



FLORIDA SPRINGS RESTORATION SUMMIT



Nov 1 – Nov 4, 2018

Harvey R. Klein Conference Center
College of Central Florida, Ocala

Hosted by



FLORIDA SPRINGS COUNCIL

With support from
The Fish and Wildlife Foundation of Florida
Jelks Family Foundation

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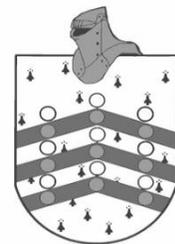
About the Host of the Florida Springs Restoration Summit

Florida Springs Council

The Florida Springs Council (FSC) was founded in 2014 by representatives from various springs advocacy groups with the goal of ensuring the regional, state, and federal conservation, preservation, protection, and restoration for future generations of Florida's springs, spring runs, and groundwater in the Floridan aquifer that sustains those natural systems and provides our drinking water. The mission of the FSC encompasses the programmatic areas of springs-related education as it relates to raising public awareness, legislation, and legal advocacy. Since its formation, the Florida Springs Council has grown to include 46 member organizations representing over 360,250 Floridians. The FSC has worked on legislative issues surrounding the passage of the 2016 Water Bill and springs funding allocations; as well as legal issues including the Basin Management Action Plan and Minimum Flows and Levels process for various major springs; and continues to educate the public through its network of allied springs organizations with workshops and events, such as the 2016 and 2018 Florida Springs Restoration Summits. To learn more about the Florida Springs Council, please visit www.FloridaSpringsCouncil.org.

Funders and Sponsors

Thanks to generous funders and sponsors, the cost to attend the Springs Summit has been kept low to encourage participation by members of the public and nonprofit organizations.



Funding has been generously provided by the Protect Florida Springs license plate through the Fish & Wildlife Foundation of Florida and by Jeles Family Foundation.



Thank you, First Magnitude Brewery, for becoming a Beer Sponsor for the Summit Social Mixer!

Thank you, Our Santa Fe River, for becoming
a 2nd Magnitude Saturday Lunch Sponsor!

Giving Our River A Voice



Join a group of concerned citizens that care about the well-being and future of a beautiful natural resource that is sadly threatened -
Our Santa Fe River.

Tax deductible donations and membership dues help our organization continue working to help protect and preserve this river, its springs and aquifer for our children, our grandchildren, and future generations.

Our challenges include educating and advocating against endless water extractions, nitrate pollution, the Sabal Trail pipeline, fracking, mining, and concentrated animal feeding operations.

Your support will help us continue our goals.

www.OurSantaFeRiver.org

Thank you to our 5th Magnitude Sponsors!



Agenda

Friday, November 2

- 8:00–9:00 AM** **Check-in, Registration, and Refreshments**
- 9:00–9:10 AM** **Welcome**
Dan Hilliard, Florida Springs Council Executive Director
James Henningsen, President, College of Central Florida
- 9:10–9:30 AM** **Recap of the 2016 Springs Summit and Introduction to the 2018 Summit**
Bob Knight, Director, Howard T. Odum Florida Springs Institute
- 9:30–10:35 AM** **Northwest Coast Springs Focus Area Panel**
Moderator: Jim Gross, Florida Defenders of the Environment
Kathleen Coates, Northwest Florida Water Management District
Kevin Coyne, Florida Department of Environmental Protection
Georgia Ackerman, Apalachicola Riverkeeper
Jim Gross, Florida Defenders of the Environment
-
- 10:35–10:50 AM** **Morning break**
-
- 10:50–11:55 AM** **St. Johns River Springs Restoration Area Panel**
Moderator: Clay Henderson, Institute for Water and Environmental Resilience at Stetson University
Mike Register, St. Johns River Water Management District
Moira Homann, Florida Department of Environmental Protection
Stephen Kintner, Volusia Blue Spring Alliance
Joe Cruz, Spring Hunters
-
- 12:00–1:30 PM** **Buffet Lunch and Keynote Address**
Jacqui Thurlow-Lippisch, Florida Constitution Revision Commission
Introduction by John Moran
-

2018 Florida Springs Restoration Summit Program

1:30–2:35 PM **Suwannee River Springs Restoration Area Panel**
Moderator: Chris Mericle, Suwannee-St. Johns Sierra Club
John Good, Suwannee River Water Management District
Tom Frick, Florida Department of Environmental Protection
Whitey Markle, Suwannee-St. Johns Sierra Club
Wayne Kinard, Amigos Dive Center

2:35–2:55 PM **Afternoon break with refreshments**

2:55–4:00 PM **Nature Coast Springs Focus Area Panel**
Moderator: David Ward, Aucilla-Wacissa River Group
Kevin Coyne, Florida Department of Environmental Protection
Seán McGlynn, Wakulla Springs Alliance
Angeline Meeks, Howard T. Odum Florida Springs Institute
Julie Hauserman, Florida Phoenix

4:00–5:30 PM **Poster Session and Evening Social with Appetizers**

Saturday, November 3

8:00–9:00 AM **Check-in, Registration, and Refreshments**

9:00–9:15 AM **Morning Introduction and Summary of Day 1**

9:15–10:20 AM **Santa Fe and Ichetucknee Springs Focus Area Panel**
Moderator: Jacqui Sulek, Florida Audubon
Bobby Hensley, UF School of Forestry and Natural Resources
John Thomas, Law Office of John R. Thomas, P.A.
Tess Skiles, The Global Connection
Rick Kilby, The Springs Eternal Project

10:20–10:35 AM **Morning break**

10:35–11:55 AM **Gulf Coast Springs Restoration Area Panel**
Moderator: Sam Upchurch, SDII Global
Sky Notestein, Southwest Florida Water Management District
Brad Rimbey, Florida Springs Council
Karen Pate, Crystal Springs Preserve
Jill Lingard, Weeki Wachee SpringsWatch

2018 Florida Springs Restoration Summit Program

*Bill Vibbert, Rainbow River Conservation
Brett Hemphill, Karst Underwater Research
James Garey, University of South Florida*

12:00–1:30 PM **Buffet Lunch and Keynote Address Sponsored by Our Santa Fe River, Inc.**
*Dinah Voyles Pulver, Environment Writer, Daytona Beach News-Journal
Introduction by Rick Kilby*

