

4th Annual Hydrogeology Consortium Workshop

May 11-13, 2005 Tallahassee, Florida



*Solving Water Pollution Problems in the
Wakulla Springshed of North Florida*



*Science and Technology at work for
a Better Florida*

Florida Geological Survey - Special Publication 58 - 2006

FGS Introduction and Disclaimer

In 2005 the Florida Geological Survey (FGS) co-sponsored ([see list of sponsors](#)) this workshop in an effort to bring together the various parties knowledgeable and involved in activities that potentially impact the water quality in Wakulla Spring. The main objective of the workshop was to facilitate open and scientifically-based discussion of these activities and the available data to better understand the hydrogeology of the system and its reaction to various land use activities. A common objective of the co-sponsors was to reverse the observed and documented deterioration of the spring's water quality. To further bolster the objectivity of the workshop and the legitimacy of its findings; the co-sponsors invited a group of reputable scientists to act as an independent peer review committee and to write a report reflecting their impressions of the information presented. This compilation of presentations, data, figures, panel findings and recommendations, along with the Peer Reviewers Report, reflects the professional opinions of authors, presenters and participants and does not constitute endorsement by the FGS or the Florida Department of Environmental Protection. The workshop proceedings are being published as an FGS Special Publication to facilitate scientific discussion of the issues involved and to educate the public at large in the hope of conserving this priceless natural resource for future generations.



Workshop Introduction

Problem Statement

Wakulla Spring is the third largest spring in Florida and one of the best known. The spring is the centerpiece of Wakulla Springs State Park, considered the crown jewel of the Florida parks. It discharges an average of 250 million gallons of water per day from the Floridan aquifer to form the Wakulla River. It has the largest range of discharge of any spring in Florida, ~80 million gallons per day at low stage and > 1 billion gallons per day at high stage. The sheer size of the spring basin is uniquely impressive being several hundred feet across and more than 100 feet deep. The spring pool contains the entrance to one of the longest and deepest underwater caves in the world having more than 10 miles of mapped passages that extend both north and south from the spring.



Glass-bottom boat over Wakulla Spring

The park features glass bottom boat tours that enthrall visitors when the water is clear with views of the spring and cave entrance. Wakulla Spring is also a national cultural treasure being the site of Indian artifacts, and the setting for classic movies such as the original Tarzan series and the Creature from the Black Lagoon.

Unfortunately, water quality in Wakulla Spring has been in decline for more than a decade due to rising nitrate levels, algae blooms and a growth explosion of Hydrilla that chokes the spring and causes the loss of native species, including the apple snail and limpkin. The decline in water clarity has kept the glass bottom boats at the docks and tourists and cave explorers waiting for clear water that seldom comes. Park attendance has dropped in recent years by approximately 20,000 visitors per year.

Purpose

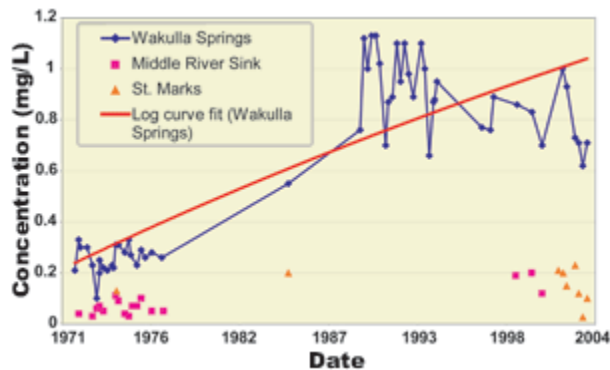
The purpose of this workshop was to present an overview of the broad and growing scientific evidence linking water quality decline at Wakulla Spring with land use practices in the region. The workshop convened scientific and engineering experts to present the current understanding of groundwater and surface water flow patterns through the Woodville Karst Plain, the sources of pollution to Wakulla Springs, and explore the applicability and effectiveness of advanced technologies as solutions to the problem of degrading spring water quality and clarity. The primary goal of this workshop was to disseminate this knowledge to local decision makers and encourage cooperative proactive governmental investment in water resource protection programs in the Woodville Karst Plain basin.

General Workshop Format

The workshop convened as a plenary session on Thursday morning, May 12. Scientists currently engaged in research projects within the Woodville Karst Plain gave presentations on groundwater and surface water flow patterns and sources of pollution in the Woodville Karst Plain. Afterward, the group broke out into three discussion sessions focused on the science and technologies specific to abating three important sources of nutrient loading in the basin: stormwater, septic systems, and wastewater treatment facilities. The discussion sessions each contained four or five panelists who gave short presentations on the problems from their perspective and a moderator who guided subsequent discussions. The goal for each session was to build a consensus of opinion and recommendations for the best course of action to solve the problems. On Friday morning, May 13, the plenary session reconvened and the moderators presented the conclusions and recommendations derived in each session. The workshop then concluded with lunch and a summary by the emcee. Members of the Woodville Karst Plain Project presented a video luncheon presentation, Exploring Wakulla Cave, on Thursday, May 12. A half-day field trip was offered on Wednesday, May 11, to provide an overview of the hydrogeologic setting and sources of pollutions.

