Florida Lake Management Society
28th Annual Technical Symposium

June 6-9, 2017

Captiva Island, Florida

Program Theme: **Balancing Water Resources for the Future**

SYMPOSIUM PROGRAM

TABLE OF CONTENTS

BALANCING WATER RESOURCES FOR THE FUTURE

June 6-9, 2017

Welcome!

TUESDAY - JUNE 6, 2017 - WORKSHOPS

8:00 AM – 5:00 AM	**Check-In and Registration**

8:15 AM – 12:15 PM **Workshop 1: Advanced Erosion Control with Innovative Technologies.** Eddie Snell, Applied Polymer Systems, Inc. – **Starfish Room**

8:15 AM – 12:15 PM **Workshop 2: Aquatic Plant Identification for Florida Lakes and Flowing Waters, The Basics.** Nia Wellendorf, Florida Department of Environmental Protection, Gloria Eby, Seminole County and Kristine Campbell, Florida Fish & Wildlife Conservation Commission. Plant material provided by Lee County Hyacinth Control District – **Sanibel Room**

9:00 AM – 4:00 PM **Workshop 3: Citizen Science, A Stormwater Pond Management Workshop (CEUs available for community association managers).** Stephen Montgomery, Allstate Resource Management, Inc. and Ernesto Lasso de la Vega, Lee County Hyacinth Control District – **Auger Room**

10:00 – 10:15 AM	**MORNING BREAK**
12:15 – 1:00 PM	**LUNCH** (*provided with full-day Workshop registration*)
2:45 – 3:00 PM	**AFTERNOON BREAK**

1:00 PM –5:00 PM **Workshop 4: Aquatic Plant Identification for Florida Lakes and Flowing Waters, Advanced (morning workshop is NOT a prerequisite).** Nia Wellendorf, Florida Department of Environmental Protection, Gloria Eby, Seminole County, and Kristine Campbell, Florida Fish & Wildlife Conservation Commission. Plant material provided by Lee County Hyacinth Control District – **Sanibel Room**

1:00 PM–5:00 PM **Workshop 5: Compilation, Analysis and Interpretation of Environmental Data.** Harvey H. Harper, Ph.D., P.E. - President Environmental Research & Design, Inc. – **Starfish Room**

WEDNESDAY - JUNE 07, 2017 MORNING – SYMPOSIUM

(* - Denotes student paper)

8:00 AM-5:00 PM	**Check-In and Registration** (Captiva Foyer)
7:00 AM-8:30 AM	**Breakfast** (Sand Dollar Plaza)

Opening Program (Auger Ballroom)

8:30-8:45 AM **Welcome & Opening Remarks:** Ron Hart, FLMS President & Symposium Chair

8:45-10:00 AM **Keynote Speakers:** Dr. Eric Milbrandt and Mark Thompson
Sanibel Captiva Conservation Foundation (SCCF) - Marine Laboratory

Overview of the SCCF-Marine Lab research activities, Impacts of "Lake Okeechobee releases", Captiva Island water quality studies and Sanibel Island nutrient management plan

10:00-10:35 AM	**MORNING BREAK** (Exhibit Hall – Captiva Ballroom)

Program Track A: Water Resources Science and Technology (Auger Ballroom)

Session A1: Nutrient Reduction and Management (Lessons Learned at the Alum Treatment Facilities)

Moderator: Harvey Harper

10:35-10:40 AM	Session Introductions -Harvey Harper
10:40-10:55 AM	Seminole County Soldiers Creek Nutrient Reduction Facility - Harvey Harper
10:55-11:10 AM	Lake Down New Alum Treatment Facility, Orange County - David Hansen
11:10-11:25 AM	Lessons Learned - Pinellas County Alum Facilities - Robert Burnes
11:25–11:40 AM	Lessons Learned - Lake County Water Authority NuRF - Ron Hart
11:40-11:55 AM	Panel Discussion on NuRF in Florida

WEDNESDAY – JUNE 07, 2017 AFTERNOON

12:00-1:30 PM	Annual Business Luncheon (Captiva Ballroom)

Track B: Watershed and Water Resources Management (Auger Ballroom)

Session B1: Lake Hancock and Okeechobee - Restoration Science and Management

Moderator: Shannon Wetzel

1:30-1:35 PM	Session Introduction - Shannon Wetzel
1:35-1:50 PM	Lake Hancock: Understanding the Multiple Influences on Water Quality in Florida's Most Polluted Large Lake - David Tomasko
1:50-2:05 PM	Lake Hancock: MFL Recovery, Water Quality and More - Randy Smith
2:05-2:20 PM	South Florida Ecosystem Restoration (SFER) Program - Kimberley Taplin
2:20-2:35 PM	Looking to the Past to Restore and Protect Florida Lakes for the Future: Using Paleolimnology in Lake Management - Melanie Riedinger - Whitmore

Track B: Watershed and Water Resources Management (Auger Ballroom)

Session B2: Indian River Lagoon and Nutrient Reduction

Moderator: Mark Hoyer

2:35-2:40 PM	Session Introduction - Mark Hoyer
2:40-2:55 PM	The challenges of integrating in situ data in critical watershed loading models: a case study from the Indian River Lagoon- Claudia M. Listopad
2:55-3:10 PM	Indian River Lagoon: Perfect Storm or New Norm - Charles Jacoby
3:10-3:25 PM	Hydrology dictates the threshold phosphorus-loading rate in shallow lakes **-** William F. Kenney
3:25-3:40 PM	Subtropical lakes are effective carbon sinks: examples from Florida, USA **-**William F. Kenney

AFTERNOON BREAK 3:40-4:00 PM (Exhibit Hall – Captiva Ballroom)

Track B: Watershed and Water Resources Management (Auger Ballroom)

Session B3: Lake and Stormwater Pond - Restoration Science and Management

Moderator: Ernesto Lasso De la Vega

4:00-4:05 PM	Session Introduction - Ernesto Lasso De la Vega
4:05-4:20 PM	Stormwater Ponds of South and Southwest Florida: Summary of a 12-year Limnological Investigation -Serge Thomas
4:20-4:35 PM	Sanibel Communities for Clean Water Best Management Practice Program – Dana Dettmar
4:35-4:50 PM	Recovering Lost Treasures: Aquatic Resources Restoration - Stephen Montgomery
4:50-5:05 PM	Restoring the Lakes of Kelly Greens- Robbin Huffines
5:05-5:20 PM	Gated Communities: Implementing a Lake Management Program with a Captive Audience - Jim Niehaus
5:20-5:35 PM	Sweep the Street in Front of Your Own Home: Volunteers Adopt Community Stormwater Ponds - Ernie Franke

WEDNESDAY - JUNE 07, 2017 EVENING

6:00-8:00 PM	**EXHIBITORS' SOCIAL** (Exhibit Hall – Captiva Ballroom)

6:00-8:00 PM **Session 4: Poster Session** (Exhibit Hall – Captiva Ballroom)

Session Leads: Gloria Eby & April Verpoorten

1. Distribution of Microplastics in Choctawhatchee Bay, Florida - Isaac Todd*
2. Distribution of Microplastics among Three, Large Florida Bays - Richie Gray*
3. Microbial community as an indicator of wetland health of Six Mile Cypress Slough Preserve, Southwest Florida - Irma L. Sanchez*
4. Influence of Competition and Predation on Success of *Cricotopus lebetis* as a Biological Control Agent - Courtney Stachowiak *
5. Determining Sediment Particle Characterization in Stormwater Treatment Area 3/4 - Jenna MacDonald*

THURSDAY - JUNE 08, 2017 MORNING

(* - Denotes student paper)

8:00 AM-5:00 PM	**Check-In and Registration** (Captiva Foyer)
7:00 AM-8:30 AM	**Breakfast** (Sand Dollar Plaza)

Morning Program (Auger Ballroom)

8:45-9:00 AM	Announcements:	Ron Hart, FLMS President
9:00 -10:00 AM	Keynote Speaker:	Dr. Wasit Wulamu, Center for Sustainability - Saint Louis University
	Using Drones for Water Resources Assessments: Integrating remote sensing, hydrochemistry and hydrological modeling to monitor regional water quality	

10:00-10:30 AM	**MORNING BREAK** (Exhibit Hall – Captiva Ballroom)

Program Track A: Water Resources Science and Technology (Auger Ballroom)

Session A2: Nutrient Reduction and Management

Moderator: Rob Burnes

10:30-10:35 AM	Session Introduction – Rob Burnes
10:35-10:50 AM	Lake Anderson Alum Aeration System - Bryce W. Edwards and Harvey Harper
10:50-11:05 AM	Lake Restoration Using Aeration and Alum: A look at the Potential Synergistic Effects - Patrick Goodwin
11:05-11:20 AM	Assessing the Influence of Land Use and Climate Variability on Nutrient Levels in Florida Lakes - Chao Xiong*
11:20-11:35 AM	Biosolids Application Database Development for Incorporation into Watershed Modeling Efforts - Lanie Meridth
11:35-11:50 PM	Polymer BMPs Used in Remote and Extreme Conditions - Eddie Snell

12:00-1:30 PM	**FLMS Annual Awards Luncheon** (Captiva Ballroom)

THURSDAY – JUNE 08, 2017 AFTERNOON

Program Track B: Watershed and Water Resources Management (Auger Ballroom)

Session B4: Restoration and Nutrient Reduction

Moderator: Lance Lumbard

1:30-1:35 PM	Session Introduction – Lance Lumbard
1:35-1:50 PM	Water Quality Restoration in 'Other Lakes' in the Ocklawaha Chain – Rolland Fulton
1:50-2:05 PM	Its 2017, Do You Know Where Your Nutrients Are? - Erich Marzolf
2:05-2:20 PM	Distribution of nutrients in Florida's lakes as inferred by the DEP's random stratified monitoring design - Thomas Seal
2:20-2:35 PM	Smart Source Control: Optimizing Street Sweeping Activities to Maximize Water Quality Benefit while Controlling Cost - Mike Hardin
2:35-2:50 PM	A Case Study: Modeling Nutrient Transport in Groundwater Flow and Discharge to the Volusia Blue Spring (Florida) - Erin Reed
2:50-3:05 PM	Interactions between Wakulla Springs and the Sinking Lakes and Streams in the Wakulla Springshed - Sean McGlynn
3:05-3:30 PM	**AFTERNOON BREAK** (Exhibit Hall -Captiva Ballroom)

Program Track B: Watershed and Water Resources Management (Auger Ballroom)

Session B5: Aquatic Plants Assessments and Harmful Algae

Moderator: Marissa Williams

3:30-3:35 PM	Session Introduction - Marissa Williams
3:35-3:50 PM	Annual Patterns of Phytoplankton in Subtropical, Florida Lakes – Dana Stephens
3:50-4:05 PM	Importance of Nutrient Ratios and Legacy Accumulation in Managing Cyanobacteria - West M. Bishop
4:05-4:20 PM	Risks of Only Monitoring Versus Managing Noxious Cyanobacteria - West M. Bishop
4:20-4:35 PM	A New IPM Approach for Hydrilla Management: Update – James Cuda
4:35-4:50PM	Algae and Nutrient Removal Using Ballasted Flocculation Technology - James Steffen
5:00-6:00 PM	FLMS Board Meeting - Board Room
7:00-8:30 PM	Kevin McCann Memorial Student Scholarship Fundraising Event

FRIDAY – JUNE 09, 2017 MORNING

8:00 AM-12:00 PM	**Check-In and Registration** (Captiva Foyer)
8:00 AM-9:00 AM	**Breakfast** (Sand Dollar Plaza)

Track A: Water Resource Science & Technology (Auger Ballroom)

8:45-9:00 AM Announcements: Sergio Duarte, Incoming FLMS President

Session A3: Lake Assessments

Moderator: Serge Thomas

9:00-9:05 AM	Session Introduction - Serge Thomas
9:05-9:20 AM	Submerged Aquatic Vegetation in Lake Apopka: How are we doing and where are we going? - Dean R. Dobberfuhl
9:20-9:35 AM	Continuing Efforts to Improve Water Quality in Lake Beauclair - Lance Lumbard
9:35-9:50 AM	Assessing Viability of Smooth Cord Grass (*Spartina Alterniflora)* in Nutrient Rich Retention Pond Water to Estimate Success in Floating Treatment Wetland Mats - Nicole Llinas*
9:50-10:05 AM	Improved tools for sharing water quality data in Northeast Florida - Margaret Q. Guyette
10:05-10:20 AM	Limnological study of Seven stormwater ponds (City of Sanibel Island, Florida) - Cayden Lawn*

