seeks to provide practical and useful information that can aid Georgians in making decisions about the important water issues our state currently faces, and in doing so, we also have generated information useful to water managers in Georgia and beyond the borders of our state.



**Doug Wilson, P. G.**  
GWPPC Executive Director

I would like to acknowledge the support we have received for our work from many sources, including the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, the Board of Regents of the University System of Georgia, and the Georgia Soil and Water Conservation Commission.

I hope that you will consider the broad scope of our water resources work and share this information with others who might find our research, services, and resources helpful. I invite you to contact me to discuss our programs at any time.

A handwritten signature in black ink that reads "Doug Wilson". The signature is written in a cursive, flowing style.

Doug Wilson, P. G.  
*Executive Director, GWPPC*

# Table of Contents



<b>From the Director</b>	<b>i</b>
<b>Mission</b>	<b>1</b>
<b>Who We Are</b>	<b>1</b>
<b>Our Resources</b>	<b>2</b>
<b>Faculty and Water Professionals</b>	<b>4</b>
<b>Major Projects</b>	<b>5</b>
<b>List of Publications</b>	<b>11</b>
<b>Financial Summary</b>	<b>16</b>
<b>Looking to the Future</b>	<b>17</b>



# Mission

To form an objective statewide institution that assists policymakers in designing policies that provide for improved water resource management in Georgia, especially in the agricultural sector, via water planning, research, education and technical assistance.

# Who we are

The Georgia Water Planning and Policy Center (GWPPC) was formed in 1999 with support from the Georgia General Assembly and the Georgia Research Alliance. The Center was created to provide leadership in Georgia in the research and design of policies affecting water resources.

The Center was designed to support a program of multi-disciplinary research, education, and technical assistance to support Georgia policy-makers, citizens, and students in the field of water resources. Given the increasing importance of water to Georgia's economy and quality of life, the Center was initiated to provide sound scientific, policy, and economic information to support a healthy water future for the state of Georgia.

The center is a three-university consortium that includes the North Georgia Metropolitan Water Planning and Policy Center at Georgia State University, the Flint River Water Planning and Policy Center at Albany State University, and the Coastal Rivers Water Planning and Policy Center at Georgia Southern University. The consortium provides the institutional framework and academic expertise to proactively address the state's water policy issues on a regional basis.

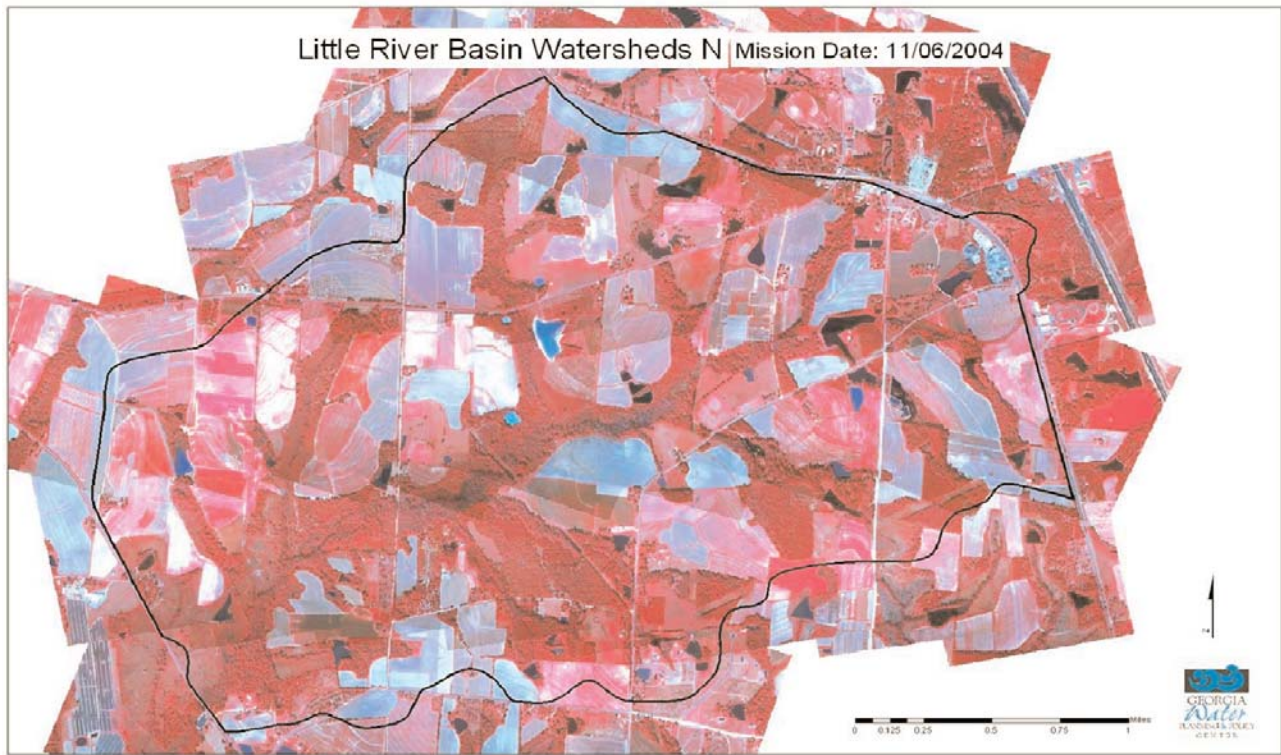
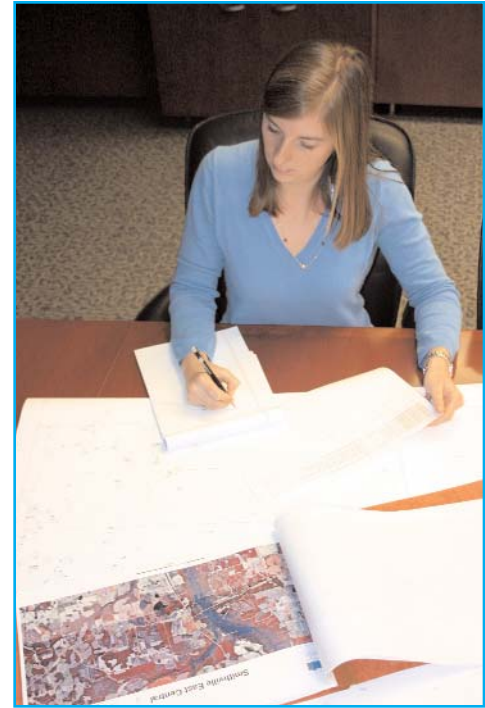