Useful Links

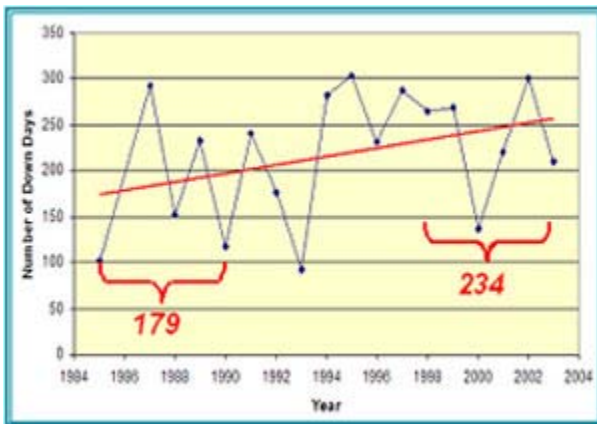
- [1000 Friends of Florida](#)
- [City of Tallahassee Public Works](#)
- [Department of Health](#)
- [FGS/FSU Woodville Karst Plain Research](#)
- [FGS - Hydrogeology Research](#)
- [Florida Department of Community Affairs - Springs Protection](#)
- [Florida Springs](#)
- [Hydrogeology Consortium](#)
- [Leon County Capital Area Flood Warning Network](#)
- [Northwest Florida Water Management District](#)
- [Wakulla County, Florida](#)
- [Wakulla Springs State Park](#)



Nitrate levels measured in the Wakulla Spring basin between 1971 and 2004



Algae and hydrilla covering the Wakulla Spring basin near the platform



Measured reduction of water clarity in the Wakulla Spring basin based on the number of days the glass bottom boats cannot run

Scientific Overview

A plenary session was held on May 12, 2005. The session began with opening remarks from the Emcee and the five political and regulatory leaders from the region.

Jim Stevenson (<i>Emcee</i>)	FDEP Retired	bio
Mike Sole	FDEP Chief of Staff	bio
Valerie Hubbard	FDCA, Community Planning Division Director	bio
Debbie Lightsey	Tallahassee City Commissioner	bio
Cliff Thaell	Leon County Commissioner	bio
Ed Brimmer	Wakulla County Commissioner	bio

Six speakers from the scientific community then presented talks on the record of water quality declines at Wakulla Spring and the unique hydrogeologic features in the Woodville Karst Plain that control water, and thus contaminant flow to the spring. Particular focus was directed to scientific work that has established connections between land use practices in the Woodville Karst Plain and water quality in the springs. Following the plenary session, a luncheon presentation was given on exploring Wakulla cave.

A list of the presenters is provided below along with links to web versions of their presentations.

Joe Hand	FDEP Water Resources Division	presentation	bio
Tom Pratt	Northwest Florida Water Management District	presentation	bio
Todd Kincaid	Hydrogeology Consortium, Hazlett-Kincaid Inc., Global Underwater Explorers	presentation	bio
Sean McGlynn	McGlynn Laboratories	presentation	bio
Hal Davis	U.S. Geological Survey	presentation	bio
Timothy Hazlett	Hydrogeology Consortium, Hazlett-Kincaid Inc.	presentation	bio

The luncheon presentation was given by Todd Kincaid representing the Global Underwater Explorers-Woodville Karst Plain Project.

Panel Discussions

Following the [scientific overview](#) presented in the Plenary Session the group broke out into three discussion sessions focused on the science and technologies specific to abating three important sources of nutrient loading in the basin: stormwater, septic systems, and wastewater treatment facilities. The discussion sessions each contain a small group of invited expert panelists who short presentations on the problems from their perspective and a moderator who guided subsequent discussions. The goal for each session was to build a consensus of opinion and a set of specific recommendations for the best course of action necessary to solve the problems.

Discussion Session 1: Stormwater Runoff

The Stormwater panel addressed water quality impacts on the Wakulla springshed stemming from stormwater discharge into the basin; correlation of discharge with precipitation; relationship between land use and the quantity and quality of runoff and use of Florida's stormwater program and BMP's to address these impacts; nutrient loading; local efforts to reduce stormwater pollution; and, the role of phosphorus vs. nitrate concentrations as triggers to eutrophication and Hydrilla and algal growth. The panel evaluated current stormwater runoff management practices and discussed field-tested and new and innovative practices that offer more environmentally sound and/or cost effective alternatives to stormwater management in karst. Panelists included:

Jon Arthur (Moderator)	Florida Geological Survey	Recommendations	bio
Eric Livingston	FDEP, Watershed Management Program	presentation1	pdf bio
Martin Wanielista	University of Central Florida, Florida Stormwater Academy	pdf	bio
John Buss	City of Tallahassee, Stormwater Management	presentation	pdf bio

Theresa Heiker	Leon County, Stormwater Management	presentation	pdf	bio
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Discussion Session 2: Septic Systems

The Septic System panel addressed the effectiveness of septic systems as wastewater treatment methods; the prevalence and density of these systems in the Wakulla springshed; suitability of local soils as drain fields; mounding as an alternative for drain field operation; multi-family and commercial facilities vs. single dwelling systems; aerobic vs. anaerobic systems; and the ideal or recommended protocols for system monitoring and maintenance. The panel also discussed the latest innovations in the manufacture and installation of septic systems and compared these systems with local or regional sewage treatment plants from the environmental, public health and economical perspectives. The panel reviewed and evaluated current practices of domestic wastewater management in the springshed and discussed best management practices that may reduce current detrimental impacts on the watershed. Panelists included:

Rodney DeHan (Moderator)	Florida Geological Survey	<i>Recommendations</i>	bio
Paul Booher	Florida Department of Health	presentation	pdf bio
Eberhard Roeder	Florida Department of Health	presentation	pdf bio
Alex Mahon	Leon County Health Department		bio
Brian Crawford	Wakulla County Health Department	notes	bio
Mark D. Repasky	Sustainable Design		pdf-1 pdf-2 bio

Discussion Session 3:

The Wastewater panel evaluated the effectiveness of existing wastewater treatment facilities in maintaining the ecological health and integrity of the Wakulla springshed and discussed alternative practices that might be considered by decision makers, within the local and State entities responsible for managing this community's wastewater and protecting its natural resources. Specific topics included: the level of treatment needed before spray irrigation, i.e. secondary, tertiary or advanced wastewater treatment (AWT); ideal crops and application rates for nutrient uptake; seasonal variations and the role of karst formations in the successful operation of spray fields or other land application methods for treating domestic wastewater. Panelists included:

Dick Fancher (Moderator)	FDEP, Northwest District	<i>Recommendations</i>	bio
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Kart Vaith	CDM, Inc, Jacksonville, Florida	presentation	pdf	bio
Mark Sees	City of Orlando Utilities	presentation	pdf	bio
Richard Drew	FDEP Wastewater Facilities		pdf	bio
Ellie Whitney	Friends of Wakulla Spring		pdf	bio
Lynne Putnam	City of Tallahassee	presentation	pdf	bio

Stormwater Discussion Session - Recommendations

Findings Recommendations from the Stormwater Panel

General comments:

- Define the issue: is it water quality at springs or aquatic plant growth
- As moving forward, be sensitive to the various perspective regarding stormwater management: urban vs. national forest vs. county
- Increase ad valorem tax for NFWFMD
- Emphasize that loadings need to be delineated as accurately as possible, and have a good hydrogeological model
- TMDLs underway (assimilation capacity of water bodies to minimize water qual. and quant. impacts
- First address stormwater entering most vulnerable areas
- Continue working with DOT re: stormwater and hydrogeological issues

Priority issues identified by breakout session participants

1. Relative loadings: septic vs. storm water vs. agriculture/spray field, etc... (group acknowledges that this work is in progress, but we stress that it needs to be completed as soon as possible).
2. Land-use; modify comprehensive plan based on highly vulnerable areas.
To map highly vulnerable areas, must:
 1. Evaluate existing data
 2. Acquire LIDAR in Wakulla Co
 3. Complete stream to sink (swallet) study
 4. Complete aquifer vulnerability assessment of natural hydrogeologic system (e.g., a local FAVA-type study)
 5. Define highly vulnerable areas based on vulnerability model
3. Leon Co/TLH/Wakulla coordination
4. Interlocal agreement
5. Phased in land use regulations (long term and short term)
6. Tie in FEMA flood zone remapping into land use plan
7. Implement DCA Springs Model Code for highly vulnerable areas within all springsheds in region
8. Evaluate and implement existing programs (i.e. ERP, other states dealing with karst, Wekiva Study)

9. Have all relevant agencies at table (i.e., DOT, DCA, DEP, WMD, etc.)
10. Improve accountability and enforcement

Septic Systems Discussion Session - Recommendations

Findings and Recommendations from the Septic Systems Panel:

1. Variability in hydrogeological settings and land use patterns across the State requires that watershed-specific approaches to waste water treatment and disposal be used. No one size fits all (centralized waste treatment might be the ideal solution in certain areas such as urban communities; while enhanced septic systems may be the model of choice in sensitive rural areas).
2. The panel recognizes the need for additional studies, monitoring and research to verify the effectiveness of Best Management Practices (BMPs) implemented or policies chosen. However, the panel also emphasizes the need for taking immediate steps, based on available knowledge, that further efforts to reverse water quality-degradation in the spring systems.
3. State, regional and local governing bodies should preserve critical areas through purchase or conservation easements.
4. The panel recommends delineation of vulnerable zones of high ground water vulnerability as delineated by FAVA or a similar approach. Local governments, in collaboration with state agencies, should define zones within which wastewater treatment practices must be designed to protect and improve water quality.
5. The EPA has defined five management models for decentralized and onsite wastewater treatment systems in ascending order of responsibility and ownership. The panel recommends that nothing lower than level 4 or 5 be adopted for the Woodville Karst Plain springshed.
6. Establish management entity(s) such as a utility that will be responsible for the construction, operation and maintenance of decentralized wastewater treatment facilities (AKA onsite wastewater systems), including existing septic systems, performance-based treatment systems, clusters systems and even small package plants, if applicable.
7. The entity could be a local government agency, a cooperative or a private sector entity with proper supervision by state, local or municipal governments. The possibility of obtaining federal EPA funds, as the initial capital outlay should be investigated; but long term funding should be from a dependable tax-based source and/or from user fees.
8. Systems used by the management entity in the defined spring protection zones should be performance-based in order to ensure compliance with established standards of water quality and periodic monitoring to verify compliance. There are many treatment options available for new construction and retrofits within a defined protection zone. Within such a zone, the panel recommends the use of systems that can achieve at least 70% nitrogen reduction, 95% reduction in BOD and TSS, 98% reduction of fecal coliforms or, establish an effluent limitation.
9. The panel suggests that existing efforts to protect environmentally sensitive areas, such as the Wekiva, the Florida Keys, or others outside Florida be evaluated for applicability to the Woodville Karst Plain.
10. The panel also considered adding the concept of reduced density in lieu of or in combination with performance-based treatment systems, hence reducing loading in higher risk/vulnerability areas. Restricting density to 5 acres or more for these areas could serve to address lowering nitrate loadings as well as reflect current land use trends."