10:20-10:45 AM	**MORNING BREAK** (Exhibit Hall – Captiva Ballroom)

Program Track A: Water Resource Science & Technology (Auger Ballroom)

Session A4: Water Resources Management

Moderator: Ron Hart

10:45-10:50 AM	Session Introduction - Ron Hart
10:50-11:05 AM	The Importance of Canals for the Florida Largemouth Bass Fishery in Lake Griffin, Florida - Scott Bisping
11:05-11:20 AM	Factors Affecting Catch Rates and Apparent Community Composition for Two Central Florida Lakes - Earl Lundy
11:20-11:35 AM	Transfer of Stormwater Pond Care: From Restoration - to Volunteerism - to Professional Maintenance - Ernie Franke

11:35 -12:00 PM	Student Awards and Closing Remarks – Ron Hart, FLMS 2016 - 2017 President

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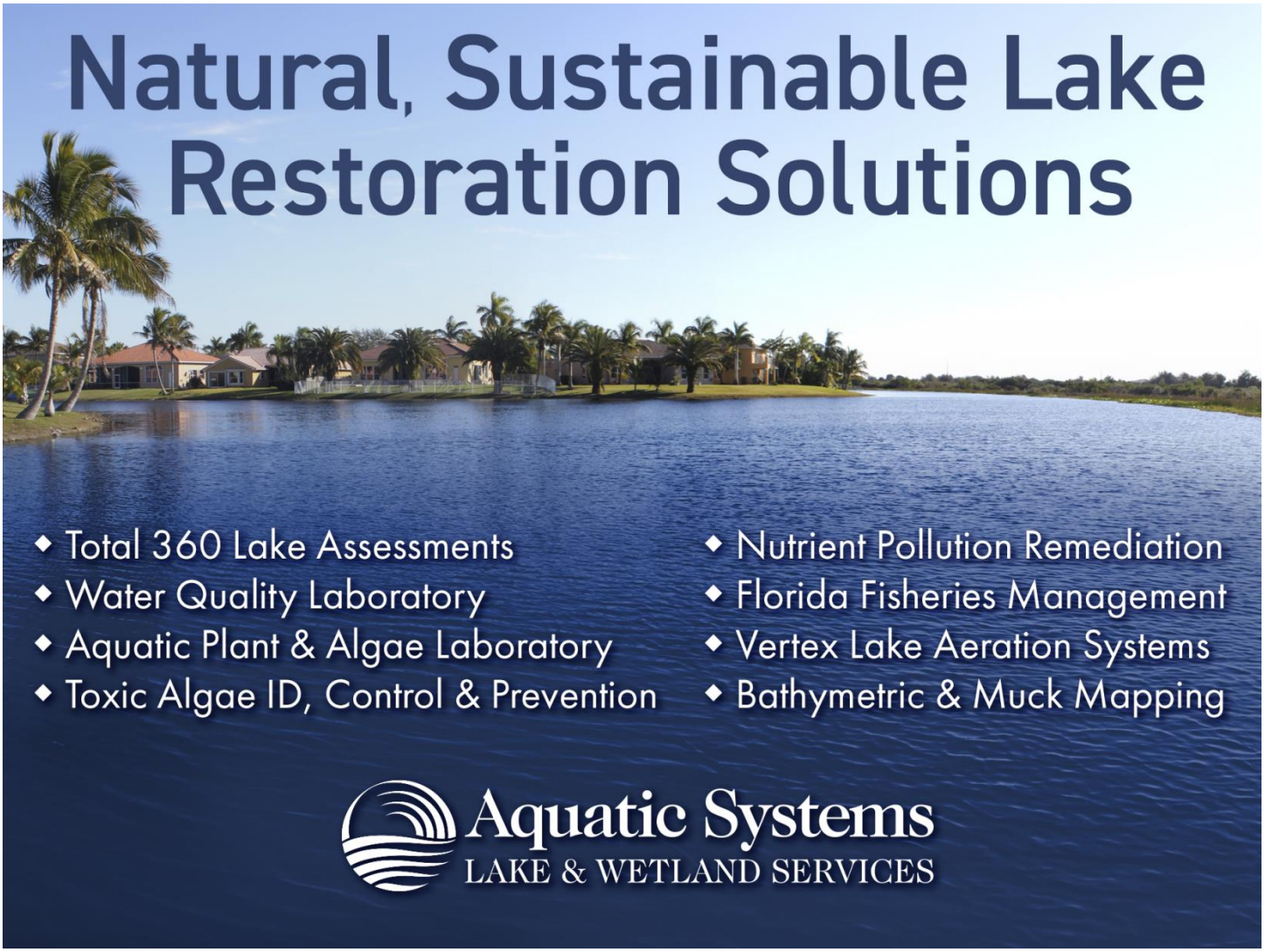

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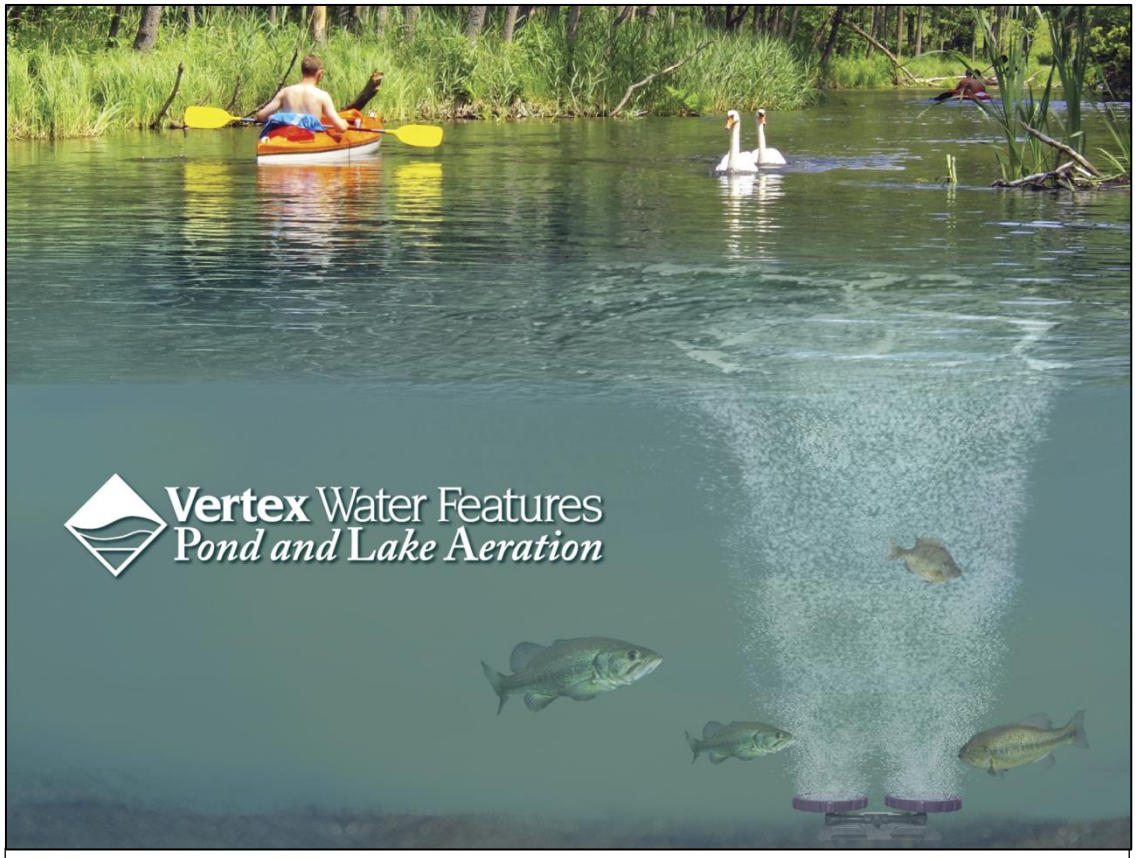

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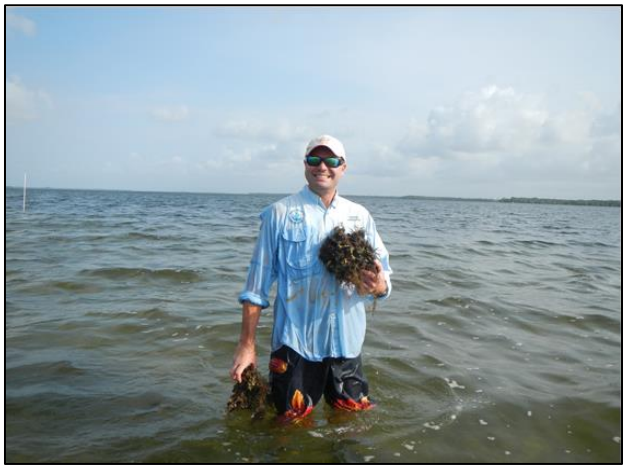
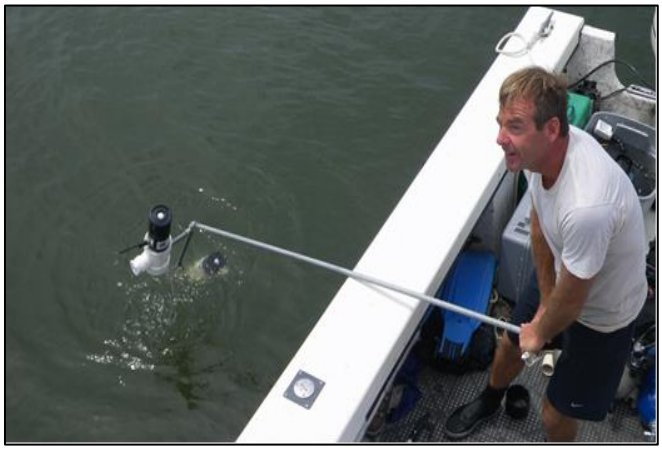
Wednesday Keynote Speakers

Dr. Eric Milbrandt ~ Sanibel Captiva Conservation Foundation - Marine Laboratory Director



Dr. Eric Milbrandt has worked on the disturbance ecology and restoration of mangrove, seagrass, and oyster reef ecosystems. He is also interested in macroalgal diversity and physiology as it relates to environmental conditions and biological interactions. His research interests have been motivated by applying science to improve resource management decisions and to inform the public. He has published articles in international journals such as *Limnology and Oceanography, Estuaries and Coasts,* and *Continental Shelf Research* and serves as an editor/reviewer for the *Journal of Wetland Management and Ecology* and *Marine Environmental Research.* He is an adjunct member of the graduate faculty at Florida Gulf Coast University (FGCU).

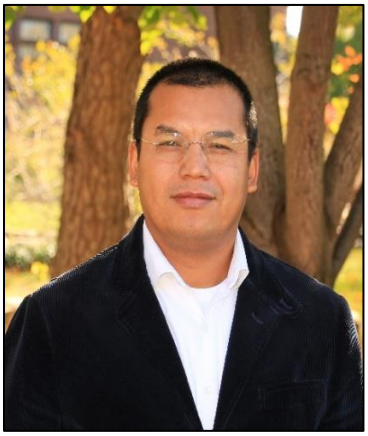
Mark Thompson. M.S. ~ Sanibel Captiva Conservation Foundation Marine Lab Research Associate



Mark Thompson developed and manages SCCF's water quality and seagrass database. He also designs and implements water quality sampling for both nearshore waters and the islands many small stormwater lakes. He applies statistical analyses to interpret complex data (water quality, shell fish, habitat restoration) and writes grant reports. Mark uses Geographical Information System (GIS) data management and analyses to be shared with stakeholders and our members.