The program stresses the use of applied policy sciences through the expertise of faculty and professionals from disciplines including law, economics, public policy & administration, and related decision sciences. Our researchers focus on water resource questions and problems that state policy makers and government officials currently face. Our work products are created with the goal of agency adoption and with an emphasis on using public dollars efficiently to achieve policy goals.

*The program stresses the use of applied policy sciences through the expertise of faculty and professionals from disciplines including law, economics, public policy & administration, and related decision sciences.*

# Our Resources

The resources of the Georgia Water Planning and Policy Center form a unique assembly of academic expertise and technological support that enables the Center to provide timely, Georgia-focused water research that can be used to support important water policy decisions in the state. Our affiliated faculty and water policy professionals bring a wealth of experience and knowledge in the field of water policy, including issues of water supply, water quality, and water resource management, especially in the agricultural sector. Our reach across the disciplines of economics, policy, law, and science uniquely enables us to provide interdisciplinary support to water policy through research, education, and technical assistance.



*An example of the type of mapping that the Georgia Water Planning and Policy Center can perform, this map illustrates irrigated parcels in the Little River sub-basin near Tifton, Georgia. Magenta areas in the map are vegetated areas. Images like this one provide valuable information such as vegetative cover, crop identification, and land use that can be used in analyses of water resource conditions and policies. The data for this map were collected using our multi-spectral aerial imaging system and processed and analyzed using our Geographic Information System. The map was created to support water quality research by the Natural Resources Conservation Service in the Little River sub-basin.*

# Our Resources (cont)

To support our water resources mission, the Center has an extensive Geographic Information System (GIS) with in-house specialists that provide data processing and analysis. The system can be used to perform analyses of water and land resources in support of research and policy-making. These analyses provide visual tools that can help us to understand the implications and effects of water policy under the actual conditions found on the ground in Georgia watersheds. The system has been used to identify field study sites based on adjacent hydrologic features. It has also been used to plot irrigated acreage in agricultural regions of Georgia and to provide implementation support for the state's Agricultural Water Use Measurement program (HB 579).

Additionally, the Center has a four-band

multi-spectral aerial imaging system that can be used to provide cost-effective, geo-referenced aerial data collection. It has been used to fly data collection missions across the state. Our in-house GIS facility allows for timely processing and the ability to generate various data formats. Our processing capability supports the use of this system to provide easily accessible geographical and environmental information for use in policy research and analysis.

This system can be used to expand our understanding of water resource use and conditions across the state. We are currently using the system to gather information in support of

irrigation and other agricultural research collaborations with federal, state, and private partners. We have the ability to fly custom missions to suit specific needs given any number of data collection requirements.

*To support our water resources mission, the Center has an extensive Geographic Information System (GIS) with in-house specialists that provide data processing and analysis.*



**The Center's four-band multi-spectral aerial imaging system provides cost-effective, geo-referenced, remote sensing data that will be used to support a wide variety of water resource studies.**

Faculty and Water Policy Professionals  
associated with the  
Georgia Water Planning & Policy Center

**Doug Wilson**, Executive Director, Georgia Water Planning and Policy Center  
Area of Interest: Hydrology, Agricultural Water Resource Management

**Mark Masters**, Interim Director, Flint River Water Planning and Policy Center; Assistant Professor, Albany State University  
Area of Interest: Agricultural and Resource Economics

**Ben Thompson**, Director, Coastal Rivers Water Planning and Policy Center  
Area of Interest: Water Law and Policy

**Ron Cummings**, Director, North Georgia Water Planning and Policy Center; Professor Emeritus, Georgia State University  
Area of Interest: Natural Resources and Environmental Economics

**Kristin Rowles**, Senior Policy Analysis, Georgia Water Planning and Policy Center  
Area of Interest: Environmental Policy

**Sam Collier**, Facilitator and Policy Analyst, Coastal Rivers Water Planning and Policy Center  
Area of Interest: Stakeholder Outreach, Policy Research, and Strategic Planning

**Nick Ogden**, Outreach Coordinator, Coastal Rivers Water Planning and Policy Center  
Area of Interest: Water Policy and Permitting

**Marty McKimney**, Geographic Information System Specialist  
Area of Interest: Geographic Information Systems and Analysis