11. Education - the panel recognizes that cooperation of the communities involved is essential to implementing measures to protect sensitive water resources. The panel strongly recommends the design and implementation of a regional public education effort including specific steps such users can take that would result in better operation and maintenance of decentralized waste treatment facilities.

Septic Systems Discussion Session

Brian Crawford - Wakulla County Health Department - Notes from Presentation

- There are approximately 2646 septic tanks in the springshed. This includes the entire area between the Wakulla and St. Marks Rivers, the north central and north western portions of the county.
- They range in age from a few days old to over 50 years old.
- The newer systems meet the current standards of the Septic Tank Code, whereas the older systems probably do not.
- The majority of the growth in Wakulla County is in the Crawfordville Area. Very few homes/business are being constructed utilizing Septic Tanks in the springshed; they are being developed using central sewerage.

Wastewater Discussion Session - Recommendations

Findings and Recommendations from the Wastewater Panel

1. Sprayfield nutrients are affecting Wakulla Springs. Additional studies are underway.
2. TMDLs important and worthwhile but allocation results uncertain; schedule for implementation needs to be better defined and sped up; some things could be done now:
 - Implement feasible short term measures now;
 - Improve Nutrient reductions at treatment plants;
 - Defining volume discharge; regulate application in regards to nitrogen already in soil;
 - Eliminate land application of biosolids in watershed;
 - Complete and implement nutrient management plan to minimize nutrients entering groundwater;
 - DEP would work with city to determine what short term measures could be undertaken quickly with moderate costs;
 - Minimize discharge of treated effluent during wet weather periods
3. Consider other types/levels of wastewater treatment to reduce nutrient levels. For example:
 - Forms of advanced wastewater treatment; and,
 - Artificial wetlands
4. Increase reuse north of Cody Scarp or off of the karst plain or on the plain with reduced nutrients.
5. Nearly all treatment and disposal options involve considerable expense, a burden on some customers, therefore the City should consider the:
 - Need for a strong educational component; and,
 - Need to explore funding alternatives that recognize issue is regional.
6. Explore and implement ways to reduce volume going to the treatment plants; partner with TAPP
7. Support and complete dye-trace study from the Southeast Sprayfield (2006)

8. Set up steering committee (local governments, citizens, agencies, WMD, scientist and engineers) to work cooperatively in order to address nutrient and cost issues in a comprehensive manner and participate in the TMDL process (2005)
9. Through local regulation, require developments of a certain size to be designed to accept reclaimed water where feasible (Leon Co, City of Tallahassee, Wakulla County)
10. Encourage Water Management District to curtail Consumptive Use Permits to support viability of water re-use.

Speaker Biographies

Emcee and Invited Speakers

JIM STEVENSON - (Emcee)

Mr. Stevenson served as Chief Biologist for the Florida State Park System for 20 years during which he developed the educational and the land management programs for the state park system. He was Chairman of the Florida Springs Task Force that developed a protection strategy for Florida's springs and he was Director of the Governor's Florida Springs Protection Initiative that implemented springs protection projects. Jim retired in 2003, after 38 years with the Department of Environmental Protection. In recognition of his dedication to the protection of Florida's springs, the State of Florida named a spring on the Suwannee River "Stevenson Spring" in his honor. And for his longstanding stewardship of Florida's public lands, the Governor and Cabinet dedicated the Department of Environmental Protection's highest award the "Jim Stevenson Resource Manager of the Year Award" that is given annually to the most deserving state lands manager. Jim continues his springs protection work by serving on the Florida Springs Task Force and coordinating the Wakulla Springs Basin and the Ichetucknee Springs Basin working groups.

MIKE SOLE

Mr. Sole was appointed by Secretary Colleen M. Castille to serve as Chief of Staff for the Florida Department of Environmental Protection (FDEP) on January 3, 2005. Mike assists the Secretary in establishing priorities and policies for the Department, communicating those to senior staff, and coordinating and monitoring their implementation to ensure departmental goals and objectives are accomplished. Prior to becoming Chief of Staff, Mike was the Division Director of Waste Management, with the FDEP. In this capacity, Mike was responsible for implementing state and federal laws, regulations, and programs relating to solid and hazardous waste management, storage tank regulation and the cleanup of contaminated sites. Mike has been with the DEP since 1991 with responsibilities ranging from marine turtle protection, beach management and Environmental Resource Permitting to managing the petroleum cleanup and regulation program and Assistant Director within the Waste Management Division. Prior to coming to work for the State, Mike was a Captain in the United States Marine Corps. He received his Bachelors of Science degree in Marine Biology from the Florida Institute of Technology.