Thursday Keynote Speaker

Abuduwasiti Wulamu, Ph.D. (aka Abduwasit Ghulam in publications)
Assistant Professor of Geographic Information Science
Center for Sustainability, Saint Louis University



Dr. Abuduwasiti Wulamu is an Assistant Professor with the Center for Sustainability at Saint Louis University since 2012. He earned his Ph.D. in Cartography & GIS from Peking University in 2006. Then, he joined the Image Sciences, Computer Sciences and Remote Sensing Laboratory (LSIIT) UMR 7005 at University of Strasbourg, France as a Post Doctoral Research Associate. From 2007 to 2009, he held a Geospatial Analyst position in the Center for Environmental Sciences at Saint Louis University. This was followed by an Assistant Research Professor position in the Department of Earth & Atmospheric Sciences held until 2012. Dr. Wulamu has distinguished himself as an educator with dedicated teaching, mentoring and outreach service to his profession. He has developed graduate and undergraduate certificate and degree programs and constructed more than 10 courses in remote sensing & GIS at Saint Louis University. Since 2012, he has mentored 8 doctoral, 12 master students and a post-doctoral researcher and served as a member on a dozen of graduate dissertation committees.

Dr. Wulamu's research focuses on environmental impacts of land cover and land use (LCLU) and climate change, with particular attention to water resources and agriculture. He develops algorithms to characterize the changes to Earth's land cover and integrate remote sensing observations with model-based approaches to understand the impacts of climate and land use changes on the water and energy cycles and ecosystems from local to global scales. As a geo-environmental scientist specializing in remote sensing and GIS applications, he is interested in developing new methods that improve the information content of satellite data for improved LCLU mapping. To this end, he uses multispectral, hyperspectral, and active microwave (SAR/PolInSAR/InSAR) and field observations to map crops, invasive plants, minerals and InSAR data to monitor land subsidence from anthropogenic activities, which are unified by a central theme: monitoring the impacts of climate and land-use changes on the environment using remote sensing and GIS as the primary tool. Currently, he is involved in NASA's Air Quality Applications Science Team (AQAST), and NASA's next mission that will study atmospheric composition, TEMPO (Tropospheric Emissions: Measurement of Pollution), which is scheduled to be launched in 2020. He has authored over 50 peer-reviewed journal publications, one book chapter, and presented more than 30 conference papers and workshops. He has served on NASA review panels, and reviewed several NSF proposals and numerous journal papers.

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FLMS 2017 AWARDS OF EXCELLENCE

The Board of Directors is pleased to announce this year's annual award winners!

THE MARJORIE CARR AWARD

Dr. Jim Griffin

The Marjorie Carr Award *is the Society's highest award and is given for lifetime work on behalf of Florida's aquatic resources. This award is named in honor of Marjorie Carr who, among other things, organized citizens and brought to an end the proposed Cross Florida Barge Canal.*

THE EDWARD DEEVEY, JR. AWARD

Judy Ott

The Edward Deevey, Jr. Award *is given to an individual for contributing to our scientific understanding of Florida's water bodies. Edward Deevey was an internationally recognized limnologist and affiliated with the State Museum of Florida at the time of his death.*

THE MARJORY STONEMAN DOUGLAS AWARD

USF Water Institute Water Atlas Program

The Marjory Stoneman Douglas Award *is given to individuals who report on aquatic resource issues. This award is named in honor of Marjory Stoneman Douglas who authored the book "Everglades: River of Grass", founded the Friends of the Everglades and who has been environmentally active in south Florida.*

THE DR. DANIEL E. CANFIELD, JR. VOLUNTEERISM AWARD

Seminole County SERV Program

The Dr. Daniel E. Canfield, Jr. Volunteerism Award *is given to a volunteer organization or outstanding volunteer for significant contributions to the research, restoration and/or preservation of our water resources. The award is named after Dr. Daniel Canfield, founder of Florida LAKEWATCH, the pioneering citizen-volunteer water quality monitoring program involving over 1,200 lakes statewide, and now being emulated across the United States.*

THE FLMS YOUNG PROFESSIONAL AWARD

Nia Wellendorf

The FLMS Young Professional Award *is presented to a young lake management professional who exhibits exemplary professional accomplishments and a commitment to water resource protection and management of our lakes and watersheds.*

Tuesday Workshops

ADVANCED EROSION CONTROL WITH INNOVATIVE TECHNOLOGIES

Eddie Snell, Applied Polymer Systems, Inc.

Learn how to utilize Polymer Enhanced Best Management Practices (PEBMPs) to protect construction and restoration projects from large and extreme rain events. Anionic Polyacrylamide (PAM) has been used as a soil stabilization and water clarification tool for decades. This workshop will show students the basics of polymer soil/water testing for maximum efficiency and lowest amount of PAM needed for each application. PAM is a very adaptable tool that can be integrated into the existing footprint of existing projects to enhance soil stabilization and turbidity control.
Existing project BMPs, such as perimeter silt fence, check dams, and inlet protection, can be augmented with PEBMPs to increase water infiltration, reduce sediment smothering, and keep soil from site discharge. Stormwater and MS4 managers can quickly create a nutrient mitigation treatment system within existing ditches and canal systems to manage particulate associated nutrients. These systems allow for short-term protection of critical habitat during infrastructure construction and maintenance operations that far exceed existing erosion, sediment, and turbidity BMPs currently in use.

The first half of the workshop will be indoor presentations covering the basics of polymer dosing, soil/water testing, use of PAM blend BMPs with case histories. After the break, part two will be an outdoor display and demonstration of most of these polymer enhanced treatment trains including a live turbidity treatment system. Contractors, project managers, NPDES/MS4 managers, and public works personnel will benefit most from this workshop.

AQUATIC PLANT IDENTIFICATION FOR FLORIDA LAKES AND FLOWING WATERS, THE BASICS.

Nia Wellendorf, Florida Department of Environmental Protection, Gloria Eby, Seminole County,
Kristine Campbell, Florida Fish & Wildlife Conservation Commission
Plant material provided by Lee County Hyacinth District

Who should come? This workshop is for those who have an interest in identifying Florida aquatic plants, particularly those who do Lake Vegetation Index (LVI) sampling or other field work in Florida lakes or flowing waters.

What will be covered? This workshop will include an overview of common aquatic plants in Florida, including hands-on experience and tips on plant identification. The workshop will also cover some challenging groups and confusing look-alikes. Bring your plant identification books/materials!

Morning session

1. Overview--cover most common LVI plants by growth form –emergent, submersed, floating
2. Basic plant ID terminology and using a taxonomic key
3. Common invasive exotics

CITIZEN SCIENCE, A STORMWATER POND MANAGEMENT WORKSHOP

Stephen Montgomery, Allstate Resource Management, Inc. &
Ernesto Lasso de la Vega, Lee County Hyacinth Control District

UNDERSTANDING WATERWAY MANAGEMENT

Objectives:

To understand the requirements for Federal, State and County Regulators while educating and keeping your homeowners satisfied. This segment will cover managing lakes and their ecosystems and familiarize property managers with current industry standards for waterway management including equipment, plants, fish and aquatic weed control.

Agenda:

- What today's educated consumer should look for in a water management company. Lake Management: Aquatic weed and algae control, fish stocking, water quality monitoring, debris removal and aquatic pest control.
- Mitigation is the re-vegetation of beneficial native wetland plant species in a disturbed area that is required by jurisdictional agencies. Discussion will cover littoral shelves, wetland preserves and upland preserves. Topic will cover the replenishment of natural areas within urban communities. Specific beneficial native aquatic plants and exotic invasive plant species will be identified.
- Aeration benefits lake ecosystems by increasing circulation and destratification which helps to control undesirable bacteria. Types of aeration equipment including fountains will be discussed.
- Stormwater systems, inspections, stormwater maintenance and erosion will be presented and discussed.
- Understanding the benefits of wildlife, beneficial plants versus invasive and exotic, which help the property manager to better understand the ecological balance of waterways. This knowledge is helpful in explaining an often misunderstood area to homeowners. Plants and wildlife will be discussed.

AQUATIC PLANTS FOR LAKE WATER QUALITY and "FLORIDA-FRIENDLY" LANDSCAPES

Objectives:

To understand why littoral plants area benefit to the aquatic environment. This seminar will cover the identification of aquatic plants and "Florida-Friendly" plants. It will familiarize property managers with the regulatory standards for "Florida-Friendly" landscapes, and how Best Management Practices (BMPs) affect our ecosystems.

Agenda:

- Benefits of littoral and "Florida-Friendly" plants and their identification.
- What are "Florida-Friendly" landscapes and their principles?
- How Best Management Practices (BMPs) work to protect our environment.

STORMWATER SYSTEMS

Objectives:

To become familiar with the requirements for State, County and Municipal regulations while educating and keeping your homeowners satisfied. This seminar will cover the functions, components and maintenance of stormwater systems. Property managers will gain knowledge in regulatory standards for maintenance and how stormwater systems affect our ecosystems.

Agenda:

- What today's educated property manager should be aware of concerning stormwater systems and regulatory requirements.
- Stormwater systems and their varied components, inspections and maintenance will be presented and discussed.
-

LAKE MAINTENANCE: CONTROLLING WEEDS, ALGAE AND AQUATIC PESTS

Objectives:

To become familiar with the types of aquatic weeds and their EPA approved treatments as well as beneficial aquatic plants. Recommended water testing and how it relates to application of herbicides. How fish stocking and aeration helps to control undesirable plant growth and aquatic pests.

Agenda:

- Licenses and certifications. Weather conditions and water testing as it relates to herbicide applications.
- Herbicides, Larvicides and their proper application situations.
- Beneficial vs. Undesirable Plants and their identification.
- How fish stocking and aeration can benefit lake quality.

WATER QUALITY, FOUNTAINS & AERATION

Objectives:

To become familiar with the components of water quality and recommended testing. Aspects of poor water quality will be discussed to include prevention and remedies. Various types of aeration equipment and their purposes will be described.

Agenda:

- Water Quality
- Thermal Stratification and Nutrient Cycling
- Types of Aeration Systems
- Fountains

AQUATIC PLANT IDENTIFICATION FOR FLORIDA LAKES AND FLOWING WATERS, ADVANCED.

Nia Wellendorf, Florida Department of Environmental Protection and Gloria Eby, Seminole County,
Kristine Campbell, Florida Fish & Wildlife Conservation Commission
Plant material provided by Lee County Hyacinth District

Who should come? This workshop is for those who have an interest in identifying Florida aquatic plants, particularly those who do Lake Vegetation Index (LVI) sampling or other field work in Florida lakes or flowing waters.

What will be covered? This workshop will include an overview of common aquatic plants in Florida, including hands-on experience and tips on plant identification. The workshop will also cover some challenging groups and confusing look-alikes. Bring your plant identification books/materials!

Afternoon session

1. *Ludwigias* in Florida (special attention to "new" exotics)
2. Grasses/Sedges/Rushes
3. Distinguishing tricky submersed taxa OR identifying *Utricularias* OR other topic based on interest or availability of specimens

COLLECTION, COMPILATION, ANALYSIS AND INTERPRETATION OF ENVIRONMENTAL DATA

Harvey H. Harper, Ph.D., P.E. - President Environmental Research & Design, Inc.

This workshop will provide a detailed discussion of techniques for collection, compilation, and analysis of environmental data such as a lake monitoring program. Techniques, methods, and reasons for collection of field data, water samples, light attenuation, and sediments will be discussed, along with recommendations for parameters to be analyzed and requirements for analytical laboratories. Recommendations will be made for methods to compile data in the most useful formats, and sources for historical environmental data will also be addressed. Data presentation and analysis will be discussed in formats such as tables, graphs, box and whisker plots, scatter diagrams, and combinations of different formats. Probability distributions for environmental data will be discussed, and methods of estimating central tendency of data sets will be addressed, along with the pros and cons of various methods. Examples of actual data will be used to illustrate how data can estimate trophic status and identify water quality issues and sources of pollutant loadings. Nutrient limitation will be discussed, along with the differences between nutrient limitation and nutrient reduction methods to decrease algal productivity. Common theoretical and procedural errors in using and calculating trophic state and nutrient limitation will be discussed. The workshop will include a discussion of internal recycling and methods to identify and quantify this internal source which is often ignored in lake studies and TMDL evaluations. This workshop is intended for persons responsible for lake monitoring programs and those who use the data to make informed decisions regarding lake conditions and selection of restoration efforts.