**Jon Webb**, Geographic Information System Technician  
Area of Interest: Geographic Information Systems and Analysis

**Mary Beth Walker**, Associate Professor, Georgia State University  
Area of Interest: Economics

**Paul Ferraro**, Assistant Professor, Georgia State University  
Area of Interest: Natural Resource Economics

**Phyllis Isley**, Associate Professor, Georgia Southern University  
Area of Interest: Economics, Economic Development, Water Resources

**Donna Fisher**, Assistant Professor, Georgia Southern University  
Area of Interest: Economics, Economic Development, Water Resources

**M. Bruce Beck**, Professor, Eminent Scholar, University of Georgia  
Area of Interest: Environmental Systems Analysis

**Elliott Marsh**, Research Associate  
Area of Interest: Agricultural Water Use

**Chad Ingersoll**, Research Associate  
Area of Interest: Economic Modeling

**Donna Sakura-Lemessy**, Assistant Professor, Albany State University  
Area of Interest: Watershed Science

**Shelly Jones**, Research Manager  
Area of Interest: Agricultural Water Resource Use, Geographic Information Systems

**Jason Norris**, Research Assistant  
Area of Interest: Agricultural Water Resource Use, Geographic Information Systems

**Kyle Grist**, Research Assistant  
Area of Interest: Agricultural Water Resource Use, Geographic Information Systems

# Major Projects

## 2003-2005

The work of the Georgia Water Planning and Policy Center is multi-faceted. Our research program is integrated with a complementary education and outreach program. In this section, a presentation of the research will be followed by a description of the Center's education and outreach activities over the past three years.

### Research

From 2003 to 2005, the primary areas of research for the Georgia Water Planning and Policy Center were:

1. Water Conservation and Storage
2. Agricultural Water Use and Conservation
3. Water Quality Trading
4. Economics and Water Policy

A brief description of the outcomes and accomplishments in each of these project areas is provided below. A list of the research papers issued by the Center is provided after this section.

### Water Conservation and Storage

Conditions of water scarcity have prompted leaders across Georgia to consider how to provide for more efficient water use and to consider opportunities for water storage for use in times of need. Our research in this area provides policy-makers with information needed to decide what kinds of water conservation programs will be most appropriate and effective in Georgia.

For example, we have conducted economic research on the use of conservation

pricing for residential water customers. Our findings demonstrate that this water conservation technique is likely to be most effective in urban areas, where the price elasticity for water is higher than in rural areas. Another study demonstrates that a one-size-fits-all approach is not the most appropriate approach to designing local conservation programs. Variation in water availability and other local conditions requires strategies designed with local conditions in mind.

Another study examines the state's minimum threshold for the requirement of water withdrawal permits. It concludes that Georgia's 100,000 gallons per day threshold may no longer serve the state's best interests. Other states require permits for withdrawals at levels as low as 10,000 gallons per day, and a lower threshold may assist Georgia in our efforts to improve water management.



# Major Projects (cont)



*Agricultural water meters are being installed throughout the state of Georgia through the Agricultural Water Use Measurement Program. The Center has been instrumental in initiating and implementing this program, which will generate an unprecedented database of agricultural water use throughout the state.*

With regard to water storage, we have an on-going project exploring the legal and scientific issues related to the application of aquifer storage and recovery in Georgia. This technique is used widely in Florida to provide water storage, but it is not currently used in Georgia.

## **Agricultural Water Use and Conservation**

Agricultural operations are a major user of water in Georgia, but to date, very little data on agricultural water use in Georgia has been available. The Center was instrumental in providing information to law-makers in 2003 to support the development and passage of House Bill 579, which created the Agricultural Water Use Measurement Program in Georgia. This program requires the metering of agricultural water withdrawals across the state. Since 2003, a significant portion of our research and technical assistance efforts have supported the Georgia Soil and Water Conservation Commission in implementing this legislation.

We have provided data management and analysis for the agricultural metering program and conducted aerial imagery collection

and mapping of irrigated lands to support the implementation of metering in basins scheduled for meter installation. The collection of this data vastly improves Georgia's ability to estimate and understand water use by agriculture in this state.

## **Water Quality Trading**

Water quality trading is a market-based policy tool that could provide increased flexibility and cost-effectiveness to the regulation of water quality. It is believed that the use of water quality trading could accelerate the clean up of streams while also decreasing the cost. It is being actively promoted by the U.S. Environmental Protection Agency, as well as other federal agencies, as a tool for improving the efficiency of water quality protection. Because water quality trading is not currently used in Georgia, we initiated research to determine the feasibility of applying this strategy in the waters of our state.

Our research on this topic reviews existing state and federal laws for potential hurdles to the use of water quality trading. It analyzes state waters and rates them for the feasibility of water quality trading implementation.

# Major Projects (cont)

We have developed estimates of the costs of wastewater treatment to support the evaluation of the demand for water quality trading credits. We have also developed water quality models to support the evaluation of water quality trading scenarios. In the field, we have conducted monitoring in an agricultural watershed dominated by poultry operations to evaluate the potential water quality credits generated from practice changes on animal operations. Our research identifies the removal, transfer, and processing of poultry manure as practices that could be supported by water quality credits in North Georgia watersheds.

Our wastewater treatment cost research provides an explanation of the lack of trading activity in existing water quality trading initiatives elsewhere and sheds new light on when water quality trading can work. It has helped us to develop criteria to guide decisions about where water quality trading will be most likely to be effective in Georgia and beyond.