VALERIE HUBBARD, AICP

Ms. Hubbard is the Director of the Division of Community Planning at the Florida Department of Community Affairs. Ms. Hubbard was appointed Director of the Division of Community Planning with

DCA on September 19, 2003. Ms. Hubbard has 25 years of experience in planning, working in a variety of jurisdictions to help formulate and implement innovative approaches to land planning. Prior to DCA she was Interim Planning Director and Chief of Comprehensive and Environmental Planning for Tallahassee-Leon County. She is also presently President of the Florida Chapter, American Planning Association (FAPA). Ms. Hubbard received a master's degree in Urban and Regional Planning and French Language and Literature from the University of Florida.

COMMISSIONER DEBBIE LIGHTSEY

Commissioner Debbie Lightsey was first elected to the Tallahassee City Commission in March 1989, and has been re-elected for three additional terms. She served as Mayor from March 1991 to March 1992. Throughout her career, she has given special attention to the environment, affordable housing, water issues, transportation, and economic development. She is currently the lead commissioner on water resources for the community, and is co-lead on financial viability of the government and student affairs. In 2001, Commissioner Lightsey received the Florida Lake Management Society's Bob Graham award, an honor bestowed to an elected official who has shown an outstanding commitment to conserve, protect and restore Florida's surface water resources. In addition, she is a long-standing member of the Florida League of Cities' Environmental Quality Policy Committee, serving as vice-chair in 1992 and as chair of the committee in 1994. Just last year, she was a finalist for the League's 2004 Council Member of the Year Award. Commissioner Lightsey has been the City's representative to the Apalachee Regional Planning Council since 1992, and a member of the Florida Regional Council Association's Policy Board for that same time period.

COMMISSIONER CLIFF THAELL

Mr. Thaell is a Leon County Commissioner and President Elect for the Florida Association of Counties. Commissioner Thaell has been a Leon County Commissioner since 1994 and Chairman from 1998-1999. He is president of Thaell Associates, Public Relations and Marketing in Tallahassee and has been involved in a wide variety of community related activities over the years such as: former President of Council of Neighborhood Associations, President of the Millennium Project 2000, former Chair of Medically Indigent Task Force and Domestic Violence Task Force and a host of other boards and committees. Born in Springfield, Massachusetts and raised in Lake Placid New York, Cliff moved to Florida in 1967 where he has been a permanent resident ever since.

COMMISSIONER ED BRIMNER

Ed Brimner is a local boy whose family home was about three miles from Wakulla Springs. He spent many summer days swimming in McBride Slough and canoeing on the Wakulla River. From these experiences, he learned to appreciate the beauty and diversity of life in this area. After graduating from Wakulla High in 1976, he joined the Air Force and spent 2 years in Michigan where he saw first hand the water pollution caused by industrial neglect. He also spent 2 years in Japan where he was part of the most densely populated area in the world. In 1981, he left the military to attend college. After graduating from FSU in 1985, he returned to the Air Force as a military officer. As a military officer, he worked and traveled throughout the world. He retired from the military in 2000. Ed's education includes an AA degree from TCC, a BA degree from FSU, and a master's degree from the University of Arkansas. Ed was elected as a Wakulla County Commissioner in 2004.

Scientific Presenters

JOE HAND

Mr. Hand has worked for Orange County Environmental Protection; National Marine Fisheries Service; and, the Florida Department of Environmental Protection (29 years). While at DEP worked for many years improving DEP's water quality assessment capabilities including: producing the biannual report to congress on Florida's water quality status and trends (Since 1980). Other successes at DEP have included working on the statewide water quality assessment program which identifies impaired waters in need of correction through the TMDL (total maximum daily load) process and, recently exploring Wakulla Spring's aquatic health and factors causing problems. Mr. Hand attended Notre Dame - Biology degree in Ecology and Limnology University of Florida, Environmental Engineering – Master's degree in chemical and biological water quality and statistics.

THOMAS R. PRATT

Mr. Pratt is a Florida registered professional geologist. He received his BS in Geology from the University of Alabama and his MS in Civil Engineering from Auburn University. Presently Mr. Pratt is Chief of the Bureau of Ground Water Management at the Northwest Florida Water Management District where he has been employed since 1979. Mr. Pratt, with Angela Chelette from the NFWFMD and Brian Katz from the U.S. Geological Survey, produced the important report entitled, "Nitrate Loading as an Indicator of Nonpoint Source Pollution in the Lower St. Marks-Wakulla Rivers Watershed". Through his work at the Water Management District, Mr. Pratt has been vital to many hydrogeologic studies and reports relevant to the region.

TODD R. KINCAID, PH.D.