Session Abstracts

Session A1: Nutrient Reduction and Management

Moderator: Harvey Harper
Wednesday, June 7, 2017. 10:35 am to 11:55 am

SEMINOLE COUNTY SOLDIERS CREEK NUTRIENT REDUCTION FACILITY

Harvey H. Harper, Ph.D., P.E.
President – Environmental Research & Design, Inc., Orlando, FL

The Soldiers Creek drainage basin is a 6,608 acre highly urbanized drainage basin which discharges into the west end of Lake Jesup. On an average annual basis, the Soldiers Creek basin contributes approximately 11% of the runoff volume discharging to Lake Jesup and 10% of the annual runoff-related phosphorus loadings. Discharges through Soldiers Creek are highly variable, ranging from no flow to discharges in excess of 50 cfs following significant rain events. During 2012, an alum-based nutrient reduction facility (NuRF) was proposed for Soldiers Creek near the intersection of Soldiers Creek and CR 427 at an existing wet detention facility owned by Seminole County. The proposed alum treatment system diverts water from Soldiers Creek into the existing wet detention pond where the inflow is treated with alum and the generated floc is collected in a collection trough. The project is a joint effort between Seminole County and FDOT which uses the load reductions achieved within the alum treatment system to compensate for a proposed road widening project along portions of US 17-92 in Seminole County.

Field monitoring was conducted by ERD from July-October 2010 to evaluate the characteristics of discharges through Soldiers Creek at the proposed treatment site. Measured concentrations of total phosphorus in Soldiers Creek ranged from 77-192 μg/l, with an overall geometric mean of 141 μg/l, and approximately 80% of the total phosphorus comprised of SRP. Laboratory jar testing indicated that an alum dose of approximately 10 mg Al/liter would be required to reduce total phosphorus concentrations to approximately 10 μg/l or less. Annual loadings of total phosphorus at the Soldiers Creek treatment system site are approximately 1,267 kg/yr, with the proposed system estimated to remove approximately 969 kg/yr.

Design of the Soldiers Creek treatment system was completed during 2015, with construction initiated during 2016 and completed in March 2017. The floc generated by the alum treatment process is collected in a settling trough, with floc disposal occurring on a daily basis into an adjacent sanitary lift station. Floc can also be pumped into a series of on-site storage tanks or into a tanker truck for delivery to a wastewater treatment facility. When operating at the maximum capacity, the system will generate approximately 26,926 gallons of floc per day. The construction costs for the system was approximately $7.2 million which was funded by FDOT. Of this amount, approximately 20% is related to the alum treatment process itself, with the remaining portion required for floc collection and pond enhancements. Annual alum usage is expected to be approxi-

mately 276,000 gallons at a cost of $124,000 per year. Annual O&M costs are expected to be approximately $50,000 per year which includes floc disposal. The calculated 20-year present worth cost for phosphorus removal is approximately $685 per kg which is 2-3 times higher than typical phosphorus removal costs associated with alum stormwater treatment as a result of the extensive system for floc collection.

LAKE DOWN NEW ALUM TREATMENT FACILITY, ORANGE COUNTY

David Hansen
Senior Environmental Specialist, Orange County Environmental Protection Division, Orlando, FL

Lake Down is considered the headwater of the Butler Chain-of-Lakes, a series of 11 interconnected lakes located in southwest Orange County. The Butler Chain-of-Lakes is designated as an Outstanding Florida Water.

A comprehensive assessment of hydrologic and nutrient budgets performed in 2007 was prompted, in part, by a short-lived "impaired" designation for Lake Butler, another one of the lakes in the chain. This designation, in addition to short term algal blooms, understandably, led to concern on several fronts in finding ways to maintain the historically excellent water quality in the Butler Chain-of-Lakes.

Lake Down is approximately 930 acres in size with an average depth of about 16'. As mentioned, Lake Down serves as the headwaters of the Butler Chain-of-Lakes with water flowing generally south through the other 10 interconnected lakes. The contributing watershed for the lake is almost 2,200 acres in size and is divided into 24 sub-basins. The aforementioned assessment pointed at two of these sub-basins, 15 and 9, as being the most significant sources of total phosphorus (TP) loading to Lake Down. Sub-basin 15, where this facility is located, at approximately 377 acres in size, was estimated to contribute 228 kg TP per year or about 50% of the total annual TP load to the lake. This translates to nearly 15% of the TP loading to the entire chain of lakes.

The Lake Down Alum Facility was substantially completed in January of 2016. It was constructed on a 5.24 acre parcel near the northwest shore of Lake Down. It consists of a 3.5 acre settling pond; main building containing a 5,000 gallon alum tank, alum and water pumps, programmable logic controller (PLC) and telemetry; an out-shelter housing flow meter control and telemetry; internal road and stormwater facilities; and diversion weirs and flume which bring stormwater and base flow into the facility for treatment. The facility is expected to reduce the TP loading from sub-basin 15 into Lake Down by approximately 182 kg/yr or 80%.

Still to come at the facility will be a dedicated water quality monitoring program and educational program.

LESSONS LEARNED: PINELLAS COUNTY ALUM FACILITIES

Robert Burnes M.S., M.A.S
Environmental Specialist, Pinellas County Public Works Environmental Management, Clearwater, FL

Beginning in 2004, Pinellas County started the process of implementing the first of a proposed eight alum treatment facilities on Lake Seminole (5 facilities) and Lake Tarpon (3 facility). The goal of these facilities was to reduce the nutrient inputs from stormwater run-off prior to entering the lake systems. Starting in the design phase, running through construction, monitoring and the operation and maintenance phases of the projects, there has been much learned about best practices and the nuances for management of alum treatment systems. In the 13 years since many of the original ideas have been modified. This includes reducing the number of systems to five (4 on Lake Seminole and 1 on Lake Tarpon), redesigning the site layouts, updating equipment to newer technology, providing extra protection measure for equipment (e.g. security cameras, lightning protection, secondary pump protections) and modification of operation and maintenance procedures. The goal of this presentation is to identify areas of improvement, revisit shortcomings and provide recommendations for best management and operations practices.

LESSONS LEARNED: LAKE COUNTY WATER AUTHORITY NUTRIENT REDUCTION FACILITY (NuRF)

Ron Hart[1] and Sergio Duarte[2]
[1] Water Resources Director and [2] Water Resources Project Manager, Lake County Water Authority, Tavares, FL

The Lake County Water Authority Nutrient Reduction Facility (NuRF) was designed as an off-line, gravity fed treatment system, with the purpose of removing phosphorous and other pollutants flowing out of Lake Apopka (via the Apopka-Beauclair Canal) into Lake Beauclair and the rest of the Harris Chain of Lakes.

The operation of the NuRF includes the management of (1) water conveyance systems (inflow and outflow canals), (2) alum addition and settling process utilizing two 9-acre ponds, (3) removal of the alum flocculent/sludge at the ponds with two remote control floating dredges, (4) pumping of the sludge to a macerator and a mixing/holding tank, (5) treatment of the sludge with polymers utilizing a large centrifuge to dewater the alum flocculent and form a cake-type material that is left to dry in the sun.

Since the NuRF became operational in 2009, numerous improvements have been accomplished in response to operational difficulties, equipment failures and newer technologies. These issues include: erosion on the canal slopes, backflows caused by low water flows at the designated alum injection points, presence of large amounts of aquatic plants blocking the inflow canal, sinking of the floating dredge equipment, alum storage tank (poly tank) leakages and alum crystallization issues. We have also incorporated better monitoring and alarm systems via smartphones to respond to power outages and false pH readings below design parameters.

The goal of this presentation is to share the improvements accomplished at the NuRF and provide recommendations for best management and operational practices at alum facilities.

Session B1: Lake Hancock and Okeechobee - Restoration and Management

Moderator: Shannon Wetzel
Wednesday, June 7, 2017. 1:30 pm to 2:35 pm

LAKE HANCOCK: UNDERSTANDING THE MULTIPLE INFLUENCES ON WATER QUALITY IN FLORIDA'S MOST POLLUTED LARGE LAKE

David Tomasko, Ph.D.
Senior Scientist/Principal Associate – Environmental Science Associates, Tampa FL

Lake Hancock has been "Florida's most polluted large lake". Impacts to Lake Hancock include hydrologic modifications, nutrient loading from industrial and municipal wastewater discharges, and stormwater runoff. In addition, Lake Hancock is located in the Bone Valley Formation, where phosphorus-rich geology results in natural nutrient enrichment. While paleolimnological studies have concluded that the lake likely never would have met FDEP's default water quality target of 20 µg chlorophyll-a / liter, there is no doubt that the lake has seriously degraded water quality. With average chlorophyll-a values in excess of 100 µg / liter, and peak values higher than 700 µg / liter, Secchi disk depth measurements have been measured at less than 10 cm. Concentrations of Total Nitrogen can be in excess of 10 mg / liter, which resulted in stormwater load reduction targets in excess of 70 percent in the draft TMDL for the lake. Recent studies have given rise to a more refined and lake management paradigm, one that includes the impacts of legacy nutrient loads, artificial lake lowering, the loss of historical wetland influences, and the influence of nitrogen-fixing cyanobacteria. Results from lake management activities completed by the Southwest Florida Water Management District will be discussed, in terms of their ability to support or refute the accuracy of evolving strategies for managing the ecological health of Lake Hancock.

LAKE HANCOCK: MFL RECOVERY, WATER QUALITY AND MORE

Randy Smith, PMP
Southwest Florida Water Management District, Brooksville, FL

Over the last 150 years, cumulative effects of land use changes and water withdrawals have altered the hydrology of the upper Peace River watershed. These activities have significantly reduced the watershed's ability to store and recharge rainfall, which, in combination with groundwater withdrawals, has resulted in lower local and regional groundwater levels, extended periods of low or nonexistent river flows in the upper Peace

River during the dry months, degraded water quality and altered ecosystems. To address problems with low flows in the upper Peace River, the District developed minimum flows and levels (MFLs) for the river in 2002. An MFL is the limit where reduced flows or further withdrawals will cause significant harm to the water resources of the area and the related natural environment. Currently, the upper Peace River from Bartow to Zolfo Springs does not often achieve the MFL. The District developed a recovery strategy for the upper Peace river in 2006 and Lake Hancock was an integral component of that strategy. The Lake Hancock projects, Lake Level Modification and Outfall Treatment Wetland, are two initiatives that are critical to the District's recovery strategy for meeting the minimum flows in the upper Peace River, restoring natural systems, improving water quality and protecting Charlotte Harbor. The goal of the Lake Level Modification Project is to store water by raising the control elevation of the existing outflow structure on Lake Hancock and to control the release of that water during the dry season to help meet the minimum flow requirements in the upper Peace River between Bartow and Zolfo Springs. The goal of the Outfall Treatment Wetland project is to improve water quality discharging from Lake Hancock and throughout the entire Peace River. The projects will also provide up to 17 cfs of recharge, preserve 4,800 acres of floodplain, restore 1,000 acres of wetlands and restore the historic level of Lake Hancock.

SOUTH FLORIDA ECOSYSTEM RESTORATION (SFER) PROGRAM

Kimberley Taplin and Howie Gonzalez
U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL

The South Florida Ecosystem Restoration (SFER) Program stretches from the southern Orlando area southward across the Everglades, the Florida Keys, and the contiguous and near-shore waters of South Florida, and across South Florida from east to west including portions of the drainage areas of the Indian River Lagoon and the Caloosahatchee River, as well as population centers along the southeast and southwest coasts. The project area is defined by the political boundaries of the South Florida Water Management District (SFWMD), and includes all of the Everglades. It encompasses an area of approximately 18,000 square miles, which includes all or part of 18 counties in the southeast part of the state of Florida.

The objective of the SFER Program is to restore, protect and preserve the South Florida ecosystem, including the Everglades, while providing for other water related needs of the region. The SFER Program includes the Central and Southern Florida (C&SF) Project, which includes the Comprehensive Everglades Restoration Plan (CERP), the Kissimmee River Restoration Project, the Everglades and South Florida (E&SF) Restoration Project, and the Modified Waters Deliveries to Everglades National Park Project, is implemented to address adverse environmental impacts caused in large part by the C&SF flood project's modification of historic Everglades flows.