1:30–2:35 PM **Silver Springs Focus Area Panel**
Moderator: Guy Marwick, Felburn Foundation
*Matt Cohen, UF School of Forestry and Natural Resources
Kevin Coyne, Florida Department of Environmental Protection
Margaret Tolbert, springs artist
Margaret Spontak, Silver/Ocklawaha Blueway*

2:35–2:55 PM **Afternoon break with refreshments**

2:55–3:45 PM **“Lost Springs” Film Screening**
Matt Keene, Film Director

3: 45-4:30 PM **Audience Discussion, Organizer wrap-up, and Path Forward**

4:30 PM **Adjourn**

Sunday, November 4

Silver River Paddle

Meet at Silver Springs State Park’s kayak launch at 8:30am. The address is: 1425 NE 58th Ave, Ocala, FL 34470. The launch is on the far side of the parking lot, and you do not have to pay park admission to get to the launch area. If you have not reserved a kayak through the Summit, you can launch your own canoe or kayak for a \$4 launch fee or rent on your own from the park’s concessionaire. Lars Andersen of Adventure Outpost will be our guide as we paddle from the launch to the headspring, down river, and then back up King’s Fort Trail, returning to the launch.

Keynote Speakers

Dinah Voyles Pulver

Environment Writer, Daytona Beach News-Journal

Friday, 12:00–1:30 pm
Introduction by Rick Kilby

The environment writer for The Daytona Beach News-Journal for more than 20 years, Dinah Voyles Pulver is a sixth-generation native Floridian. She has received numerous state and national awards, including a Gold Medal for Public Service from the Florida Society of News Editors. She is a four-time recipient of the Waldo Proffitt Award for Excellence in Environmental Journalism. She received a national award of merit from the Grantham Foundation for Excellence in Reporting on the Environment and a Biff Lampton Communicator of the Year Award from the Florida Wildlife Foundation.



Dinah, who grew up in Tampa and Chiefland, is a mother of three and grandmother of four, who likes to kayak, birdwatch, cook and do genealogy.

Jacqui Thurlow-Lippisch

Florida Constitution Revision Commission

Saturday, 12:00–1:30 pm
Introduction by John Moran

Jacqui Thurlow-Lippisch began her environmental work flying in a Legend Cub. For six years, she and her husband Ed, have religiously documented the impacts of Lake Okeechobee discharges on the St Lucie River/Indian River Lagoon. “The wind beneath the wings of the River Movement,” these shocking aerials have been shared widely on social media and published in both state and national outlets. Jacqui grew up in Stuart, graduated in Journalism from the University of Florida, and received her masters at the University of West Florida while teaching German at Pensacola High School. Jacqui served as mayor and commissioner for the peninsular Town of Sewall's Point; and was appointed by Senate President, Joe Negron as a Commissioner for the 2017-2018 Florida Constitution Revision Commission. She serves on the Rivers Coalition Leadership Team representing River Kidz; writes a popular blog focusing on water politics, health, and history; and is a new director at large for the Florida Wildlife Federation.



Abstracts

Northwest Coast Springs Focus Area Panel

- ◆ Distribution and Characteristics of Panhandle Springs

Kathleen Coates, Northwest Florida Water Management District

This session will provide an overview of the springs and springs protection initiatives within the Northwest Florida Water Management District. There are approximately 250 springs in the Florida panhandle. A summary of their distribution, flow, and water quality characteristics will be provided. A brief overview of one or more of the District's spring protection programs will be presented such as the Agricultural Best Management Practices (BMP) cost-share program, Grass-based Crop Rotation program, septic-to-sewer projects, and/or the development of minimum flows and levels (MFLs).

- ◆ Jackson Blue Spring Basin Management Action Plan

Kevin Coyne, Florida Department of Environmental Protection

No abstract available.

- ◆ Water Restoration Issues and Springs Protection in Florida's Panhandle region

Georgia Ackerman, Apalachicola Riverkeeper

No abstract available.

- ◆ Effects of climate change on Florida's Aquifer and Springs

Jim Gross, Florida Defenders of the Environment

No abstract available.

St. Johns River Springs Restoration Area Panel

- ◆ Distribution, Characteristics, and MFLs of St. Johns River Springs

Mike Register, St. Johns River Water Management District

No abstract available.

◆ Volusia Blue Spring and Wekiva Springs Basin Management Action Plan

Moira Homann, Florida Department of Environmental Protection

No abstract available.

◆ Building a Network to Protect Springs in Volusia County

Stephen Kintner, Volusia Blue Spring Alliance

The organizations that I work with and represent have a common goal of protecting springs through education and outreach. Instead of creating one large organization, we have worked to support smaller, targeted organizations, starting with the Blue Spring Alliance, the Friends of Lyonia Environmental Center, and the Gemini Springs Alliance (all projects of West Volusia Audubon), Project H2O, the Institute of Water and Environmental Resilience, Volusia County, and the cities along the St. Johns River, just to name a few. All work together to educate the public about the declining water quality and quantity of the springs, groundwater, and streams in the County.

We accomplish this by providing programs like the Water Symposium, the Water Festival, Springshed Ambassadors, and by providing presentations to groups, schools, churches, cities, and governments to raise awareness that there are problems and that solutions to these problems do exist. We are all a part of the problem and must become a part of the solution.

◆ Truth, Beauty, and Goodness: A Look into Blue Spring

Joe Cruz, Spring Hunters

Joe speaks about the truth, beauty and goodness of Blue Spring. Truth- deals with the problems facing Blue Springs like algae, invasive animals, erosion and water quality. Beauty- deals with the beauty of the springs like its underwater photography, wildlife, ecosystem and plant life. Goodness- deals with the enjoyment and recreation we get to experience at the spring like kayaking, tubing, cave diving, hiking and snorkeling.

Suwannee River Springs Focus Area Panel

◆ Distribution, Characteristics, and MFLs of Suwannee River Springs

John Good, PE, Suwannee River Water Management District

The area encompassed by the Suwannee River Water Management District (District) has been aptly called Florida's "Springs Heartland". There are over 400 springs within the District, 68 of which are on its Minimum Flows and Minimum Water Levels (MFL) Priority List and 14 of which have been identified by the Florida Legislature as Outstanding Florida Springs. Fifty-one, or 75 percent of the priority springs are part of the Suwannee River system. Seventeen, or 25 percent are part of the Santa Fe and Ichetucknee River system. The District has set an aggressive

schedule for completion of MFLs on the Suwannee River system with rule development planned for the Lower Santa Fe and Ichetucknee and Middle and Upper Suwannee rivers in 2019. MFL establishment (or re-evaluation as appropriate) for the remainder of the Suwannee system rivers and springs, the Withlacoochee and Alapaha rivers, are scheduled for 2020. When complete, an MFL will have been set for all priority springs in the District.