Todd is a native Floridian who grew up swimming, scuba diving, and canoeing in many of Florida's springs and rivers. He has been an active underwater cave explorer for more than 25 years having dived, mapped, and explored numerous underwater caves in Florida, Mexico, and Turkey. His passion for springs and caves led him to earn BS and MS degrees from the University of Florida in Geology and Hydrogeology in 1991 and 1994 and a Ph.D. in karst hydrogeology from the University of Wyoming in 1999. He is currently the vice President of Hazlett-Kincaid, Inc., a small consulting firm specializing in hydrogeological modeling. He also serves on the Steering Committee for the Hydrogeology Consortium, a non-profit group dedicated to understanding and protecting the karstic Floridan aquifer and as a board member for Global Underwater Explorers, a non-profit organization dedicated to underwater education, exploration, and research. Together with the Florida Geological Survey and Florida State University, he has been working for the past four years to map the underground flow to Wakulla Spring through groundwater tracing and modeling.

SEAN ERNST MCGLYNN, PH.D.

Dr. McGlynn was born in Tallahassee, FL. Sean began working on aquatic issues in the late 70's at the Center for Wetland resources at Louisiana State University in the Sediment Geochemistry Department of the Center for Wetland Resources. Dr. McGlynn has worked in aquatic systems from Laguna Madre,

Texas to the Florida Keys and north to the coast of Maine. He worked at Receptor Molecules Inc., a Research and Development Laboratory specializing in immunoassays for pollutants; the Center for Aquatic Research and Resource Management at Florida State University to direct laboratory and field experimentation during the Choctawhatchee Project. In 1997 Dr. McGlynn incorporated McGlynn Laboratories, Inc. (MLI) in response to requests to elucidate nutrient loading problems. Dr. McGlynn has published extensively in the field of aquatic research and ecology. McGlynn Laboratories, Inc. expanded operations along the Gulf of Mexico opening a second office in Baton Rouge, La. Dr. McGlynn is on the Board of Directors of the Florida Lake Management Society, the Big Bend Environmental Forum, Leon County Science Advisory Committee and has been elected to a second term as Supervisor, District 1, Ochlockonee Soil and Water Conservation District.

HAL DAVIS

Mr. Davis has been cave diving in the karst terrain of Florida for almost 25 years with additional cave diving experience in the Yucatan of Mexico. He is a certified cave diver by the National Association for Cave Diving and has logged over 300 cave dives. He has a B.S. in Geology from Georgia Southwestern University and a M.Sc. in Hydrology from the University of Arizona. He has studied karst aquifers in Florida for 13 years, both as a private consultant and with the U.S. Geological Survey. He is a registered professional geologist in Florida. His work in hydrology has included ground-water flow modeling, fate and transport modeling, the degradation of contamination due to natural attenuation, interpretation of seismic data, and the delineation of areas of contribution to pumping wells.

TIMOTHY J. HAZLETT, PH.D.

Dr. Hazlett is the current President of the Hydrogeology Consortium and is also President of Hazlett-Kincaid, Inc. He has a background in hydrogeology, geological engineering, and numerical modeling and has worked on computer modeling of groundwater flow and contaminant fate and transport on projects nationwide. Tim has worked with Dr. David Loper, at FSU, over the last four years on the development of a new model for groundwater flow in karst basins and has also developed the first models of karst systems with cave conduits included (for the Woodville Karst Plain - WKP). Much of the data from the quantitative dye tracing experiments ongoing in the WKP is being integrated into a regional groundwater model currently being developed by Dr. Hazlett.

Stormwater Discussion

JONATHAN ARTHUR, PH.D. (Moderator)

Dr. Arthur is a licensed Professional Geologist and graduate of Florida State University, where he received his B.S. with honors and Ph.D. degrees in geology. Jon began working at the Florida Geological Survey (FGS) as a staff geologist in 1987. He currently supervises the Florida Department of Environmental Protection – FGS Hydrogeology Program and serves on numerous state and federal committees and work groups involving aquifer research and protection. Jon's numerous research publications focus on hydrogeology and geochemistry, with emphasis on water-rock interaction during aquifer storage and recovery activities, regional hydrogeologic framework mapping, and aquifer vulnerability modeling. His professional memberships include the Geological Society of America,

Southeastern Geological Society, International Association of Hydrogeologists and the Hydrogeology Consortium. He is also a member of the Florida Association of Professional Geologists, where he serves as the organization's President. Devoted to environmental stewardship, Jon is also active in geology education and outreach. He is producer of the award-winning video curriculum, *Florida's Geology Unearthed*, and recently co-produced *Florida's Aquifer Adventure*, which will soon be available to public educators.

ERIC H. LIVINGSTON

Mr. Livingston is a public servant who has dedicated his life to the protection, management, and enhancement of our planet's water resources. He began his career at the Florida Department of Environmental Protection in Tallahassee in 1977 as a scientist in the Stormwater/Nonpoint Source Management program which he administered from 1984 through 1999. In late 1999 he became the chief of the newly created Bureau of Watershed Management which is responsible for the implementation of the state's watershed management and restoration program. Eric received his B.S. in Biology from Florida State University and his M.S. in Biology from the University of Alabama.

MARTY WANIELISTA PH.D.

Dr. Wanielista is the director of the Stormwater Management Academy at the University of Central Florida and Professor of Engineering. He holds a Civil Engineering degree from the University of Detroit, Masters from Manhattan College, and a PhD in Environmental Systems from Cornell. He has completed over 60 research projects in the areas of Hydrology and Stormwater, and is currently working on 7 projects for the Stormwater Management Academy. He has about 200 publications including 7 textbooks. He completed the springshed identification study for the Wekiva area and proposed stormwater methods to help protect springs.