The presentation will provide the background, status, and path forward for the SFER Program.

LOOKING TO THE PAST TO RESTORE AND PROTECT FLORIDA LAKES FOR THE FUTURE: USING PALEOLIMNOLOGY IN LAKE MANAGEMENT

Melanie A. Riedinger-Whitmore, Francesca M. Lauterman, Thomas J. Whitmore, Daniel L. Franklin, and Christine R. Leonard
Department of Biological Sciences, University of South Florida St. Petersburg, St. Petersburg, FL

Effective management of Florida lakes, and the establishment of realistic goals for Total Maximum Daily Loads (TMDL), require a strong understanding of pre-disturbance environmental and water quality conditions, and evidence for how these conditions have changed over time. Defining reference conditions is challenging because limnological data exist for very few Florida lakes prior to the 1980s. Historical data about nutrients, biological communities, watershed-level changes, anthropogenic impacts, and natural environmental variation are needed to design meaningful restoration targets, and to restore the ecological character of lake ecosystems. Paleolimnology has been used successfully to document past lake water quality and environmental conditions in Florida, and it is considered an established and accepted approach to determine reference conditions for water quality management. Paleolimnogical studies provide lake managers with a wealth of biological and geochemical information that can be used to make informed decisions that address impaired sites, and protect and conserve fragile lake ecosystems. In this presentation, we describe common paleolimnological methods, such as fossil diatoms, sedimented cyanobacteria and algal pigments, plant macrofossils, nutrient geochemistry, and stable isotopes, and discuss how they can be used to document historical impacts on water quality and lake biota. We provide case studies of our past and current paleolimnological research on Florida lakes, and identify how these studies are being used to address specific lake-management issues.

Session B2: Indian River Lagoon and Nutrient Reduction

Moderator: Mark Hoyer
Wednesday, June 7, 2017. 2:35 pm to 3:40 pm

THE CHALLENGES OF INTEGRATING *IN SITU* DATA IN CRITICAL WATERSHED LOADING MODELS: A CASE STUDY FROM THE INDIAN RIVER LAGOON

Claudia M. Listopad[1], Ph.D., GISP and Ellen Eveland[2], P.E.
[1]Applied Ecology, Inc. and Florida Institute of Technology, Melbourne, FL
[2]3E Consultants, Inc., Tampa, FL

To implement the Federal Clean Water Act locally, the Florida Department of Environmental Protection adopted Nitrogen and Phosphorus Total Maximum Daily Loads (TMDLs) in 2009 for most of the Indian River Lagoon (IRL). Basin Management Action Plans (BMAPs) to implement TMDLs for the Banana River, North IRL and Central IRL were adopted in early 2013. During TMDL and BMAP development, local governments shared concerns regarding the age, quality, degrees of freedom, spatial accuracy and temporal resolution of data

used to develop IRL TMDLs. A consortium of eighteen local, state and federal interests jointly funded a research team to refine IRL TMDLs using data sets and computational power that were not available during initial TMDL development. Available data were analyzed and a new geo-spatial load-estimating model, the Spatial Watershed Iterative Loading Model (SWIL), was built for the IRL. The original goal of this model development was to allow new load-response relationships to be developed and eventually adopt it for load reduction allocations among stakeholders.

Since 2015, the FDEP-reviewed SWIL model has been used to fill an immediate need to prioritize management decisions and efforts by local stakeholders. Simulations of catchment generated stormwater and baseflow loads have been completed across spatial scales, based on a myriad of updated input data, with several goals in mind. This session presents a unique case study from two military bases, the Patrick Air Force Base and Cape Canaveral Air Force Station, which incorporates the largest continuous field-data monitoring record for complementary stormwater and baseflow information within the Indian River Lagoon watershed.

The simulation results provide a critical link between modeling efforts among the scientific community and immediate "real-world" application, desperately needed to restore our Indian River Lagoon. Understanding which catchments are likely to be hotspots of TN or TP loads in the watershed is the first step in developing a priority list of projects to implement and channel funding and resources to very specific areas. In addition, obtaining empirically driven contributions and magnitudes of baseflow versus stormwater loads across temporal and spatial scales, provides managers with very pinpointed guidance when selecting the most suitable projects by basin.

Simulation results incorporating the extensive dataset of runoff coefficients and event mean concentrations for both baseflow and runoff coefficients are compared to the currently approved watershed loading models. In this specific case study, the presented simulations based on in situ data provide an example of when conventional Basin Management Practices (BMPs) might not provide the most efficient and cost-effective solutions for the restoration of the Indian River Lagoon. Challenges and lessons learned on selecting the most appropriate sampling locations, best methodologies for data collection, and analyses will also be discussed.

INDIAN RIVER LAGOON: PERFECT STORM OR NEW NORM

Charles Jacoby, Margaret Lasi, Lori Morris, Rex Ellis, Ali Simpson, Jan Mille,
Robert Chamberlain, Ron Brockmeyer and Erica Hernandez
St. Johns River Water Management District, Palatka, FL

The Indian River Lagoon extends for 156 miles along Florida's central east coast, and this barrier island lagoon generates billions of dollars in revenue for the region. The system is diverse, shallow and microtidal, without flow from a major river. These characteristics support the lagoon's diversity and make it vulnerable to people's activities. In fact, people have altered the system since the mid-1700s, and major portions are impaired by excess loads of nutrients. Stakeholders are working to meet mandated total maximum daily loads by 2028, but they are concerned that recent events indicate a shift in the ability of the lagoon to cope with nutrients. For

example, the intensity, duration and composition of phytoplankton blooms have changed since 2011, which suggests a potential regime shift. The increased phytoplanktonic biomass has led to fish kills, and shading and loss of seagrasses. As we implement projects that reduce nutrient loads, restore natural cycling of nutrients and increase consumption of phytoplankton, we also are improving our understanding of the lagoon's nutrient budget and the factors that initiate and control phytoplankton blooms. Bottom-up drivers of increased phytoplankton production include nutrients delivered in surface water runoff, injected via submarine groundwater and released from accumulated "muck." Changes in the abundance of macroalgae and seagrasses alter storage and cycling of nutrients, which affects the availability of nutrients for phytoplankton. Environmental conditions influence the composition of blooms, and blooms of certain taxa may escape top-down control by filter feeders. Overall, the situation in the Indian River Lagoon points to a need to consider the effects of events when managing nutrient inputs.

HYDROLOGY DICTATES THE THRESHOLD PHOSPHORUS-LOADING RATE IN SHALLOW LAKES

William F. Kenney[1], Matthew N. Waters[2] and Mitra B. Khadka[3]*
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The Alternative Stable States Model describes the functioning of shallow lakes as a contrast between periods of lesser external phosphorus (P) loading when macrophytes dominate and periods of greater external P loading that cause a shift to phytoplankton dominance. Identification of the P-loading rate that determines the contrasting stable states, i.e. the threshold phosphorus loading rate (TPL), is fundamental to shallow lakes science and management. We used data from nine shallow Florida lakes and the shallow Silver River, Florida to generate a parsimonious model that predicts the TPL from the hydraulic detention time (HDT). A comparison with data from lakes in Asia, Africa, Europe, North America and South America, shows that the Florida model has global applicability. The majority of lakes are shallow, so our findings will improve the understanding and management of many freshwater systems throughout the planet. In warmer regions, the Florida model predicts that climate change in the form of decreased rainfall can have negative consequences for both macrophyte-dominated and phytoplankton-dominated shallow lakes. Lakes with shorter HDT (<1 year) will be more sensitive to decreased rainfall than lakes with longer HDT (>10 years).

SUBTROPICAL LAKES ARE EFFECTIVE CARBON SINKS: EXAMPLES FROM FLORIDA, USA

William F. Kenney[1*], *Matthew N. Waters*[2], *Mark Brenner*[1&3] *& Benjamin C. Webster*[4]
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Recent studies showed that the sediments of temperate water bodies are effective sinks for organic carbon, but there are few carbon burial estimates for subtropical lakes. Thousands of subtropical lakes in Florida (USA) possess organic sediment that typically has accumulated continuously since the early Holocene. We used ^{210}Pb-dated sediment cores from 11 shallow (z_{max} < 10m) Florida lakes to estimate recent organic carbon (OC) burial in these systems. Our results show that among natural freshwater ecosystems, shallow Florida lakes have high OC content in their sediments (~30% of dry mass), which are effective sinks for OC (60 – 200 g C m^{-2} a^{-1}). Considering that Florida has over 9,000 km^2 of lakes, OC burial in these aquatic systems accounts for as much as 1% of global OC burial (170Mt). We did not find an inverse relationship between lake size and OC burial in Florida, as has been observed in lakes of temperate regions. In our data set, organic carbon burial rate increased as a consequence of recent cultural eutrophication, and the associated shift from macrophyte to phytoplankton dominance reduced the efficiency of OC burial, with respect to phosphorus loading. The relatively high OC burial estimates for lakes in Florida (USA) demonstrate the carbon-sequestration potential of subtropical lakes throughout the world.

Session B3: Lake and Stormwater Pond - Restoration and Management

Moderator: Ernesto Lasso de La Vega
Wednesday, June 7, 2017. 4:00 pm to 5:35 pm

STORMWATER PONDS OF SOUTH AND SOUTHWEST FLORIDA: SUMMARY OF A 12-YEAR LIMNOLOGICAL INVESTIGATION

Serge Thomas
Florida Gulf Coast University, Fort Myers, FL

Stormwater ponds constitute an obvious landscape element of south and southwest Florida. E.g. southwest Florida has over 10,000 stormwater ponds 1-40 ha in size for a combined surface area of 100 km^2 which accounts for 1.5 times the surface area of the Caloosahatchee River. Some could be dated back to 1962 but their presence especially increased in the 80ies when they were mandated to be associated with urban development as a water treatment feature. Per Chapter 62-40 of the Florida Administrative Code, manmade stormwater

ponds aim to i) prevent land erosion, ii) provide pollution runoff control via filtration and decantation and iii) reestablish the natural hydropatterns in the region thus allowing aquifer recharge and adequate 80% pollutant free freshwater deliveries. However, the water and sediment characteristics of the ponds studied since 2005 in south (n=25) and southwest Florida (n=50) often reflect high pollutant (and especially nutrients) loads. Pollutants most likely originate from the surrounding fertilized lawns and golf courses, the surrounding paved watershed (e.g. roads and parking lots) and from groundwater influxes (n= 4). Eutrophication is often masked with the use of algaecides which negates biological filtration and increases the pollutant load in these ponds (e.g. copper accumulation). Additionally, ponds do not seem to recharge the aquifer since groundwater mostly replaces evaporative losses. As alarming is that oligotrophic and mesotrophic ponds which grow large expanse of Everglades like periphyton and littoral vegetation are perceived as "impaired" and treated as such with algae- and herbicides. As such, it does not appear that stormwater ponds offer a sustainable solution to mitigate the effects of urbanization. Treatment wetlands would most likely be a better choice but would greatly conflict to what real estate and people desire, i.e. a "lake view" with lush lawns abutting the water. Compromises are thus offered.

SANIBEL COMMUNITIES FOR CLEAN WATER BEST MANAGEMENT PRACTICE PROGRAM

Dana Dettmar
City of Sanibel, Natural Resources Department, Sanibel, FL

The City of Sanibel, in conjunction with the Sanibel-Captiva Conservation Foundation (SCCF) Marine Lab, performed water quality sampling in lakes and ponds across the Island as part of the Sanibel Communities for Clean Water Program. The program provides both City staff and the public with baseline data on the status of water quality within waterbodies throughout the Island. The data collected is presented on an interactive website, which will allow residents to see how their community lake ranks in water quality, based on U.S. EPA and FDEP numerical nutrient criteria, when compared to other waterbodies on the Island as well as the state standards. Through the website, residents will be able to examine what role they can play in protecting water quality, and how their actions can improve the health of their lakes, wetlands and other waterbodies. The program will recommend best management practices (BMPs) to improve water quality tailored to each individual community with the goal that residents will adopt these environmentally friendly measures.