💧 [Suwannee River Basin Management Action Plan](#)

Thomas Frick, Florida Department of Environmental Protection

No abstract available.

💧 [Springs Protection Efforts in Florida's Suwannee River Springs Region](#)

Whitey Markle, Suwannee-St. Johns Sierra Club

I will speedily talk about our (FSC) conferences with FDEP and FDACS before and during the adoption of the Basin Management Action Plan (BMAP) for the Suwannee River Basin. I will point out some of the criticisms we brought to the table, and some of the responses we got. Then I will talk about solutions that would remedy the BMAP in lieu of our intended administrative appeal.

Essentially, we asked for realistic strategies and projects that would actually reduce nutrient pollution in the Suwannee River springsheds rather than wishlists that have no built-in enforcement mechanisms as required by statutes; realistic project and staffing funding for the mechanisms to work; real, rather than voluntary monitoring, and milestones for contingent strategies at the 5,10, 15, and 20 year marks; inclusion of future land use projections in the basin with real nutrient reduction goals as well as matching water supply policy.

💧 [Cave Diving in the Suwannee River Springs](#)

Wayne Kinard, Amigos Dive Center

No abstract available.

Nature Coast Springs Focus Area Panel

💧 [Nature Coast Springs Basin Management Action Plans](#)

Kevin Coyne, Florida Department of Environmental Protection

No abstract available.

◆ Preserving Wakulla Springs

Seán McGlynn, Wakulla Springs Alliance

Seán's research focuses upon karst interactions between surface and ground water in the Wakulla Springshed. Lakes and streams in the Wakulla Springshed flow down sinkholes into the aquifer. Wakulla Springs, reputed to be the largest single event spring in the world, has a voracious appetite for water, and unfortunately is soaking up these waters and associated pollutants from domestic sewage, septic tanks, and fertilizers throughout the springshed. Now is a very dynamic time for Wakulla Springs with the TMDL, the BMAP and the SWIM programs all focusing on restoring Wakulla Spring. Still, increasingly dark greenish water is welling up at the springhead. Harmful filamentous algae coat the spring run. The glass bottom boats no longer ply its darkened waters.

Seán has modeled the seepage rate of most of the sinking lakes and streams in the Wakulla Spring Shed. Dye studies have shown cavernous connections between these sinks and the springs. Flow rates often exceed 0.5 miles per hour, underground, in caverns that must stretch for distances as great as 30 miles (Lake Iamonia to Wakulla Springs). Furthermore, the dynamic subterranean connection between Wakulla Spring and Spring Creek, submerged cave large enough to run a semi-truck through, often reverses flow. And occasionally, preceding flow reversal, pumps saline waters into Wakulla Spring, creating an undesirable habitat for aquatic species.

The Decrease in flow at Spring Creek seems to be driven by sea level rise. The increasingly bad visibility at the spring correlates to a multiple regression of the tannic and the chlorophyll pigments in the spring water. The chlorophyll levels in the spring water are derived from planktonic algae in the sinking lakes; this was traced with DNA analysis. The tannic substances are derived from the sinking streams.

◆ The Blue Water Audit: Spatial Analysis and Visualization of Human Impact on the Floridan Aquifer

Angeline Meeks, Howard T. Odum Florida Springs Institute

The Floridan Aquifer System (FAS) is essential to life in Florida, supplying fresh water for both natural and human systems. The growth of Florida's population and economy has resulted in an increased impact on the FAS through elevated nitrogen levels and increased groundwater withdrawals. The Blue Water Audit (BWA) project was developed by the Florida Springs Institute (FSI) to estimate the varying magnitudes of impact on the Floridan Aquifer and to estimate an 'Aquifer Footprint' for parcels 5 acres and larger, general land use for parcels under 5 acres, and city limits. The magnitude of individual contributions varies greatly depending factors such as size of the parcel, type of activity, and intensity of activity. A GIS analysis was performed using data from a variety of sources to estimate nitrogen loading to the FAS and to estimate groundwater withdrawals. The project area includes 56 counties in Florida with an extent of roughly 43,000 square miles. BWA results include a geodatabase and detailed tabular

database that can be used to prioritize efforts to protect the FAS. An educational website for the general public was also created that includes an interactive map of generalized BWA results.

💧 [A Tribute to Wes Skiles, Explorer and Photographer](#)

Julie Hauserman, Florida Phoenix

Julie is the author of *Drawn to the Deep: The Remarkable Underwater Explorations of Wes Skiles*, published by University Press of Florida. *Drawn to the Deep* celebrates the life of an extraordinary adventurer who braved extreme danger to share the hidden beauty and environmental truths of the planet with others. Skiles felt a pull to the water as a child, captivated by the cobalt springs of Florida. His passion for diving and his innovative camera techniques earned him assignments with National Geographic and Outside. He also took part in creating over a hundred films, many of which won international awards and acclaim. Skiles was a self-taught expert on Florida's freshwater springs and an outspoken advocate for their conservation. He went head-to-head with scientists and government officials who dismissed his firsthand observations of water movement through the "Swiss-cheese" karst rock of the underground aquifer. But he never gave up on his quest to disprove the prevailing scientific models or to protest what they allowed—the unchecked pumping and depletion of Florida's groundwater. Through interviews with Skiles's friends and family, along with insights from his own journals, Julie Hauserman describes the escapades and achievements that characterized his life's work. This book is the inspiring story of an explorer and activist who uncovered environmental abuses, advanced the field of underwater photography, and astonished the world with unprecedented views of the secret depths of the planet.

[Santa Fe and Ichetucknee Springs Focus Area Panel](#)

💧 [Metabolism in the Ichetucknee-Santa Fe-Suwannee River Basin](#)

Dr. Bobby Hensley, UF School of Forestry and Natural Resources

We have deployed a network of sensors within the Ichetucknee, Santa Fe and lower Suwannee River Basin aimed at understanding factors controlling primary production and respiration. We are interested in how rates vary temporally in response to factors such as light, temperature and flow conditions, and spatially from headwaters to mouth in response to changing width, depth, canopy shading and external versus internal sources of carbon. This work is part of two larger NSF funded collaborative projects taking place in multiple places throughout the United States. A feature which makes this catchment somewhat unique is the mixing dynamic between tannic surface water and clear groundwater from springs. This produces variability in water column light transmittance both temporally (groundwater constitutes a larger fraction at low flow) and spatially (from longitudinal accumulation of groundwater). This variable attenuation controls light reaching the benthos and appears to be the primary control on metabolism in this region.