## Economics and Water Policy

Our Center is unique in Georgia for its expertise in and emphasis on the use of natural resource and environmental economics in research on water issues. Economists from all three member universities, and from other universities as well, have contributed to the water resource research of the Center. These economists have played a central role in the research areas described above. Additionally, these economists have enabled us to consider a variety of other important water issues and to provide economically-based research to support our understanding of these issues in Georgia.

For example, economists from Georgia Southern University have examined methods for forecasting demographic and land use trends to evaluate the best source of data on future conditions to support water resources planning. They

have also evaluated the current status and feasibility of the use of desalination for water supply. Economists from Georgia State University have completed research on encouraging voluntary development of environmental management systems, the need for randomized water policy experiments, and experimental approaches to understanding natural resource management conflicts. The application of economic tools to water resource issues provides for the development of innovative policies to protect and enhance Georgia's water future.

## Outreach

Our research efforts generate useful knowledge about water resources, but that information would be meaningless if it were not shared with those who can use the information - the people of Georgia who will make decisions about our state's water resources, now and in the future. We transfer the knowledge gained in our research through education and outreach programs targeted to the following audiences: (1) water policy leaders in Georgia, (2) water policy stakeholders in Georgia, including agricultural



# Major Projects (cont)

operations and organizations, municipal and industrial water suppliers and users, and environmental organizations, (3) university students, with an emphasis on under-represented minority groups, and (4) school children. Our research and education efforts emphasize agricultural water issues, both in terms of the topics covered and the audiences addressed.

Outreach to water policy leaders and stakeholders is delivered as technical assistance, in stakeholder meetings, and through our publications and website. In 2005, we held meetings with and gave presentations to over 1400 permit holders, a large proportion of whom were involved with irrigated agriculture, and other stakeholders concerned about water issues in Georgia. We discussed water policy issues and our research with policy-makers from local, state, and federal governments in over 65 meetings. During 2005, we made 54 presentations to educate stakeholders, farmers, agency personnel, and other public officials about water policy issues and our related research.

Through our Listening Project in the coastal region, we held a series of 11 stakeholder meetings to discuss and hear opinions on water policy issues in the coastal region where water quantity and quality have become primary concerns for the region's future development. We used stakeholder input from the Listening Project to design highly responsive follow-up research, which continues to serve the region's stakeholders.

## *Our Ears Are Open!*

Starting Fall 2004, the Coastal Rivers Center at Georgia Southern University held a series of listening sessions with stakeholders in the coastal region, where increasing demands for water have created a high level of concern about water supply, water quality, and saltwater intrusion in the aquifer. The listening sessions elicited comments on water management in the region and stimulated discussion about what is working and what needs improvement in providing a healthy water future in the region. The six stakeholder groups that were invited to participate in the sessions were: agriculture, developers, industry, environmental groups, local governments, and fishermen. The Center is using what we learned to direct future research in the coastal region of the state.

## ***A Sample of Presentations Given by the Georgia Water Planning and Policy Center: 2003-2005***

*An Evaluation of Water Quality Trading for Georgia Watersheds by Kristin Rowles for the Georgia Water Resources Conference in April 2005*

*Trading for Water Quality by Kristin Rowles for the Georgia Association of Conservation District Supervisors Annual Meeting in January 2005*

*Georgia Groundwater Resources 2005: Status and Challenges by Doug Wilson for the national meeting of the Groundwater Management District Association in January 2005*

*Agricultural Water Issues in Georgia: Research and Responsibilities by Mark Masters for the Georgia Farm Bureau Convention in December 2004*

*Estimated Peanut Returns from Long-Range Climate Forecasts by Mark Masters for the Sunbelt Agricultural Exposition in October 2004*

*Economic Impact of Limited Irrigation Techniques in Southwest Georgia by Mark Masters for the Alabama Water Resources Conference in September 2004*

*Briefing on Georgia Water Issues by Doug Wilson and Nick Ogden for Senator Tommie Williams in September 2004*

*Briefing on Water Quality Trading by Kristin Rowles for Region IV Environmental Protection Agency officials in June 2004*

*Update on Georgia Water Issues by Doug Wilson for members of the Georgia General Assembly in June 2003*

*The Use Of Auctions For Reducing Agricultural Water use During Periods Of Drought by Ron Cummings for the USDA Economic Research Service in June 2003*

*Feasibility of Irrigated Wheat-Cotton Interseeding by Mark Masters for the Beltwide Cotton Conference in January 2003*

# Major Projects (cont)

Our publications include a series of working papers which are listed in this report. During the past three years, we issued over 50 working papers that address important water issues in Georgia. These publications are designed to provide a general audience with in-depth knowledge of the findings of our water resource research. Additionally, our researchers have published, or currently have in review, fourteen articles in peer-reviewed academic journals and three academic book chapters, which are related to the water policy research of the Center.

The Center's periodical, *Water Talk*, has an audience of about 350 local government officials who are interested in water policy issues. *Water Talk* provides these readers with up-to-date scientific and policy information in an easy-to-read format that addresses a current water issue in the state. Additionally, we contribute numerous articles each year to the publication *Water Stewards*, which has a circulation of over 6,000 water managers in Georgia. This publication provides articles that explain and provide a variety of perspectives on current water policy issues in Georgia.

In addition to our publications, our website ([www.h2opolicycenter.org](http://www.h2opolicycenter.org)) is an extensive Internet resource that provides instant access to hundreds of articles, documents, and other resources concerning water policy issues in Georgia.