"RECOVERING LOST TREASURES" AQUATIC RESOURCES RESTORATION

Stephen Montgomery
Allstate Resource Management, Davie, FL

Aquatic resources in South Florida have great ecologic, financial, and cultural importance. Our lakes, canals, and wetlands are the foundation for sustainable existence. They create a complex watershed that requires management in order to function properly. Invasive species can cause detrimental effects and when regular

maintenance efforts fall short, degradation of the resource starts to occur. Badly degraded waterways and wetlands require direct, specialized efforts to recover before they become irrevocably damaged and lost. The techniques and tools used in aquatic restoration are situation specific and careful planning is needed to coordinate an appropriate response. This presentation will review how to develop restoration work plans and which techniques and tools are best suited to various problems.

RESTORING THE LAKES OF KELLY GREENS

Robbin Huffines
Aquatic Systems Inc. Fort Myers, FL

Kelly Greens is a golf course community in Fort Myers, Florida that was constructed in 1987 and 1988. They have 18 lakes and 2 wetlands that comprise 43.9 acres. As these lakes aged the community began experiencing many problems relating to their lakes and water quality. In August 0f 2014 Aquatic Systems gathered data to assess the current site conditions relating to water clarity, nutrient levels, bottom muck accumulations, midge fly larvae counts, and current fish populations. With this initial data a comprehensive restoration plan was developed to address the lakes problems. Beginning in early 2016 the restoration work began including native fish stocking, lake shoreline buffer plantings, lake aeration system installations, and alum applications. Routine sampling was done throughout the project to document any improvements. The lakes have experienced improved dissolved oxygen levels throughout the water column, reductions in nitrogen, ammonia, and phosphorus, improved water clarity, and reductions in midge fly larvae. These improvements have resulted in greater wildlife usage and reductions in chemical applications for algae, weed, and midge fly control. This successful lake restoration project not only benefits the residents of Kelly Greens, but the receiving water bodies, for all of their summer rain discharge, as well.

GATED COMMUNITIES: IMPEMENTING A LAKE MANAGEMENT PROGRAM WITH A CAPTIVE AUDIENCE

Jim Niehaus

UF IFAS LAKEWATCH Volunteer & Florida Master Naturalist, Cape Coral, FL

Gated communities in South Florida are known for their beautiful lush landscape and expansive waterways. These communities attract a diverse population that brings varying knowledge, perceptions, attitudes and behaviors concerning environmental quality. Residents are united through investment and share a common appreciation of their community, which can allow for productive dialog regarding environmental concerns.

What are the key characteristics of a gated community that facilitate implementation of long-term waterway management program? Goals are increase resident environmental awareness and sensitivity, reduce chemical use, promote biodiversity and realize value added.

Environmental management begins with the developer maintaining high standards in stormwater pollution prevention measures during construction and timely installation of shoreline buffer vegetation. Ongoing

maintenance of waterway health depends on commitment by management, complimented through a committee of residents to serve as watchdogs, data gatherers and educators. Partnerships are formed through selection of landscape and lake maintenance vendors who recognize the long-term vision, openly collaborate and offer alternative non-chemical treatment methods. Voluntary participation in UF IFAS LAKEWATCH and attendance of Florida Lake Management Society training workshops can serve as a catalyst for successful program development.

Resident education can be accomplished through:

- Utilizing weekly newsletters to alert residents to environmental issues (for example: wildlife sightings and interesting facts, ongoing and new project updates, irrigation and fertilizer restrictions including BMPs, mosquito control treatments).
- Conducting regular presentations to residents that include overview of stormwater management system and purpose, function of littoral plants, lake biology, aquatic pests and invasive species, integrated pest management, completed and planned environmental projects.
- Developing a food web to illustrate the relationships and dependencies of the waterway inhabitants can enlighten residents on the importance of biodiversity and healthy habitat. Aquatic pests and invasive species should be incorporated.
- Posting relevant environment resources to a dedicated page on the community website.

In summary, early establishment of a waterway management program and ongoing education of residents can influence attitudes and behaviors towards the environment. Linking waterway health to property values is certain to capture the interest of homeowners.

References:

Community Associations and Stormwater Management: A Coastal South Carolina Perspective, www.scseagrant.org/pdf_files/commassoc_stormwtrmgmt.pdf

LAKEWATCH, University of Florida Institute of Food and Agricultural Science, www.lakewatch.ifas.ufl.edu

Florida Lake Management Society, www.flms.net

SWEEP THE STREET IN FRONT OF YOUR OWN HOME: VOLUNTEERS ADOPT COMMUNITY STORMWATER PONDS

Ernie Franke
Chairman of the Wetlands Committee, The Shores of Long Bayou, St Petersburg, FL

An old proverb says, "Sweep the street in front of your house," meaning if everyone swept in front of their own door, the whole world would be clean. There's a war going on, right at our doorsteps. Florida is blessed with stormwater ponds, originally built to control flow and water-level. With a booming population, the need to control water-quality, the quantity of nutrients entering Tampa Bay's estuaries, is quickly becoming the prime necessity for these stormwater ponds. These nutrients contribute to harmful algae blooms and red-tide, with the fight best handled as close to the source as possible.

We ask the question, "What can we, as a small community, do to improve our part of the estuary?" In order to make a change, we need to concentrate on changing attitudes, which leads to a change in voting for conservation issues and stepping forward with volunteerism at the community association level. This comes about by knowing what can be done, volunteers experiencing the change, and having adequate guidance through the process. We have experienced this metamorphosis over the last seven years in our community.

With a dozen stormwater ponds and two lakes, we are in an excellent position to develop techniques that can be used for rejuvenating stormwater ponds. We have rejuvenated eight stormwater ponds and instituted an in-house adopt-a-pond program. Through our website and presentations at county and state levels, we have been able to share our lessons-learned for mobilizing a force of change. Our goal is to provide a "non-chemical" approach to stormwater pond maintenance. We have established a showcase of ponds around our clubhouse to share our findings at the local, regional and state levels. We instill a conservation attitude within our condo community. We have conducted multiple tours and open-houses for communities, showing what can be done.

Poster Session

Session Lead: Gloria Eby & April Verpoorten
Wednesday, June 7, 2017. 6:00 pm to 8:00 pm

DISTRIBUTION OF MICROPLASTICS IN CHOCTAWHATCHEE BAY, FL

Isaac Todd, Richard Gray, and Dana Stephens
Mattie Kelly Environmental Institute and Northwest Florida State College, Niceville, FL

During 2016-2017, water samples were collected in Choctawhatchee Bay, FL to identify distribution of microplastics. Water samples were collected monthly, spanning northern, southern, eastern, and western regions of the Choctawhatchee Bay. Surface water samples were collected and stored in 1-L plastic bottles. Samples sat for a week at room temperature before 1-L of water was filtered through 0.45 micron sized gridded filter paper. Once filtered sampled dried, microplastics (i.e., fibers, fragments, beads, and films) were counted with a Swift microscope at 10x magnification and at 40x, if needed to distinguish from organic material. Total microplastic counts are a sum of fibers, fragments, beads, and film plastics. There were 67 total samples collected in Choctawhatchee Bay from April 2016 to March 2017. Of the 67 samples, there were 227 total microplastics found across the Choctawhatchee Bay. Total combination of microplastics included fibers (n= 55), fragments (n= 123), beads (n= 49), and film (n= 0). Summary statistic analysis showed the mean total of microplastics was 3, median was 2, minimum was 0, maximum was 52, and Coefficient of Variation (CV) was 225% in Choctawhatchee Bay. One-way analysis of variance showed significant differences ($p < 0.05$) in mean total microplastic samples among north, southern, eastern, and western regions of Choctawhatchee Bay. Tukey-Kramer HSD indicated mean total microplastics significantly differed in the southern region from all other regions of

Choctawhatchee Bay. Specifically in the north region mean total microplastics was 1.6. Mean was 1.63 in the east region, mean of 1.2 in the west region, and mean total microplstics of 6.08 in the south region.

DISTRIBUTION OF MICROPLASTICS AMONG THREE LARGE FLORIDA BAYS

Richie Gray, Isaac Todd, and Dana Stephens
Mattie M. Kelly Environmental Institute and Northwest State College, Niceville, FL

Microplastics are pieces of plastic that have broken down over time and are 5mm or less in size. This study examined the distribution of microplastics in three major Florida bays (Pensacola Bay, Choctawhatchee Bay, and Tampa Bay). Citizen scientists with Choctawhatchee Basin Alliance (CBA) collected samples from the Choctawhatchee Bay and other environmental entities and citizen scientists collected samples from the Pensacola Bay and Tampa Bay. These efforts were part of the University of Florida's Florida Microplastic Awareness Project. All samples were collected at the surface and 1-L collected in plastic bottles. Water samples sat at room temperature for a week prior to being filtered through a 0.45 micron sized gridded filter paper. Total microplastics were counted with a Swift microscope at 10x magnification and with 40X if difficult to distinguish from organic material. There were 19 total microplastics samples collected in Pensacola Bay in February 2016. Of the 19 samples, there were 143 total microplastics found in Pensacola Bay. There were 67 total microplastic samples collected in Choctawhatchee Bay from April 2016 to March 2017. Of the 67 samples, there were 227 total microplastics. There were 4 total microplastic samples collected in Tampa Bay from January to March 2016. Of the 4 samples, there were 95 total microplastics found. Summary statistics analysis for Pensacola Bay showed the mean total of microplastics was 15, median was 5, minimum was 0, maximum was 64, and Coefficient of Variation (CV) was 70%. Summary statistic analysis for Choctawhatchee Bay showed the mean total of microplastics was 3, median was 2, minimum was 0, maximum was 52, and CV was 225%. Summary statistic analysis for Tampa Bay showed the mean total of microplastics was 4, median was 2.5, minimum was 0, maximum was 11, and CV was 104%.

MICROBIAL COMMUNITY AS AN INDICATOR OF WETLAND HEALTH OF SIX MILE CYPRESS SLOUGH PRESERVE, SOUTHWEST FLORIDA

Irma L. Sanchez[1], Megan E. Feeney[1], Haruka E. Urakawa[1], Ernesto Lasso de la Vega[2] and Hidetoshi Urakawa[1]
[1]Department of Marine and Ecological Science, Florida Gulf Coast University, Fort Myers FL
[2]Lee County Hyacinth Control District, Lehigh Acres, FL

Wetlands serve as a natural filtration system of excess nutrients and pollutants, but they are vulnerable to anthropogenic changes in hydrology and land use. This study aims to establish the efficient use of microbial community as a possible bioindicator associated for monitoring the health condition of Six Mile Cypress Slough Preserve. The use of microbial indicators is advantageous, as microbial communities rapidly respond to changes in environmental conditions by shifting in both composition and function. Microbial indicators may help to

develop a more comprehensive assessment of wetland restoration and management practices. At six sampling sites in the slough, surface water samples were collected, and the physicochemical characteristics of the water were determined using a YSI sensor. Nutrient analyses were combined with microbial community fingerprinting techniques including high-throughput sequencing of 16S rRNA genes and microbial community level metabolic profiling using Biolog EcoPlates. Betaproteobacteria were the most abundant bacterioplankton found at Six Mile Cypress Slough Preserve. However, the composition of the communities located in the human-made Gator Lake differed significantly from those of the other natural sampling sites. The microbial community profiles responded to seasonal and spatial environmental variations. Overall, the results indicated that the microbial community fingerprinting is useful in assessing wetland health with a combination of traditional water quality assessment.

INFLUENCE OF COMPETITION AND PREDATION ON SUCCESS OF *CRICOTOPUS LEBETIS* AS A BIOLOGICAL CONTROL AGENT

Courtney Stachowiak,
University of Florida -Entomology and Nematology Department, Gainesville, FL

The use of a chironomid midge, *Cricotopus lebetis*, as a biological control agent of hydrilla is currently being studied at the University of Florida. The hydrilla tip mining midge (*C. lebetis*) specifically targets and feeds on the apical meristem of hydrilla. This study focuses on the influence of a predator, the western mosquitofish (*Gambusia affinis*), and a competitor, the hydrilla leafcutter moth (*Parapoynx diminutalis*), on the ability of the midge to survive and feed on hydrilla. Six treatments were established in 10 gallon tanks that contained combinations of the organisms. In the presence of the predator, the eclosion of adult midges was found to be significantly reduced. The results of this study indicate the need for management techniques to be adopted that will reduce the influence of predation by the western mosquitofish and other similar predators on the hydrilla tip mining midge. To facilitate successful establishment of the midge in Florida's freshwater systems, the release numbers must be great enough to overcome the intense influence of predation.