◆ Santa Fe BMAP and Springs Legal Remedies

John Thomas, Law Office of John R. Thomas, P.A

No abstract available.

◆ Springs Protection Through Digital Media

Tessa Skiles, The Global Connection

Springs are a looking glass into the health of Florida's most vital natural resource, the Floridan Aquifer. Because this resource is out of sight, its declining health tends to be out of mind. With nearly 70% of U.S. citizens using social media or digital news outlets of some sort, it's more important than ever to understand the impact that online outreach has on our audience so that we can choose the most effective means of communicating to them the importance of preserving Florida's freshwater resources.

◆ Myth & Magic: Lessons from the History of Florida's Waters

Rick Kilby, The Springs Eternal Project

The origins of Florida's contemporary tourism-based economy can be traced back to the 1800s, when visitors flocked to the Land of Flowers, encouraged by accounts of an untamed paradise with more than 1,000 fresh water springs, 1,300 miles of coastline, and 30,000 lakes. Throughout human history, indigenous people found profound mystery in water, and a sense of awe in its powers of both creation and destruction. In the New World, native peoples showed Europeans the water they believed to have curative properties. These sacred waters often became destinations for health and healing – evolving into elaborate spas for the upper classes. Some freshwater springs were utilized as sources of energy to turn mill wheels, while others were piped to supply drinking water, never returning to their natural channels. Today, many springs have become beloved recreational resources for a culture more about sun and fun than physical renewal, yet some people still find sacred havens of restoration in Florida's waters.

Throughout history, all of the state's waters, especially its springs, have inspired stories that continue to have resonance, even for an increasingly jaded audience. Through learning about our springs as historical resources, we can see them in a different light, adding additional context to our understanding of Florida's amazing natural environment.

Gulf Coast Springs Restoration Area Panel

◆ Distribution, Characteristics, and MFLs of Gulf Coast Springs

Sky Notestein, Southwest Florida Water Management District

No abstract available.

💧 [Gulf Coast Basin Management Action Plans](#)

Brad Rimbey, P.E., Florida Springs Council

Weeki Wachee, Chassahowitzka, Homosassa, Kings Bay, and Rainbow River comprise Florida's central gulf coast first magnitude spring systems. All are located along a 30 mile stretch of central Florida's gulf coast and all are designated as Outstanding Florida Waters and Outstanding Florida Springs.

FDEP has determined that these spring systems are impaired by nutrient (nitrate) pollution as evidenced by algal proliferation. Subsequently, FDEP established total maximum daily load (TMDL) targets for nutrient pollution in all these spring systems.

The Weeki Wachee TMDL target was set at 0.25 mg/L. The Chassahowitzka, Homosassa, and Kings Bay targets were set at 0.23 mg/L. The Rainbow target was set at 0.35 mg/L.

According to FDEP, the current nitrate pollution levels for these systems are 0.90 mg/L for Weeki, 0.65 mg/L for Chassahowitzka, 0.75 mg/L for Homosassa, 0.20 mg/L for Kings Bay, and 2.31 mg/L for Rainbow.

FDEP has determined the primary source of nitrate pollution for these spring systems is agriculture for Chassahowitzka, Homosassa, and Rainbow. Septic systems are the primary source of pollution for Weeki and Kings Bay.

Adopted BMAPs are intended to correct this pollution problem. Only time will tell if these BMAPs are effective.

💧 [Springs Outreach and Education](#)

Karen Pate, Vice President, Crystal Springs Foundation, Inc.

Habitat management & private stewardship of Crystal Springs. Crystal Springs Foundation environmental education programming. Water Ventures environmental education statewide outreach. Making public- private partnerships work for the betterment of Florida's Springs.

💧 [SpringsWatch in the Gulf Coast Springs Region](#)

Jill Lingard, Weeki Wachee SpringsWatch, Florida Paddling Trails Association

Paddlers enjoy immersing themselves in the watery beauty of the areas they explore by kayak, canoe, or paddleboard. This quality makes them natural waterway stewards. Indeed, one of the central missions of the Florida Paddling Trails Association is to protect the environment surrounding the state's water trails, many of which are spring-fed. An avid kayaker and paddleboarder, Jill Lingard has led SpringsWatch teams on both the Ichetucknee and Weeki Wachee Rivers. In her presentation, she will discuss the process of organizing a SpringsWatch

team, some general findings, and how she's leveraged various environmental groups to join in water monitoring efforts.

- ◆ Rainbow Springs Recreation Impacts

Bill Vibbert, Rainbow River Conservation

The presentation will begin with a series of video examples of recreation impacts including vegetation damage, user conflicts, wildlife impacts, and overcrowding. Several slides will discuss current management plans and regulations followed by recommendations to reduce recreation impacts on the natural system and improve visitor experience.

- ◆ Collection Methods and Utilization of Underwater Conduit Research, Documentation, and Data

Brett B. Hemphill, Karst Underwater Research

No abstract available.

- ◆ Research in Coastal Springs and Salt Water Intrusion

James Garey, University of South Florida

No abstract available.

Silver Springs Focus Area Panel

- ◆ Description of Silver Springs Ecosystem Current Status and Restoration Needs

Matt Cohen, UF School of Forestry and Natural Resources

No abstract available.

- ◆ Description of Silver Springs Ecosystem Current Status and Restoration Needs

Kevin Coyne, Florida Department of Environmental Protection

No abstract available.

- ◆ Description of Silver Springs Ecosystem Current Status and Restoration Needs

Margaret Tolbert, springs artist

Like a Lost Continent, the Lost Springs of the Ocklawaha exist in our midst, covering almost half of the state, an unseen world.

2018 Florida Springs Restoration Summit Program

A storied river is choked back and imprisoned behind the Rodman Dam.
Left for decades, a captive of a failed project.
What rights do natural phenomena have?

Tolbert presents the background and impetus for the *Lost Springs* film and exhibit, and comments on the ongoing efforts to restore the river.

- ◆ [Description of Silver Springs Ecosystem Current Status and Restoration Needs](#)

Margaret Spontak, Silver/Ocklawaha Blueway

No abstract available.