JOHN BUSS , P.E.

Mr. Buss is the Director of the City of Tallahassee Stormwater Management Division. He holds degrees in both Civil Engineering and Business Administration. He has worked for Tallahassee for nearly 15 years, and has worked in various aspects of water resource engineering for 25 years. During his tenure with the City, he has transformed the City's stormwater program from essentially a drainage maintenance operation into one of the most progressive and pro-active stormwater management programs in the state. Actions include: Tallahassee was the first in the state to create a stormwater utility fee to provide funding to manage stormwater; Tallahassee developed and implemented SW regulations that became a model recommended to other Florida cities; Tallahassee pioneered the treatment of stormwater with alum in a pilot project in Lake Ella in the late 1980s; since 1990, Tallahassee has invested over \$70 million in capital projects to control flooding and improve water quality; and, most recently, Tallahassee has enacted a stormwater fee increase to generate an additional \$60 million to invest in projects specifically to reduce stormwater pollution this is in addition to the normal level of stormwater infrastructure investment. In addition to his work with the City of Tallahassee, John has worked to improve stormwater regulations and stormwater management practices, state-wide. He was the founding president of the Florida Stormwater Association, and at various times is invited to provide testimony to legislature committees on stormwater issues.

THERESA B. HEIKER, P.E.

Ms. Heiker is the Stormwater Management Coordinator for Leon County Public Works. She graduated from Godby High School and went on to receive a B.S. in Engineering and Public Policy from Washington University in St. Louis, Missouri. She returned to Tallahassee, working for the Florida Dept. of Environmental Regulation in the Wastewater Construction Grants Program and then with Broward Davis & Assoc., a local consulting firm, before joining Leon County in 1994. She established the County's NPDES-MS4 program (National Pollutant Discharge Elimination System - Municipal Separate Storm Sewer System). Other County projects have included the Stormwater Management Master Plan for the non-urban basins, the Lake Munson Restoration Project, and the Capital Area Flood Warning Network. She has served on the Florida Stormwater Association Board of Directors since 1996.

Septic Systems Discussion

RODNEY S. DEHAN, D.V.M, PH.D. (MODERATOR)

Dr. DeHan holds advanced degrees in veterinary medicine, microbiology and biochemistry. He was in charge of the Ground Water Protection Program at Florida Department of Environmental Protection for many years until his move back in 1997 into the research arena as a Senior Research Scientist at the Florida Geological Survey. His main research interests focus on the dynamics of interaction between surface and ground water in karstic settings.

PAUL BOOHER

Paul Booher has worked with the Department of Health in the Bureau of Onsite Sewage Programs Bureau since 1995. He joined the Bureau to manage the research and engineering projects. His previous experience was in the private sector, having spent 18 years in facility management, project management for defense contracts, and engineering management for process engineering and process installations. In addition, Mr. Booher spent 10 years in shipyards management and engineering, and 2 years in private consulting. Booher's assignments with the Bureau include reviewing engineered designs, product approvals, septic tank designs and construction, innovative proposals, and performance-based design reviews.

EBERHARD ROEDER, PH.D.

Dr. Roeder coordinates the research program of the Bureau of Onsite Sewage Programs in the Florida Department of Health. Current projects include the fate and transport of nutrients and coliforms from onsite sewage systems in karst and coastal areas, and the performance of advanced onsite sewage systems. He joined the Department in 2004 after working on studies related to contaminant hydrology and groundwater modeling in Florida, South Carolina, Finland and Germany. He graduated with a Ph.D. in environmental systems engineering from Clemson University and is a registered professional engineer in Florida.

LAWRENCE ALEXANDER (ALEX) MAHON

Mr. Mahon is a 1982 graduate of the University of Georgia with a Bachelor of Science degree in zoology. He began a career in public health in 1983 at the Osceola County Health Department in Kissimmee, Florida as a Sanitarian. In 1985 was promoted to Environmental Health Supervisor assuming supervisory responsibilities for all environmental health programs and staff and had primary responsibilities for all permitting, soil testing and site evaluation of septic systems. In 1987 he accepted a promotion to become the Assistant Environmental Health Director of the Leon County Health Department and in 1995 accepted a promotion as the Environmental Manager of that Division.

BRIAN CRAWFORD

Mr. Crawford has been in Public Health since 1984 when he started working for the Florida Department of Environmental Regulation in the Pesticide Review Section. Mr. Crawford began at the Wakulla County Health Department in 1989, becoming the Environmental Health Director in 1994.

MARK D. REPASKY

Mr. Repasky graduated with a BS in Civil Engineering from UF in 1978. After a few months working as a Civil Engineer, he was employed by Harris Corporation, Melbourne Florida. At Harris, he worked as a mechanical stress analyst, and designed a major substructure for the Galileo Space Probe (which was recently plunged into Jupiter's atmosphere). Later, Harris Corporation sent him to Argentina as Field Engineer for 3 years, constructing Satellite Communications Earth Stations. Continuing his work overseas, Repasky spent several years designing and building Air Freight facilities for Flying Tigers Airlines, out of their Los Angeles headquarters. purchased Flying Tigers, Mark went independent, consulting in California for 7 years. In 1997, he returned to his hometown of Tallahassee. Mr. Repasky became involved in onsite wastewater systems design and construction in 1999. His company has designed and overseen installation of more than 500 performance-based and engineered systems in the Florida Keys, as well as dozens more statewide. He is currently involved in the design of the advanced wastewater treatment and reuse system for the South Shoal Development at Alligator Point in Franklin County.