DETERMINING SEDIMENT PARTICLE CHARACTERIZATION IN STORMWATER TREATMENT AREA 3/4

Jenna MacDonald, Serge Thomas, David Fugate
Florida Gulf Coast University, Fort Myers, FL

Sediment dynamics are an important factor in understanding ecosystems, including the cycling of nutrients such as phosphorus. There are various instruments which can be used to measure the numerous aspects of sediment dynamics. For measuring particle sizes, instruments that use laser diffraction are commonly used. Three such instruments are the Laser In Situ Scatterer and Transmissometer (LISST), the digital floc camera (DFC), and the Malvern Mastersizer 2000 (Malvern). These three instruments will be evaluated using sediment from Stormwater Treatment Area 3/4.

The Stormwater Treatment Areas (STAs) are constructed wetlands developed and managed by the South Florida Water Management District to deal with stormwater and other sources of runoff, particularly agricultural runoff from the Everglades Agricultural Area. This anthropogenic phosphorus input is causing the Everglades to receive more than the recommended inflow concentration of 10 ppb. The artificially managed flows in the STA wetland system may cause phosphorus that has settled out of the water column to become resuspended and continue flowing to the Everglades, causing the STAs to not meet their goal of 10 ppb phosphorus.

Therefore, this study aims to investigate the detection efficiency of three instruments, the LISST, DFC, and Malvern, in a wetland environment with organic sediments. In addition, phosphorus concentrations in different sediment size classes will be investigated to determine if there is a relationship between sediment particle size and sediment adsorption. These data may help inform the SFWMD which flow rates will better prevent phosphorus from being resuspended in the water column, where it can be more easily transported. Many factors go into the determination of these flow rates, but phosphorus uptake is a main goal of these constructed wetlands. Therefore, this may help the STAs reach 10 ppb of phosphorus entering Everglades National Park, a rate that is not currently being met.

TARGETING THE "BAD PLAYERS" - EFFECTIVE CYANOBACTERIAL MANAGEMENT IN THE SANTA CRUZ POTABLE WATER RESERVOIR WITH AN EPA REGISTERED, NSF/ANSI 60 CERTIFIED LIQUID ACTIVATED PEROXYGEN ALGAECIDE/CYANOBACTERICIDE

Tom Warmuth, Hugh Dalton, Tom McNabb
BioSafe Systems LLC, Santa Cruz Water Laboratory and Clean Lakes, Inc. Winston-Salem, NC

Effective copper alternative treatments for cyanobacterial management are emerging as a needed option as the threat to our waters by these organisms becomes more realized and understood. The development of effective treatments for the "Bad Players", or what are identified as cyanobacteria that are known to produce harmful toxins or even taste and odor compounds, has never been more imperative. Santa Cruz Water Laboratory, through a program of monitoring, sampling, algal enumeration and development of an algaecide treatment regime with Clean Lakes, Inc. (Santa Cruz's contracted California Certified Pest Control Advisor and licensed aquatic applicator) has delivered effective control of cyanobacteria throughout the season using a liquid activated peroxygen algaecide, in their reservoir. Peroxide based algaecide has been identified as effective in selective treatments for cyanobacteria, where it is not greatly effecting the population of green algae/phytoplankton. Traditional use and delivery of "granular peroxide", known as SCP – Sodium Carbonate Peroxyhydrate, can have challenges not only in the delivery of the treatment to the water, but also in effectively controlling the target depending on where it may be in the water strata. The chemistry of activated peroxygen algaecide has shown to be effective, while also being easier to apply SCP and having the ability to be more effectively applied near the surface as well as at variable depths and temperatures in the reservoir where the target cyanobacteria are found. This all leads to a better potable water source through better control of target cyanobacteria while preserving the phytoplankton. An overall healthier and productive algal population while limiting the input of copper based algaecides to the system.

Session A2: Nutrient and Reduction Management

Moderator: Rob Burnes
Thursday, June 8, 2017. 10:30 am to 11:50 pm

LAKE ANDERSON ALUM AERATION SYSTEM

Bryce W. Edwards[1] and Harvey H. Harper, Ph.D., P.E.
[1]Environmental Specialist II, Orange County Environmental Protection Division, Orlando, FL
[2]President, Environmental Research and Design, Inc., Orlando, FL

Lake Anderson is an urban lake in Orange County. Over time, stormwater control projects have connected this small 14 acre lake to a drainage basin of 230 acres. An innovative alum-based injection system is being installed on a stormwater pond just north of the lake which receives stormwater from 75% of the drainage basin. Due to the small pond size, the pond is hydraulically overloaded with a short residence time and provides limited treatment. The innovative system provides treatment for the pond water rather than the incoming runoff using a simplified alum addition system instead of a more complex flow-based design. The system is based on the well-established positive relationship between pH and algal productivity. The treatment system measures the pH of the pond water and injects an alum-air mixture into a carrier water system which is injected near the center of the pond using a nozzle structure. The system generates micro-bubbles which attach to the floc, causing the floc to stay in the water column for an extended period of adsorption. The system shuts off when the pond pH returns to the pre-set value. The system will remove approximately 18kg/yr of phosphorus from Lake Anderson. This technique was developed as a low cost enhancement to existing ponds to improve the efficiency without pond expansion.

LAKE RESTORATION USING AERATION AND ALUM: A LOOK AT THE POTENTIAL SYNERGISTIC EFFECTS

Patrick Goodwin
Aquatic Systems and Vertex Water Features, Pompano Beach, FL

Lakes and ponds, both naturally formed and man-made, are common features within urban areas throughout Florida. Residential and industrial communities often include one or more ponds that serve primarily as collection points for the runoff generated from rain events, thus reducing the threat of flooding. Urban runoff can consistently deliver nutrient rich water, sediments, metals and other pollutants to lake systems. This leads to sediment build up, eutrophication and associated changes in flora and fauna, including the proliferation of cyanobacteria blooms and the growth of aggressive invasive species that thrive under high nutrient conditions. Lake managers must therefore employ various methods to reduce the effects of storm water runoff on the overall state of urban lakes. Two widely used management tools for combatting lake eutrophication are aeration and alum. Aeration is commonly recommended to meet a variety of lake management goals including: (i) habitat improvement by eliminating thermal gradients and improving water chemistry allowing for a more diverse and robust food web, and/or (ii) reducing symptoms associated with eutrophication, especially

in regards to hazardous algal blooms, taste and odor issues, and water clarity. Alum on the other hand, is commonly recommended for lakes that exhibit high internal Phosphorus (P) loading, which is regarded as one of the key nutrients causing lake eutrophication. Combining these techniques may prolong a lakes restoration and reduce overall management costs. This presentation will discuss the mechanisms, limitations, and potential synergy of the two techniques, along with introducing case studies where the two techniques were used.

ASSESSING THE INFLUENCE OF LAND USE AND CLIMATE VARIABILITY ON NUTRIENT LEVELS IN FLORIDA LAKES

Chao Xiong
Fisheries and Aquatic Sciences, Florida LAKEWATCH Program, School of Forest Resources and Conservation, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL

Nutrient concentration in water bodies are known to be influenced by geology and/or land use. Often studies on impacts of watershed land use on nutrient concentrations do not account for the effects of geology and therefore may produce undesirable results. To better examine the relations between watershed land use and nutrient concentrations, static and change in land use over time analyses will be conducted on Florida lakes (n=97) while accounting for impacts of geology (total phosphorus (TP) zones). Total phosphorus zones are areas that are characterized by similar water chemistry, geology and physiology. For static analyses, Pearson Correlation Coefficients and linear regressions are used to identify relationships between watershed land use in two different time periods (1989/1990 and 2009/2010) and lake nutrient concentrations within individual TP zones. A Kruskal-wallis one way analysis of variance test will be used to examine the change in water chemistry over time with concurrent changes in land use, again within TP zones. An evaluation on the influence of climate variability on lake nutrient concentration will also be conducted. These analyses show that static nutrient concentrations among some lakes, after accounting for geology, does correspond to land use but inconsistent among all the lakes analyzed. However, changes in land use did not seem to correlate with changes in nutrient concentration over time. In addition, climate variability over time was strongly correlated with changes in nutrient concentrations in multiple lakes. This research suggests that multiple mechanisms drive nutrient concentration in lakes and a thorough investigation of individual lakes should be conducted before developing standard nutrient management plans.

BIOSOLIDS APPLICATION DATABASE DEVELOPMENT FOR INCORPORATION INTO WATERSHED MODELING EFFORTS

Lanie Meridth, Vickie Hoge, Emily Schmidt
St. Johns River Water Management District, Palatka, FL

The St. Johns River Water Management District (SJRWMD) is currently in the process of completing a districtwide inventory of biosolids application for incorporation into watershed modeling efforts for evaluation of Total Maximum Daily Loads (TMDLs). Currently, there is no existing database of biosolids applications within

the SJRWMD and there have been no extensive studies that evaluate biosolids as a potential source of excess nutrients. Thus, this work will help to improve our understanding of the effects of biosolids application on water quality within the St. Johns River and its tributaries. The Department of Environmental Protection (DEP) permits generating treatment facilities and residual application sites that receive and land apply biosolids. Biosolids land applied in Florida are generally Class B, or minimum quality for beneficial use through land application. Application rates of biosolids are determined by crop nitrogen demand, which may result in an over application of phosphorus to the soil and increase the risk of nutrient runoff into nearby surface waters. The biosolids inventory includes yearly total nitrogen (TN) and total phosphorus (TP) application rates for biosolids application sites districtwide between 2000-2015. Within this period of record, the district has identified over 120 biosolids application sites and more than 200 generating facilities that produce biosolids for land application. Biosolids application data within the Upper St. Johns River basin (USJRB) was incorporated into the USJRB water quality model as a point source load. Currently, biosolids application data are being used to evaluate connections with water quality issues in surface water bodies proximal to application sites.

POLYMER BMPS USED IN REMOTE AND EXTREME CONDITIONS

Eddie Snell
Applied Polymer Systems, Woodstock, GA

Chemical flocculants have been commonly used to treat industrial and mine effluent. Attempts to use these materials have had limited success due to performance limits of coagulants/flocculants in cold temperatures. Discharge pollutants containing total suspended solids, turbidity, and metals are discharged into the aquatic environment on a regular basis due to lack of a solution to this problem. Development of water-soluble anionic polyacrylamide (PAM) blends and development of delivery methodologies have resulted in a whole new class of in-situ erosion control and water clarification tools.

This presentation will show examples of how PAM blends can successfully reduce these pollutants in extreme conditions using passive treatment systems. Case histories will be given that range geographically from Canada to Georgia and Florida on use of these polymer treatment train systems. Examples will show the use of anionic polymers to bind soil particles, metals and particulate preventing their transport to waterways, thus reducing aquatic life toxicity.

Session B4: Restoration and Nutrient Reduction

Moderator: Lance Lumbard
Thursday, June 8, 2017. 1:30 pm to 3:05 pm

WATER QUALITY RESTORATION IN 'OTHER LAKES' IN THE OCKLAWAHA CHAIN

Rolland Fulton
St. Johns River Water Management District, Palatka, FL

Previous FLMS presentations on the Ocklawaha Chain of Lakes have focused on lakes Apopka and Griffin. This presentation will focus on lakes Beauclair, Dora, Eustis, and Harris, located downstream of Lake Apopka. Reductions in total phosphorus (TP) loads to these lakes due to changes in TP concentrations discharged from Lake Apopka and downstream restoration projects were estimated for the period 2000-2015. Multiple factors affected the TP concentrations in Lake Apopka discharges, including restoration of the Lake Apopka North Shore, rough fish harvesting, the Lake Apopka marsh flow-way (portion of discharges returned to the lake), and changes in lake water levels. Estimated TP loads to lakes Beauclair and Dora were reduced by about 51% and 40%, respectively. About 88% of those reductions were due to changes in Lake Apopka discharge concentrations, about 6% were due to removals by the marsh flow-way (portion of discharges flowing downstream to Lake Beauclair), and 6% due to removals by the Lake County Water Authority NuRF project. Estimated TP loads to Lake Eustis were reduced by about 32%. About 58% of those reductions were due to the Pine Meadows Restoration Area, 31% due to Lake Apopka discharge changes, 6% due to the Lake Harris Conservation Area, and 2% due to the marsh flow-way and the NuRF. Estimated TP loads to Lake Harris were reduced by about 10%, all due to the Lake Harris Conservation Area.