Notes

Poster Session

- ◆ **Integrated Control of the Invasive Aquatic Plant, Hydrilla, Using Snails and a Plant Growth Regulator**

Janani Kumaran, Gainesville High School

Hydrilla verticillata, is on the Federal Noxious Weeds List and is classified as a Florida Class I Prohibited Aquatic Plant. Its rapid growth chokes water bodies in Florida and around the world, causing major problems to water systems and navigation. The control of this weed is a major concern and physical, chemical, and biological control methods have been incorporated into its management.

This study is a two-year project. Last year (Year 1), I found that the snail, *Planorbella duryi*, was significantly better than *Viviparus georgianus* at controlling Hydrilla and also preferred Hydrilla when offered an alternate diet. However the control method was slow and likely impractical under natural conditions. Therefore, this year, I aimed at including *Planorbella* in an integrated control plan along with a plant growth regulator (PGR). This study included two repetitions of the experiment using low concentrations of the herbicide, Clearcast®, either by itself or along with the snail. Significantly stronger control of plant growth was observed when PGR and *Planorbella* acted together. While the snail grazed on the leaves, the PGR slowed/stunted plant growth and prevented the formation of subterranean tubers. There was a significant decrease in the weight of the snails in both rounds of experimentation. The findings from this study confirm my prediction that an integrated control plan is more effective in the control of Hydrilla than each agent acting individually. In the future, I will use different PGRs to compare their efficacy in an integrated control experiment for Hydrilla.

- ◆ **Blue Water Audit: Spatial Analysis and Visualization of Human Impact on the Floridan Aquifer**

Angeline Meeks, Howard T. Odum Florida Springs Institute

The Floridan Aquifer System (FAS) is essential to life in Florida, supplying fresh water for both natural and human systems. The growth of Florida's population and economy has resulted in an increased impact on the FAS through elevated nitrogen levels and increased groundwater withdrawals. Fertilizer use, wastewater disposal, and groundwater pumping are examples of human activities that contribute to reduced flows and increased nitrogen levels. The Blue Water Audit (BWA) project was developed by the Florida Springs Institute (FSI) to estimate the varying magnitudes of impact on the FAS and to estimate an 'Aquifer Footprint' for parcels 5 acres and larger, general land use for parcels under 5 acres, and city limits. The magnitude of individual contributions varies greatly depending on many factors, such as size of the parcel, type of activity, and intensity of activity. A GIS analysis was performed using existing data from a variety of sources to estimate nitrogen loading to the aquifer and to estimate groundwater withdrawals. The project area includes 56 counties in Florida with an extent of roughly 43,000

square miles. The BWA estimates that in the Florida Springs Region about 51 million lbs-N per year are entering the FAS and about 2.9 billion gallons per day of groundwater are being withdrawn. BWA results include a geodatabase and detailed tabular database that can be used to prioritize efforts to protect the FAS. An educational website for the general public was also created that includes an interactive map of generalized BWA results.

💧 [The fate of Urban Springs: Pumping-induced seawater intrusion in an underwater cave](#)

Bobby Scharping, University of South Florida

The objective of this study was to characterize the hydrogeological and ecological impacts that urbanization might have on Sulphur Springs Cave, an extensive phreatic cavity that produces a large spring in metropolitan Tampa, Florida, USA. To address potential mechanisms of seawater intrusion at this site, we consolidated historical and current hydrogeological data, and supplemented these data with our own collected on scientific dives. To identify ecosystem impacts, we sampled biofilms growing in Sulphur Springs Cave for analysis using fluorescence microscopy, carbon stable isotopes, and DNA sequencing and collected cave water for geochemical analysis. Groundwater extraction at this site has occurred for many decades, but intensified in the early 2000s, corresponding to a rapid increase in spring water salinity. Numerous vents in the cave issue saline, slightly-thermal, sulfidic water, and are likely connected to bedrock fractures which provide preferential flow-paths for deep-sourced anchialine water. Cave-water salinity increased during dry-season pumping activity but also throughout wet seasons, likely because recharge to regional topographic highs disproportionately pressurized deep saline water. Saltwater vents hosted white, filamentous *Thiothrix* biofilms which exhibited $\delta^{13}\text{C}$ values lower than those of sediment organics collected from a nearby, hydraulically-connected sinkhole (-37.4‰ and -28.8‰, respectively). Brown biofilms colonizing the remainder of the cave consisted of a mixed community exhibiting a mostly heterotrophic $\delta^{13}\text{C}$ signature (-30.5‰). As groundwater extraction and seawater intrusion at this site continues, the cave ecosystem will probably start to favor the colonization of white biofilms, and the spring may become unable to support low-salinity surface habitats.

💧 [Blue Characterization and Analysis of the Crab Creek Cave Biofilm Community](#)

Meredith Snyder, University of South Florida

Crab Creek Cave is a coastal submerged cave in west-central Florida which forms a spring-head tributary in the Chassahowitzka River. This spring is unique from others in this watershed because it discharges brackish water and expels bright orange biofilm. Observations by divers have confirmed orange biofilm growing along the cave walls and a rare brackish-water population of *Crangonyx hobbsi*, a troglobitic amphipod. The purpose of our study is to characterize the orange biofilm microbial community and determine its role in the trophic structure of this anchialine cave using scientific cave diving techniques to collect hydrochemical, biological, and stable isotope samples. The cave water varies in salinity (2.8-5.8 ppt) in response to Florida's wet season but maintains an average of 0.40 mg/L of total organic carbon. Nitrate and phosphorus levels remain at an average of 0.63 mg/L and 0.06 mg/L respectively. This indicates that this environment is oligotrophic, despite the presence of microbial life. Through

fluorescence microscopy, we have identified sheaths characteristic of some chemolithoautotrophic iron-oxidizing bacteria. Future stable carbon and nitrogen isotope analyses will identify the trophic role of the Crab Creek Cave biofilms, and metagenomic 16S rRNA gene analyses will define the biofilm community structure and function. This study will (1) expand our understanding of how anchialine cave ecosystems differ from nearby freshwater ecosystems, (2) address the knowledge gap of primary production via iron cycling in underwater caves, and (3) define a pristine habitat that serves as a model to compare to local anchialine springs influenced by urbanization.

Notes

Biographies

Georgia Ackerman, Apalachicola Riverkeeper

Georgia Ackerman joined the Apalachicola Riverkeeper team in December 2017 and serves as Riverkeeper and Executive Director. Georgia has been involved with Apalachicola Riverkeeper for over a decade as a business sponsor, a program volunteer and board member.