## Education

For university students, the Center maintains an Academic Program of Excellence that develops water resource professionals and scholars while providing study opportunities for minorities and groups underrepresented in the field of water resources. The Program offers graduate degrees and certificates for Masters of Public Administration students in Natural Resources Management at Georgia State University, a Concentration in Water Resources Management for Masters of Public Administration at Albany State University, and a continuing education program for Masters of Business Administration students at Georgia Southern University. Faculty associated with the Center also teach other courses related to water resource issues outside of these degree programs.

The Center's education programs concentrate on providing real world opportunities for the application of water resources research and planning through internships and research assistantships. The Center's students represent diverse racial and economic backgrounds. Our education programs at Albany State University, a historically black university, provide an opportunity to attract minority students to graduate study in the field of water resources, in which minorities have been consistently under-represented. Through our education programs, we are developing the next



*Ron Cummings, Professor Emeritus, Georgia State University, has directed the Center's research effort since its inception.*

# Major Projects (cont)

generation of water policy leaders and management specialists who will embark on careers that serve that state's future needs in this area.

Finally, the Center seeks to provide water resources education to school children each year through an annual Water Festival. Held in Dawson, Georgia, the event attracts hundreds of fourth and fifth grade students from Southwest Georgia to enjoy a day of fun and learning. The festival includes hands-on learning experiences and presentations on topics such as the uses of water and water conservation practices. The event emphasizes awareness of the need for groundwater conservation in Southwest Georgia. Over 750 students attended the event in 2004.



*Graduate students of the Flint River Water Planning and Policy Center on a trip to the field*



*Over 750 fifth graders attended this years annual Water Festival which raised water awareness and the value of our most precious natural resource.*

# Financial Summary

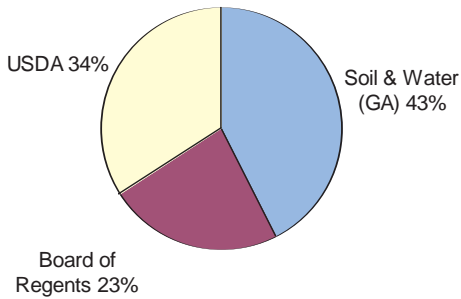


GWPPC receives funding from both State and Federal sources. Below is a representation of the contribution of the funding sources by fiscal year along with how the funds were expended.

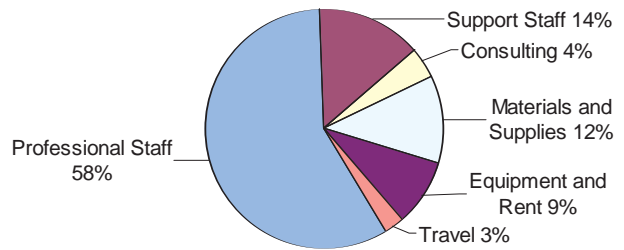
## Sources of Funds

## Uses of Funds

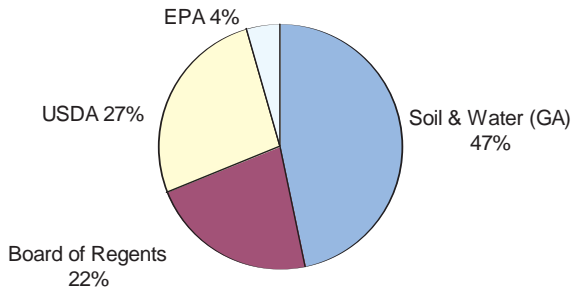
**Fiscal Year 2005**  
Total: \$2,430,000



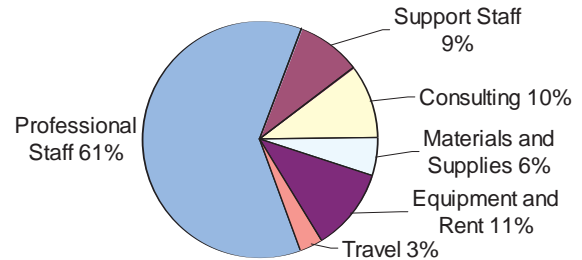
**Fiscal Year 2005**



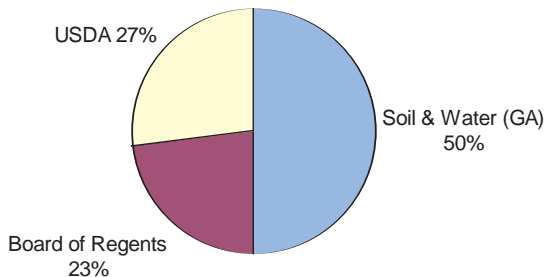
**Fiscal Year 2004**  
Total: \$2,442,000



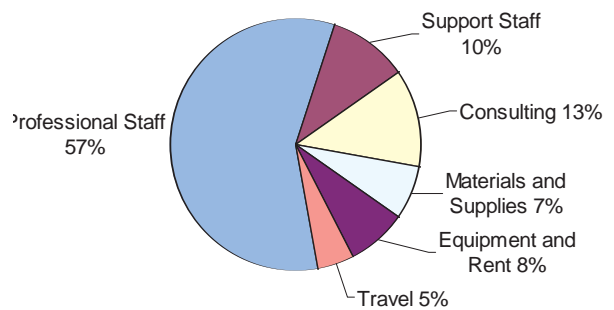
**Fiscal Year 2004**



**Fiscal Year 2003**  
Total: \$2,502,000



**Fiscal Year 2003**



# List of Publications

## 2003-2005

### Working Papers

Paper #2003-001

Attitudes of Georgia Irrigators Regarding the Use of Water Meters, Mark Morrison, Nancy Norton and David Eigenberg, January 2003, (21 pp.)