Wastewater Discussion

W. RICHARD (DICK) FANCHER (MODERATOR)

Mr. Fancher is currently the District Director for the Northwest District of the Department of Environmental Protection (DEP). He is a Graduate of Regent University where he obtained a Masters in Management in 1994. He began his career with DEP over 30 years ago that has included working with citizens and agencies on various environmental restoration projects, managing the Northwest District's wetlands and stormwater programs and air, water and wastewater sampling and analysis.

KARTIK VAITH, P.E

Mr. Kart Vaith is currently serving as Vice President and Senior Officer in CDM. In this role Mr. Vaith serves as project manager or principal in charge for major infrastructure projects including those that are delivered using the design/build method. Mr. Vaith has been the principal in charge of many projects inclusive of: City of Valdosta for a 7.5 mgd \$19 million expansion to a water treatment plant (WTP); St. Johns County, Florida for the design build delivery of 2 WTPs; the City of St. Augustine, Florida for a 2-mgd RO WTP; Tallahassee for the TP Smith Wastewater Treatment Plant (WWTP) overseeing a process and operations evaluation of a 22.5 mgs WWTP. Mr. Vaith worked with a number of utilities in the Tampa Bay area with their wastewater effluent management programs ranging from wastewater treatment technology development and design, to acting as the design build contractor to construct improvements for wastewater treatment. Mr. Vaith's professional activities have included work with Water Environment Federation, American Water Works Association and the Florida Water Environment Association.

MARK D. SEES

Mr. Sees manages the Orlando Easterly Wetlands, a 1,650-acre facility that serves to polish reclaimed wastewater. Day to day activities include oversight of various sub-contractors, nuisance and exotic species control, providing technical tours, conducting prescribed burns, conducting scientific investigations into the flora and fauna of the Wetlands, and documenting water quality trends, manipulating water levels within treatment areas, obtaining and administering educational and recreational grants. Mr. Sees also functions as a consultant to various City Bureaus in the area of wetlands and other environmental related areas. Mr. Sees has previously worked for the St. Johns River Water Management District and Post, Buckley, Schuh and Jernigan, Inc.

RICHARD DREW

Mr. Drew is the Chief of the Bureau of Water Facilities Regulation, located in the Division of Water Resource Management with the Florida Department of Environmental Protection in Tallahassee. He has a Masters Degree in Environmental Engineering Sciences from the University of Florida's College of Engineering. Except for a four-year span when he co-authored four books on the ecology of southwest Florida watersheds for the U. S. Fish & Wildlife Service, Richard has spent over 20 years with the department, working with water resource issues. Since the mid-1980s, he has been involved in wastewater regulatory programs. In addition and over the last ten years as chief, he has been responsible for managing the drinking water, Underground Injection Control, and federal pretreatment regulatory programs.

ELLIE WHITNEY, PHD

Dr. Whitney grew up in New York City, was educated at Harvard and Washington Universities, and moved to Tallahassee in 1970. She has spent the three-plus decades since then exploring outdoor Florida and studying its ecology. She taught at both the Florida State and Florida A&M universities from 1972 to 1985 and has authored some two dozen college textbooks which are used nationwide. She also contributed weekly columns on environmental matters to the *Tallahassee Democrat* from 1990 to 1995. Dr. Whitney's book, *"Priceless Florida: Natural Ecosystems and Native Species"*, written with D. Bruce Means, PhD and Anne Rudloe, PhD was published by Pineapple Press in 2004.

LYNNE PUTNAM

Ms. Putnam has been the Engineering Manager for the City of Tallahassee's Water Utility for three years. Previously she was employed with Black & Veatch, an international consulting firm, where she managed several water and wastewater master planning projects in addition to managing various reuse projects. Prior to that she was the Special Projects chief engineer with Central Contra Costa Sanitary District\ specializing in treatment, solid waste and reuse projects. She has conducted or managed pilot studies for filtration, UV disinfection, clarifier capacity and solids stabilization. Ms. Putnam has conducted stream water quality monitoring programs for use in analyzing wet weather discharge requirements and effluent mixing zone studies for a treatment plant. Ms. Putnam has managed a large recycled water program from funding and permitting through implementation and marketing. Ms. Putnam received her B.S. in Civil Engineering from the University of California at Berkeley in 1978 and her Master degree in Public Administration from California State University at Hayward in 1987. Ms. Putnam is a member of the Florida Water Environment Association (FWEA), Current Chair of the Big Bend Section FWEA, Water Environment Federation (WEF) and was past chair of the WEF Disinfection Committee, American Water Works Association (AWWA), Florida Section AWWA.

Conveners

- Hydrogeology Consortium
- 1000 Friends of Florida

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- Florida Department of Community Affairs
- Department of Environmental Protection
- Leon County
- Wakulla County
- City of Tallahassee
- Northwest Florida Water Management District
- Florida Department of Health
- Florida Geological Survey