Georgia is an avid kayaker and outdoor enthusiast. She ran a north Florida ecotourism company for nearly a decade where she spent time learning about the Apalachicola River system and began volunteering with Apalachicola Riverkeeper. She also was founding member of the Friends of the Wacissa. After selling her business in 2013, she was recruited to lead a regional conservation awareness initiative at Tall Timbers. Georgia has also worked with the Red Hills Small Farm Alliance to help promote local, sustainable farming.

Georgia believes outside play and wild places are fundamental to both the health of humans and the planet. She says, “People will protect what they love. Also, people depend on this river system for their livelihoods. I’m constantly reminded by people’s actions that so many people deeply care about the Apalachicola River—and the Bay that it nourishes. It deserves our long-term protection and restoration efforts.”

Kathleen Coates, Northwest Florida Water Management District

Dr. Kathleen Coates is the Chief of the Water Resource Evaluation Bureau at the Northwest Florida Water Management District and oversees the Minimum Flows and Minimum Water Levels Program. Dr. Coates has an interdisciplinary background in water resources and has worked at the District for 11 years. Kathleen has a master’s degree in Water Resources Engineering from the University of Florida and is a licensed Professional Engineer. She also earned a Ph.D. in Forestry and Natural Resources from Purdue University with a concentration in wildlife ecology.

Kevin R Coyne, Program Administrator, Basin Management Action Plan Program Division of Environmental Assessment and Restoration, Florida Department of Environmental Protection

Mr. Coyne has been with the Florida Department of Environmental Protection since October 2014 and is the Program Administrator for the Basin Management Action Plan (BMAP) program. Prior to Mr. Coyne’s start at the department, he managed the West Virginia Department of Environmental Protection’s Water Quality Standards Program, and he also spent time working on various total maximum daily load (TMDL) and nonpoint source issues in California and Maryland. Mr. Coyne has a B.S. in wildlife and fisheries management, a Master of Public Administration (MPA), and is currently a graduate student at the Florida State University, Aquatic Environmental Science Program.

Joe Cruz, Spring Hunters

Joe Cruz is the co-founder of Spring Hunters, a springs awareness group with over 20,000 members. He is a native Floridian who grew up in Central Florida visiting many of its springs. He is an award-winning nature and underwater photographer. He has traveled extensively throughout Florida photographing its springs and wildlife to bring about conservation and awareness. He currently works at Blue Spring State Park as a kayak and nature tour guide with St Johns River Cruises. Having type 1 diabetes hasn't stopped him from his love of the outdoors and passion to photograph.

**Thomas Frick, Director, Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection**

Tom has been the director of the Division of Environmental Assessment and Restoration of the Florida DEP since 2013. The Division is responsible for setting water quality standards, monitoring and assessing surface water quality, establishing TMDLs and restoration plans known as Basin Management Action Plans. The division also includes the department's chemical and biological laboratory.

Tom began his career as an environmental scientist more than 25 years ago and has worked in both the private and government sectors specializing in environmental data, quality assurance, ecological assessment, and waterbody restoration.

John Good, PE, Suwannee River Water Management District

John has been with the Suwannee River Water Management District for 24 years, primarily working on Minimum Flows and Levels. Prior to that he was a consultant in Gainesville, Florida. He began his career in water use permitting at the Southwest Florida Water Management District and in irrigation programs and storm water permitting at the St. Johns River Water Management District. In between, John earned the Master of Engineering degree from the University of Florida, while serving as a visiting agricultural extension agent.

Jim Gross, Florida Defenders of the Environment

Jim Gross is a professional geologist with over 40 years of experience in water resources. He is a native of California. He earned a bachelor's degree in geology at the University of California at Santa Barbara, and a master's in geology at New Mexico State University. Jim is a licensed professional geologist in California and Florida and is certified as a Professional Geologist by the American Institute of Professional Geologists. Jim is currently the executive director of Florida Defenders of the Environment, and an adjunct professor at Santa Fe College in Gainesville where he teaches Earth Science.

**Clay Henderson, Executive Director
Institute for Water and Environmental Resilience, Stetson University**

Clay Henderson serves as Executive Director of the Institute for Water and Environmental Resilience at Stetson University which utilizes faculty and student research to inform policy options for significant environmental issues. Previously he served as senior counsel at Holland & Knight LLP practicing in the public policy section in the field of environmental law. He also served as President of Florida Audubon Society and was elected to two terms on the Volusia County Council.

Henderson has long been engaged in environmental policy in Florida. He served on the 1998 Florida Constitution Revision Commission and sponsored most of the environmental provisions in Florida's Constitution including the creation of the Fish and Wildlife Conservation Commission. He co-authored the Florida Water and Land Legacy Initiative, the largest conservation funding program our nation's history ratified in 2014. He was also a leader in the development of Florida's signature land acquisition programs and negotiated the acquisition of over 300,000 acres of conservation lands.

Henderson has been recognized for his body of work including the national public service award from The Nature Conservancy and Bill Sadowski Memorial Award from the Environment and Land Use Section of the Florida Bar.

Dan Hilliard, President, Florida Springs Council

Dan was born in 1949 in Washington DC and transplanted to Florida shortly thereafter. His first memory was the view through the bottom of a boat on Silver Springs in 1950 while his father dabbled around in Okinawa in support of the Korean War. A long adventure in Florida's outdoors followed, interrupted by various forms of formal education and aviation. He is a Vietnam combat veteran, a retired FAA en route air traffic controller, aircraft accident investigator, and wood worker. His claims of expertise in flying helicopters inverted are not verified, nor is his juggling of cats and chainsaws. He attended the USC School of Aerospace Safety and Florida Institute of Technology.

Julie Hauserman, Florida Phoenix

Julie Hauserman has been writing about Florida for more than 30 years. She is a former Capitol bureau reporter for the St. Petersburg (Tampa Bay) Times and reported for The Stuart News and the Tallahassee Democrat. She was a national commentator for National Public Radio's *Weekend Edition Sunday* and *The Splendid Table*. She has won many awards, including two nominations for the Pulitzer Prize. Her work is featured in several Florida anthologies, including *The Wild Heart of Florida*, *The Book of the Everglades*, and *Between Two Rivers*. Her new book is *Drawn to The Deep*, a University Press of Florida biography of the late Florida cave diver and National Geographic explorer Wes Skiles.