Paper #2003-002

Developing Offset Banking Systems in Georgia, Ronald G. Cummings, Laura O. Taylor and M. Bruce Beck, March 2003, (26 pp.)

Paper #2003-003

Basin Water Plans for Georgia's Coastal Region: The "Empty Shelf" of Data Critical for the Planning Process, Donna Fisher and Ben Thompson, July 2003, (20 pp.)

Paper #2003-004

Economic and Population Forecasts for Basin Water Planning in Georgia's Coastal Region: Methodological Issues, Professor Phyllis Isley, January 2003, (32 pp.)

Paper #2003-005

Coastal River Basins Water Resource Assessment: An Evaluation of Water Use and Availability in Seven Coastal River Basins, Donna K. Fisher, PhD., Paulo Röwer, C. Elliot Marsh, Justin Daniels, Uli Ebensperger and Shantell Roberson, March 2003, (62 pp.)

Paper #2003-006

Water Markets in Georgia: An Overview of Ongoing Sales of Water, Phyllis Isley and Robert J. Middleton, Jr., March 2003, (16 pp.)

Paper #2003-007

Riparian Vegetation Changes in Relation to Farming Activities in Ogeechee River Basin, 1970s - Present, Dr. Zhi-Yong Yin and Ray Nafziger, May 2003, (17 pp.)

Paper #2003-008

Reconstruction of Flint River Streamflow using Dendrochronology, Troy Knight, June 2003, (22 pp.)

Paper #2003-009

Industrial Water Use/Discharge Statistics, Ronald G. Cummings and Staff, May 2003, (24 pp.)

Paper #2003-010

Economic Activity Report: Recreational Saltwater Fishing in Southeast Georgia, Paulo Röwer, Donna K. Fisher and Anthony Barilla, October 2003, (17 pp.)

Paper #2003-011

Are Cheap Imports Good for the Environment? Globalization in the Coastal Fishery, Ujjayant Chakravorty and Donna K. Fisher, December 2003, (20 pp.)

Paper #2004-001

Characteristics of Water-use Control Policies: A Survey of 28 Eastern States, Ronald G. Cummings and Whitney Rusert, February 2004, (15 pp.)

Paper #2004-002

Policies for Identifying and Reacting to Regional Areas of Water Scarcity: Case Studies in Selected Eastern States, Ronald G. Cummings and Jennifer Adams, February 2004, (11 pp.)

Paper #2004-003

Minimum Water Use Levels Requiring State Permits: Is Georgia's 100,000 Gallons/Day Appropriate? Ronald G. Cummings, Jennifer Adams and Hyun-Jung Park, February 2004, (12 pp.)

Paper #2004-004

The Sale and Leasing of Water Rights In Western States: An Update To Mid-2003, Ronald G. Cummings, Jennifer Adams and Dottie Crews, May 2004, (38 pp.)

# List of Publications (cont)

Paper #2004-005

Reconstruction of Flint River Streamflow Using Tree-Rings, Troy Knight, March 2004, (88 pp.)

Paper #2004-006

Riparian Vegetation Changes in Relation to Farming Activities in Ogeechee River Basin, 1970s - Present: Warren and Taliaferro Counties: An Extension, Ray Nafziger, May 2004, (17 pp.)

Paper #2004-007

Spatial Interaction of Domestic Fishing Fleet and Import Competition, Ujjayant Chakravorty, Donna K. Fisher and Paulo Röwer, May 2004, (36 pp.)

Paper #2004-008

Unaccounted-for Water in Georgia's Urban Areas: An Exploration of Policy Issues, Ronald G. Cummings, Nancy Norton, Virgil Norton and Douglas Wilson, December 2004, (23 pp.).

Paper #2004-009

Measuring Irrigated Acreage in Georgia: Methodological Issues, Ronald Cummings and Kevin Ackaramongkolrotn, September 2004, (18 pp.).

Paper #2004-010

Estimation of Costs of Phosphorus Removal in Wastewater Treatment Facilities: Construction De Novo, F. Jiang, M.B. Beck, R.G. Cummings, K. Rowles and D. Russell, June 2004, (29 pp.)

Paper #2004-011

Conservation Pricing of Household Water Use in Georgia Communities: A Preliminary Exploration, Ronald G. Cummings, Nancy Norton, Virgil Norton and Douglas Wilson, July 2004, (23 pp.).

Paper #2004-012

Flint River Natural Flow of the Stella ACF Model, Peter Terrebonne and Ronald G. Cummings, December 2004, (25 pp.) .

Paper #2004-013

The Value of Irrigation Permits to Agricultural Landowners: A Hedonic Analysis, Ragan Petrie and Laura Taylor, December 2004, (32 pp.).

Paper #2004-014

Crops, Water Usage, and Auction Experience in the 2002 Irrigation Reduction Auction, Susan Laury, Stephanie Hill and Ragan Petrie, December 2004, (44 pp.).

Paper #2004-015

Nutrient Trading in the Chattahoochee Watershed: A Feasibility Analysis, Kristin Rowles and Ronald G. Cummings, June 2004, (66 pp.).

Paper #2004-017

Assigning Priority to Ecosystem Restoration Investments in Georgia's Chickasawhatchee Swamp, Paul Ferraro, June 2004, (26 pp.).

Paper #2005-001

Listening Project, Sam Collier, Ben Thompson, Dotti Crews, Jean McRae, Nick Ogden & Mike Vaquer, January 2005, (56 pp.).

Paper #2005-002

Residential Water Demand Management Programs: A Selected Review of the Literature, R. Peter Terrebonne, January 2005, (48 pp.).

Paper #2005-003

An Evaluation of Water Quality Trading for Georgia Watersheds, Kristin Rowles, January 2005 (7 pp.).

Paper #2005-004

Enhancing Water Supplies in the Flint River Basin: A Preliminary Exploration of the ASR Alternative, Ronald G. Cummings and Douglas Wilson, January 2005, (16 pp.).

Paper #2005-005

Designing Water Conservation Policies that Match Sense with Cents: A Case Study Approach, Ronald G. Cummings and Douglas Wilson, January 2005, (20 pp.)

Paper #2005-006

# List of Publications (cont)

Georgia's Agricultural Water Use Metering Program: Using Results to Benefit Farmers and the State, Ronald Cummings, Mary Beth Walker, Krawee Ackaramongkolroth, Elliott Marsh, Douglas Wilson and Marty McKimney, January 2005, (45 pp.)

Paper #2005-007

Conservation Pricing of Household Water Use in Public Water Systems in Georgia's Coastal Communities: A Preliminary Exploration, Ronald Cummings, Jeremy Hill, Ben Thompson and Douglas Wilson, January 2005, (14 pp.)

Paper #2005-008

Review of the Current State Desalination, Ulrich Ebersperger and Phyllis Isley, January 2005 (32 pp.)

Paper #2005-009

Accounting for Georgia's Public Water Supply, Ulrich Ebersperger and Phyllis Isley, January 2005 (45 pp.)

Paper #2005-010

Water Management with Downstream Externalities; The Case of the Ogeechee River Basin, Ujjayant Chakravorty and Donna K. Fisher, January 2005, (29 pp.)

Paper #2005-011

Estimation of Costs of Phosphorus Removal in Wastewater Treatment Facilities: Adaptation of Existing Facilities, F. Jiang, M.B. Beck, R.G. Cummings, K. Rowles, and D. Russell, May 2005 (45 pp.)

Paper #2005-012

Decentralized Sewer Unit Packages as an Alternative for Bulloch County to Manage Fast Growth, Russell K. Williams, Jr., Donna K. Fisher, Ph.D., and Cheryl Tatum, May 2005, (20 pp.)

Paper #2005-013

Conservation Pricing: Phase II Report, Ronald Cummings, Mary Beth Walker, and Douglas Wilson with Peter Terrebonne and Nick Ogden, June 2005, (20 pp.)

Paper #2005-014

Investor Reactions to Information Disclosure: Can Providing Public Information About Firms' Pollution Improve Environmental Performance?, Paul J. Ferraro and Toshihiro Uchida, June 2005 (8 pp.)

Paper #2005-015

Can Encouraging Voluntary Development of Environmental Management Systems Augment Existing Regulations?, Toshihiro Uchida and Paul J. Ferraro, June 2005, (30 pp.)

Paper #2005-016

Experimental Approaches to Understanding Conflict Over Natural Resources, Paul J. Ferraro and Ronald G. Cummings, June 2005, (27 pp.)

Paper #2005-017

Can Public Goods Experiments Inform Environmental Policies?, Paul J. Ferraro and Christian A. Vossler, June 2005 (32 pp.)

Paper #2005-018

Irrigated Acreage in Georgia's Altamaha River Basin During the Drought Year 2000, Krawee Ackaramongkolroth, Peter Terrebonne, and Ronald Cummings with the assistance of graduate research assistants Ki-whan Choi, Kovadio Dongo, Panupong Panudulkitti, and Abdul-Akeem Sadiq, June 2005 (17 pp.)

Paper #2005-019

User-friendly Software That Allows Farmers To Use Agricultural Metering Data For Management Purposes, Elliott Marsh and Chad Ingersoll, June 2005 (9 pp.)

Paper #2005-020

A Feasibility Analysis of Applying Water Quality Trading in Georgia Watersheds, Kristin Rowles, June 2005 (28 pp.)

Paper #2005-021

Water Quality Trading: Legal Analysis for Georgia Watersheds, Kristin Rowles and Ben Thompson, June 2005 (27 pp.)

Paper #2005-022

Are We Getting What We Paid For? The Need for Randomized Environmental Policy Experiments in Georgia, Paul J. Ferraro, June 2005 (7 pp.)

# List of Publications (cont)

Paper #2005-023

Watershed Pollutant Trading: Estimating Costs of Phosphorus Removal in Wastewater Treatment Facilities, F. Jiang, M. B. Beck, R. G. Cummings, and K. Rowles, December 2005 (29 pp.)

## Journal Articles

Azzaino, Z., J. Conrad and P.J. Ferraro. 2002. Optimizing the Riparian Buffer: Harold Brook in the Skaneateles Lake Watershed, New York. *Land Economics* 78(4): 501-514.

Ferraro, P.J. 2003. Assigning Priority to Environmental Policy Interventions in a Heterogeneous World. *Journal of Policy Analysis and Management* 22(1): 27-43.