Hauserman is Editor-in-Chief of the Florida Phoenix (www.floridaphoenix.com), an online-only, nonprofit state news bureau with three reporters based in Tallahassee. It is free to readers and free of advertising.

Brett Hemphill, Karst Underwater Research

Brett has been the President of KARST Underwater Research / KUR, for over 10 years. KUR is a registered 501c3 nonprofit organization. KUR is committed the preservation and protection of karst aquifers and the quality of their water by conducting relevant scientific research and documentation of surface features and corresponding underwater caverns and conduits.

Brett Hemphill has been exploring since he can remember and in the past 27 years has assisted in exploring, mapping, and documenting many of the most unique and deepest underwater cave systems in the United States. Using specialized survey techniques and low frequency radio transmitters the KUR team has catalogued more underwater conduit data than any organization in the United States.

**Dr. Robert Hensley, Research Assistant Scientist
University of Florida Ecohydrology Lab**

Dr. Hensley is a scientist at the University of Florida, where his research focus is on understanding the role of river networks in transporting and modulating fluxes of carbon, nutrients and other solutes. As H.T. Odum observed more than 60 years ago, many features of springs make them ideal natural laboratories for understanding these processes. He has been performing research in springs for over 10 years and is also the instructor of the Springs of Florida course.

**Moira Homann, Environmental Consultant
Division of Environmental Assessment and Restoration, Florida Department of
Environmental Protection**

Moira Homann began her career at DEP in 2010 as an Environmental Specialist with the Watershed Evaluation and Total Maximum Daily Load (WET) Section. In 2014, she joined DEP's Watershed Planning and Coordination Section as the Basin Management Action Plan (BMAP) coordinator for Wakulla Springs, Volusia Blue Spring, Wekiva, Lake Jesup and Lakes Harney and Monroe. Moira received a bachelor's degree in Natural Resource Conservation Management from the University of Kentucky's College of Agriculture in 2004; and a joint master's degree in Environmental Science and Public Affairs from Indiana University's School of Public and Environmental Affairs in 2009.

Matt Keene, Film Director

Matt Keene is an award-winning filmmaker and journalist based in St. Augustine, Fla. His focus is on environmental and social justice issues, particularly those affecting his home state of Florida. In addition, Keene is a long-distance adventurer that has spent more than 16 months in a tent, sharing stories and photos along the way. All together, Keene has hiked, paddled or

bicycled more than 10,000 miles on long-distance journeys and holds the title of being the first person to complete Florida's 1,515-mile-long Circumnavigational Trail.

Rick Kilby, The Springs Eternal Project

Rick Kilby's first book, *Finding the Fountain of Youth: Ponce de León and Florida's Magical Waters*, was published by University Press of Florida in 2013 and received the bronze medal in the Visual Arts category in the 2014 Florida Book Awards. A companion exhibit to the book has been displayed around the state and can be currently viewed at the Matheson History Museum in Gainesville. Since the publication of his book, Kilby has given presentations from Miami to Tallahassee and participated in a panel discussion at the 2016 Springs Restoration Summit. An Orlando-based graphic designer, Kilby is the managing editor and designer of the Orange County Regional History Center's award-winning historical journal, *Reflections from Central Florida*. He is the creator of both a blog and Facebook page dedicated to the commemoration and preservation of the culture, history, and environment of Old Florida. Kilby is also a contributor to the Springs Eternal Project, an evolving series of creative partnerships initiated by Lesley Gamble and John Moran in collaboration with a diverse community of springs scientists, researchers, artists, and advocates. He is currently working on his second book, tentatively titled "Florida's Healing Waters."

Steve Kintner, Blue Springs Alliance

Stephen S. Kintner is a Professional Geologist and retired in March 2010 after 20 years as Director of Environmental Management for Volusia County. In recent years, Mr. Kintner has focused his attention on water conservation and water supply issues. In retirement, Mr. Kintner serves as the Conservation Chair of the West Volusia Audubon Society and spends much of his time working on Audubon issues and volunteering at the Lyonia Environmental Center. He is also Vice Chair of the Blue Spring Alliance and Chairman of the Volusia County Smart Growth Review Committee. He continues to promote conservation issues. Mr. Kintner holds a Master's in Resource Planning from Missouri State University as well as undergraduate degrees in geology and economics. Mr. Kintner resides in DeLand, Florida, with his family.

Dr. Robert Knight, Howard T. Odum Florida Springs Institute

Robert is an environmental scientist/systems ecologist with over 35 years of experience as an aquatic and wetland ecologist in Florida. His doctoral work included an ecological assessment of Silver Springs and Silver River under the direction of Howard T. Odum. Dr. Knight currently serves as the President and Executive Director of the Howard T. Odum Florida Springs Institute and President of the Silver Springs Alliance. Dr. Knight also serves in an advisory capacity to Our Santa Fe River, the Wakulla Springs Alliance, and the Ichetucknee Alliance.

Jill Lingard, Florida Paddling Trails Association, SpringsWatch

Jill Lingard serves as president for the Florida Paddling Trails Association, a statewide network dedicated to connecting paddlers to Florida's many beautiful water trails. Jill was a 30-year resident of Gainesville, where she regularly paddled North Central Florida's rivers and springs. A recent move to Tampa Bay has exposed her to the joys (and challenges) of sea kayaking. She

is a certified ACA kayak instructor, a Florida Master Naturalist, and a SpringsWatch team leader for the Florida Springs Institute.

Whitey Markle, Suwannee-St. Johns Sierra Club

Whitey Markle has been a member of the Suwannee/St. Johns Sierra Club's Executive Committee since 2003, Conservation Committee Chair since 2010, and Chair since 2014. This year he was elected to begin a term on the Florida Chapter Sierra Club's Executive committee. He is a member of the Silver Springs Alliance Board of Directors and a member of the Florida Springs Council Executive Committee, where he currently is serving as Legal Committee Chair. He also served a term as a Director of the Marion Soil and Water Conservation District in 2016.

Guy B. Marwick, Executive Director, The Felburn Foundation

Guy Marwick has been involved with environmental issues here in Marion County since 1970. As an environmental activist involved in numerous land acquisitions he has been a recipient of many honors. To name a few: The DEP Springs Protection Award, Christa McAuliffe Fellowship, Unsung Hero Award, Guy Bradley Award, and the 1,000 Friends of Florida Award. He was the Founder and Director of the Silver River Museum. He has served on many boards and participated in numerous other environmental activities. Guy is currently the Executive Director of The Felburn Foundation.

Seán McGlynn, Chair, Wakulla Springs Alliance

Seán McGlynn was born in Tallahassee; his grandfather was the Hungarian Composer, Ernst von Dohnányi, and Composer in Residence at FSU. His father was a Physical Chemist and Vice Chancellor at LSU where Seán earned his first academic degree, a BS in Biochemistry. He earned a MA and finished with a PhD in Biological Science under the ecologist, Robert J. Livingston. His dissertation concerned the cycling of PAHs, their metabolism and fate, in a karst lake. Seán analyzes pollutants and conducts dye studies at his environmental laboratory. He is currently monitoring the optical properties in Wakulla Springs. He combats invasive exotics and has developed patented innovative control mechanisms. Dr. Seán E. McGlynn is the chair of the Wakulla Springs Alliance, the director of the Florida Lake Management Society, a board member on the Florida Water Resources Monitoring Council, and the Technical Director for McGlynn Laboratories Inc.

Angeline Meeks, Howard T. Odum Florida Springs Institute

Angeline's love for the springs started in High Springs, her hometown. She received a B.A. in Political Science from the University of Central Florida, where she discovered her passion for cartography and geospatial analysis. Following graduation, she spent two years in Turkey traveling and teaching English to students and corporate professionals. She went on to receive her MSc in Environmental Informatics from the University of Leicester in the UK. Her thesis focused on performing and visualizing a contamination risk assessment of the Floridan Aquifer and was awarded the departmental Royal Institution of Chartered Surveyors (RICS) prize for

best GIS thesis. Angeline is continuing her research on the Floridan Aquifer as a GIS Analyst with the Florida Springs Institute.

Chris Mericle, Suwannee-St. Johns Sierra Club

Chris is a native Floridian who grew up on the Wekiva River in central Florida and learned from an early age to love nature and the outdoors. In 2010, he moved to Hamilton County and now lives on the Withlacoochee River. From 2014 -2016, he was a board member of WWALS Watershed Coalition. In 2016, he and his wife, Deanna, were awarded the Cypress Award from the Florida Chapter of Sierra Club for their efforts fighting the Sabal Trail pipeline. Chris is currently an active member with Suwannee-St. John's Sierra Club advocating for environmental issues impacting the north Florida region.

John Moran, Springs Eternal Project

As our waters go, so goes Florida. *"Choices have consequences,"* says photographer and writer John Moran. *"And there can be no long- term wellbeing in Florida unless we embrace a new way of thinking about water."* Chronicling the stunning changes he's seen over 30 years, Moran focuses on Florida's iconic springs as a case study for exploring the larger topic of water, democracy, and Florida's future. John Moran's work is a deep meditation on water and Florida's future. Florida author and scholar Gary Mormino says, *"If Florida had a Photographer Laureate, John Moran should hold that title."*

Karen Pate Crystal Springs Preserve

Karen Pate is a University of Florida graduate. She is an advocate of the private stewardship of Florida's wilderness and has worked as an environmental educator in Florida for 25 years. For the past 17 years she has been responsible for the restoration, habitat management and the implementation of an environmental education center at Crystal Springs Preserve.

Brad Rimbey, P.E., Florida Springs Council

Brad has been a permanent resident of Florida since 1967. Registered Florida Professional Engineer 1990-Present, Resident of Chassahowitzka 2006-Present, Spokesman Chassahowitzka River Restoration Committee 2010-2013, Director Homosassa River Alliance 2011-Present, Director Withlacoochee Aquatic Restoration 2013-Present, President Chassahowitzka Community Association 2013-2015, Participant FDEP Springs Coast BMAP meetings 2015-2018, Participant SWFWMD SWIM Springs Coast Technical Working Group 2016-2017, Vice President Florida Springs Council 2016-Present.

Tessa Skiles, The Global Connection, Howard T. Odum Florida Springs Institute

Tessa has spent her entire life in, and around, Florida springs. She has experienced their degradation first-hand and is passionately driven to preserve and protect them. She has a background in graphic design, photography, and film. She has produced a number of films featuring Florida springs, most notably, her own environmental documentary, *Saving*

Florida's Springs. Tessa's passion for Florida springs runs in her blood as the successor to her late father, Wes Skiles, who was a respected cave diver, springs conservationist, National Geographic explorer, and cinematographer. Much like Wes, she enjoys exploring nature and capturing its beauty through film and photography to better help the public appreciate and understand Florida's natural resources.

Jacqui Sulek, Chapters Conservation Manager, Audubon Florida

Jacqui Sulek is an advocate for Florida's springs. She is a founding member of the Ichetucknee Alliance and the Lower Ichetucknee Springs Watch program. While President of the local Four Rivers Audubon she created the Alligator Lake Spring Festival to highlight the headwaters of the Ichetucknee. As a recipient of the Toyota Together Green award she planned the first Our Water Our Future program. She spent 4 years on the North Florida Regional Water Supply Plan Stakeholder Advisory Committee and currently serves as an environmental representative on the Suwannee River Partnership and the UF Water Institute FACETS project.

Margaret Tolbert, springs artist

Margaret Ross Tolbert is a professional artist living in Gainesville. Her art inspired by the Florida Springs has been exhibited and is in collections on four continents. Her project AQUIFERious, is a book combining art and science to convey the complexity of the springs and Floridan aquifer (AQUIFERious.org), traveling exhibit and film. She also part of the team for *Lost Springs* (lostsprings.org) and *Proje-SU*, about springs in Turkey and the water culture and traditions there (Proje-SU.org). Tolbert has a bachelor's and Master of Fine Arts from the University of Florida.

Bill Vibbert, Rainbow River Conservation

During a 33-year career with the New Jersey State Park Service Bill managed State Parks, Historic Sites and Natural Areas including two of New Jersey's most visited parks, Island Beach State Park and Liberty State Park, each with one million annual visitors. He was involved in all phases of state park administration including planning, natural resource management, land acquisition, education, and operations. He initiated and managed five visitor interpretive centers. Bill wrote and managed New Jersey's first Marine Conservation Zone and served on the committee that passed New Jersey's Freshwater Wetlands Protection Act. He was responsible for the restoration of the historic village in Double Trouble State Park and wrote the General Management Plan, New Jersey's first. Currently Bill serves on the Board of Rainbow River Conservation.

Notes