Ferraro, P.J. 2003. Conservation Contracting in Heterogeneous Landscapes: an application to watershed protection with threshold constraints. *Agricultural and Resource Economics Review* 32(1): 53-64.

Cummings, R., C. Holt, and S. Laury. 2004. The Georgia Irrigation Reduction Auction: Experiments and Implementation. *J. Policy Analysis and Management*, Vol. 23, No. 2, Spring, 2004.

Ferraro, P.J. 2004. Targeting Conservation Investments in Heterogeneous Landscapes: A distance function approach and application to watershed management. *American Journal of Agricultural Economics* 86(4): 905-918.

Chakravorty, U. and D. Fisher. 2006. Water Management with Downstream Externalities; The Case of the Ogeechee River Basin. *ICFAI Journal of Environmental Economics*, February 2006.

Röwer, P., D. Fisher, and A. Barilla. 2006. Economic Activity Report: Recreational Saltwater Fishing in Southeast Georgia. *Journal of Business and Economic Perspectives*, Vol. XXXI, No. 2.

Cummings, R. and M. B. Walker. Conservation Pricing Of Household Water Use in Rural Communities. *Natural Resources Journal*. In review.

Ferraro, P.J. and T. Uchida. Voluntary Approaches to Pollution Control: Evaluating Japan's New Pollutant Release and Transfer Register. *Environmental Economics and Policy*. In review.

Ferraro, P.J. and R. Cummings. Cultural Diversity, Discrimination and Economic Outcomes: an experimental analysis. *Economic Inquiry*. In review.

Ferraro, P.J. and C. Vossler. The Dynamics of Other-regarding Preferences and Decision Error: what's really going on in Voluntary Contributions Mechanism experiments? *Journal of Public Economics*. In review.

Jiang, F., M.B. Beck, R.G. Cummings, and K. Rowles. Watershed Pollutant Trading: Estimating Costs of Phosphorus Removal in Wastewater Treatment Facilities. *Water Environment Research*. In review.

Taylor, L. and R. Petrie. Estimating the Value of Water Use Permits: A Hedonic Approach Applied to Farmland in the Southeastern U.S. *Land Economics*. In review.

Uchida, T. and P.J. Ferraro. The Adoption of Environmental Management Systems and their Effect on the Environment: evidence from manufacturers. *Journal of Regulatory Economics*. In review.

# List of Publications (cont)

## Book Chapters

Ferraro, P.J. Forthcoming. Integrating Biophysical and Economic Information to Guide Land Conservation Investments. In *Economic Advances in Land Use Policy: Implications of Emerging Research for Conservation of Farm, Forest, and Rural Character*, edited by Robert Johnson and Stephen Swallow. Resources for the Future Press, Washington, D.C.

Ferraro, P.J. and R.G. Cummings. Forthcoming. Elucidating conflict over natural resources: an experimental approach. In *Using Experimental Methods in Environmental and Resource Economics*, edited by J. List. Edward Elgar Publishing.

Cotton, S., P.J. Ferraro and C.A. Vossler. Forthcoming. Can Public Goods Experiments Inform Policy? Reducing Confusion among Experimental Subjects. In *Experimental Methods, Environmental Economics*, edited by T. Cherry, S. Kroll and J. Shogren. Routledge Press.

# Looking to the Future

The Georgia Water Planning and Policy Center takes great pride in the work that we have done to support the wise management of our state's water resources. As we look to the future, we plan to continue to play a leading role in providing the information needed to support sound water resource management policy in our state. We will continue to answer the questions that need to be answered to ensure that Georgia's water policies are effective. Our mission to provide for improved water resource management in the state emphasizes the agricultural sector. Agriculture is a primary water user in this state, and farmers are key participants in the stewardship of our water resources. We will continue to emphasize the agricultural sector in our research and outreach efforts with the goal of identifying and developing a program of agricultural water management practices that is the most effective and appropriate for Georgia farm operations.

At this time, our research is focused on agricultural water use estimation, water conservation, water storage, and water quality protection. We are currently developing an Internet-based portal for agricultural operations to provide data to researchers and state and federal agencies on water uses. We envision the portal developing into an interactive resource for the exchange of information on a range of natural resources and farm practices. It will provide for a database of information on the agricultural sector currently unparalleled in Georgia.

At this time, Georgia is beginning the process of developing a statewide water plan to guide water resource policy for years to come in Georgia and to ensure that our water resources will continue to provide for our basic needs, our development, and our quality of life. At the same time, water use permitting plans are being finalized for the Flint River Basin and the coastal region. Our research relates directly to the questions being raised in these planning processes, and we are actively submitting information to assist in the development of these plans. Working together with other state agencies and researchers, we can provide a foundation for sound water policy in this state.

Given the increasing importance of water issues in Georgia and the Southeast, we expect there also to be increasing tension over the allocation of such resources. Legal actions, including lawsuits from neighboring states, over water allocation and the protection of water quality, are likely to continue and become even more heated over the next several years. We intend to support Georgians who are affected by these disputes and seek effective solutions.

In summary, we plan to continue to tackle issues that are central to on-going debates over water resources and to seek innovative and effective answers to the difficult and important questions that our state faces in this arena. Our work on issues such as water quality trading, desalination, and conservation pricing for water systems is forward-thinking, and it provides research and information that would not otherwise be available to Georgia policy makers and stakeholders. The Center will continue to provide practical and useful information to water managers in Georgia and beyond the borders of our state to support sound water resources policy and a healthy water future.