Water quality has improved in all four lakes. Lakes Beauclair and Dora show an improving trend since about 2000, while lakes Eustis and Harris have been improving since about 2008. TP concentrations in lakes Eustis and Harris have been averaging close to their TMDL targets for the last 6 years. TP concentrations in lakes Beauclair and Dora have been approaching the targets in the last 2 years. Similar improvements have occurred with chlorophyll-a concentrations and Secchi transparency.

ITS 2017, DO YOU KNOW WHERE YOUR NUTRIENTS ARE?

Erich R. Marzolf, Vickie Hoge, Lanie Meridth, Andy Canion, Casey Harris, Lawrence Keenan, John Hendrickson
St. Johns River Water Management District, Palatka, FL

While significant progress has been made in reducing point source discharges to waterbodies, opportunities still exist to better manage the nutrients distributed via reclaimed water, biosolids and wet weather discharges. While recognition of the nutrient content of reclaimed water is increasing, specific recommendations on how reclaimed water customers should reduce their fertilizer use to offset the nutrients delivered with reclaimed water are largely absent. Also missing are guidelines for reclaimed water irrigation system design that reduces the water wasted and nutrient pollution associated with irrigation overspray onto impervious surfaces and stormwater infrastructure.

In 2010 new rules on the use of wastewater biosolids were adopted and included bans on the application of Class B biosolids in some watersheds with existing phosphorus pollution problems. Because of the ban in the Okeechobee basin, and new reporting requirements, biosolids application data have documented increased use throughout the Upper St. Johns River basin. Despite significant wetland and water quality restoration efforts, none of the lakes meet their phosphorus concentration goals, and several have an increasing trend in phosphorus concentration. A working hypothesis is that the increased use of biosolids is an important contributor to phosphorus loads in the basin. Outside of several phosphorus-sensitive watersheds specifically identified in *F.A.C.* 62-640, biosolids are applied and regulated based upon their nitrogen content. Because the phosphorus : nitrogen ratio of biosolids is higher than crop requirements, prolonged application of biosolids leads to soil phosphorus saturation, and ultimately to export to surface waters. This increasing phosphorus enrichment of the Upper St. Johns River has important implications for algal bloom frequency and intensity, use of surface water as a drinking water source, and downstream water quality for waterbodies whose restoration relies in part, upon reduced nutrient loads from the Upper St. Johns River Basin.

DISTRIBUTION OF NUTRIENTS IN FLORIDA'S LAKES AS INFERRED BY THE DEP RANDOM STRATIFIED MONITORING DESIGN

Thomas Seal, Chris Sedlacek and James Silvanima
Florida Department of Environmental Protection, Watershed Monitoring Section, Tallahassee, FL

The Department of Environmental Protection's Watershed Monitoring Section (WMS) staff annually conducts sampling of multiple water resources, including lakes. Lake sediment nutrient data derived from 2013 through 2015 DEP Status Network samples were evaluated in two lake size classes – small lakes (between 4 and 10 HA; n = 227) and large lakes (> than 10 HA; n = 270). Sample sites are selected at random from established statewide lists for each size class. Small lakes are sampled for water and sediment in the center of the lake; large lakes are sampled at a preselected latitude-longitude value. Statewide continuous distribution functions and margins of error for Kjeldahl nitrogen, total phosphorous, total carbon, total organic carbon, and total inorganic carbon will be presented for use as baseline data for Florida lake scientists. In lacustrine environments, sediments provide habitat for many species, but at the same time may become a source of recycled nutrients as they accumulate over time. Knowledge of lake sediment quality helps environmental managers evaluate restoration projects and potential dredging projects, as these projects often liberate accumulated

sediment nutrients. In contrast to standards established for water quality, the Florida Department of Environmental Protection (DEP) has no standards for sediment, and no statutory authority to establish such criteria. Therefore, it is important to evaluate the natural range of nutrients to determine their ecological significance

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SMART SOURCE CONTROL: OPTIMIZING STREET SWEEPING ACTIVITIES TO MAXIMIZE WATER QUALITY BENEFIT WHILE CONTROLING COSTS

Mike Hardin, Ph.D., P.E., CFM, Mark Ellard, P.E. CFM, D.WRE, and Nick Hartshorn, E.I.
Geosyntec Consultants, Orlando, FL

Street sweeping is a common pollution source control practice performed by municipalities to help meet NPDES permit requirements as well as TMDL and BMAP requirements for improving the quality of stormwater runoff discharging to impaired waters. Geosyntec Consultants recently completed an assessment of the City of Lakeland's street sweeping program, including characterization of street debris and identification of factors contributing to nutrient content of street debris. This information was utilized to perform a cluster map optimization of the swept street segments within the City with respect to maximizing the mass of nutrients removed and minimizing program costs. Changes in routes and frequencies were suggested based on this analysis.

A spreadsheet simulation model was developed to quantify the benefit of altering the street sweeping routes and frequencies. The spreadsheet simulation model was first calibrated using historical street sweeping collection rates as reported in past NPDES permits. The historical NPDES permit values showed good agreement with those predicted using the spreadsheet simulation model. Using this model, three different alternatives were developed with the goal of maximizing the mass of nutrients collected and maintaining existing costs. The first alternative utilized the existing program data except the site-specific collection rates and nutrient content values were used. The second alternative optimized the frequency of the City's existing street sweeping zones and utilized site-specific collection rates and nutrient content values. The final alternative developed new street sweeping zones based on the cluster map analysis, assigned frequencies based on the new zone "score", and utilized site-specific collection rates and nutrient content values. The results of this analysis showed that optimization could result in significant increases in the mass of TN and TP collected for the same cost or potentially lower cost than the current street sweeping program.

A CASE STUDY: MODELING NUTRIENT TRANSPORT IN GROUNDWATER FLOW AND DISCHARGE TO THE VOLUSIA BLUE SPRING

Erin M. Reed, Ph.D., P.E.
Geosyntec Consultants, Orlando, FL

Water quality analysis coupled with groundwater flow and transport modeling is a useful approach to prioritizing protection strategies of impaired water bodies throughout Florida. In this case study, field observed water levels and concentrations of nitrogen and boron were utilized to develop a three-dimensional groundwater flow and nutrient transport model of a karst aquifer in Florida, while a chemical and isotopic characterization

of sources and spring discharge was performed to validate model results and study anthropogenic recharge. The purpose of this study was to understand groundwater and spring water quality throughout the recharge area of Volusia Blue Spring, an Outstanding Florida Water Body located in Volusia County (Florida) so that priority focus areas for nutrient reduction can be determined.

The Volusia Blue Spring (VBS) is both unique and similar to other springsheds and watersheds throughout Florida. It is unique in that it is the largest spring located along the St. Johns River (near Orange City, Florida) and is considered home to hundreds of manatees during winter months. Similar to other springs in Florida, VBS is an impaired water relied upon for tourism and surrounded by tens of thousands of septic systems.

To understand the fate and transport phenomena of nutrients within the springshed, a groundwater flow and nutrient transport model was developed. The model relied on information and data related to natural water features, aquifer characteristics, rainfall, land use, water use, and nitrogen and boron concentrations of treated wastewater discharge, fertilizers, and septic tank effluent flows as inputs. Results of the model indicate that sources of anthropogenic nutrient loadings applied to the surficial aquifer in specific surrounding urban areas contributed to the flow and water quality of the Spring's discharge.

To study anthropogenic recharge into the karst limestone aquifer, wastewater effluent, golf course ponds, septic tanks, groundwater monitoring wells, and the Spring's discharge were sampled for boron, nitrate-nitrogen, nitrate-oxygen and their isotopes spatially throughout the springshed. Nitrate, boron, and chloride data was used to characterize sources and spring discharge. Unique boron isotopic signatures were found in treated wastewater (2.2-15.3‰), fertilizer (21.0‰), local limestone freshwater (40.0‰), and Volusia Blue Spring (VBS) discharge (28.4-45.9‰). Our findings indicate that VBS discharge is currently a varying mixture of limestone freshwater, relict seawater, and anthropogenic recharge.

Results of this study can be interpreted to develop priority focus area(s) of best management practices targeted to reduce nutrient loadings throughout the springshed. Proposed management practices including advanced septic systems and groundwater treatment systems, can be implemented into the groundwater flow and transport model to project estimated improvements to the water quality of the springshed. This modeling information is useful in support of future pollution prevention planning for this springshed. The approach and methodology could also prove useful applied to other springsheds and watersheds throughout Florida.

INTERACTIONS BETWEEN WAKULLA SPRINGS AND THE SINKING LAKES AND STREAMS IN THE WAKULLA SPRINGSHED

Sean McGlynn
McGlynn Laboratories, Inc., Tallahassee, FL

This study examines the aquatic light field in Wakulla Springs in relation to the karst lakes and streams in the springshed. Flows and seepage of these pollutants were quantified as well as dye trace studies run to follow the flows from source to sink. Wakulla Springs is darkened by two colored pigments, natural tannins traced to the sinking streams and chlorophyll and its degradation products from eutrophic sinking lakes, also in the springshed. Surprisingly, conditions improved at the park for the Memorial Day weekend in 2016. The spring vent was clearly visible at 100 feet and glass-bottom boats plied the spring again for five days, the first runs since 2014.

Session B5: Aquatic Plant Assessments and Harmful Algae

Moderator: Marissa Williams
Thursday June 08, 2017. 3:30 pm to 4:50pm

ANNUAL PATTERNS OF PHYTOPLANKTON IN SUBTROPICAL, FLORIDA LAKES

Dana Stephens[1] *and Daniel Canfield, Jr.* [2]
[1]Mattie M. Kelly Environmental Institute, Northwest Florida State College, Niceville, FL
[2]School of Forest Resources and Conservation, University of Florida, Gainesville, FL

Although seasonal phytoplankton patterns are well documented in northern, temperate lakes, shifts in environmental variables (e.g., temperature, photoperiod, precipitation, and nutrient loading) with geographic location impact timing and frequency of phytoplankton. Inter-annual patterns (among years) and inter-annual (within year) phytoplankton patterns were examined using 20 to 24-years of monthly chlorophyll concentrations estimates from 27-subtropical, Florida lakes. Dominate periods of variance, reoccurrence of the periods, and strength of the variance at each period were extracted using spectral density analysis to address the timing and frequency (periodicity) of phytoplankton. Periodicity of phytoplankton was also evaluated along a continuum of biological productivity. Among the examined 27 Florida lakes, phytoplankton increased from January to September (peak) and, thereafter, linearly decreased through December. Periodicity of phytoplankton was similar in pattern among oligotrophic, mesotrophic, and eutrophic classified waters where phytoplankton reached higher levels during months June through October and lower levels during months November through May. However, periodicity of phytoplankton in hypereutrophic waters exhibited bimodal peaks in phytoplankton occurring in April and October. Examining variance of periodicity of phytoplankton over 20 to 24-year time series showed the strength of a seasonal signal was partitioned into quarterly, annual, and centennial time periods. Mesotrophic and eutrophic lakes had the strongest seasonal signals at a period of 12, suggesting seasonal signals occurred on annual cycle. Oligtrophic lakes showed seasonal signals indicative of an annual cycle, but also a weaker seasonal signal on a quarterly basis potentially indicating some years exhibited two phytoplankton peaks. Hypereutrophic lakes had strong seasonal signals annually and quarterly capturing the bimodal season phytoplankton pattern.

IMPORTANCE OF NUTRIENT RATIOS AND LEGACY ACCUMULATION IN MANAGING CYANOBACTERIA

West M. Bishop, Ph.D., CLP[1], Michael Shaner[2]
[1]SePRO Corporation, SePRO Research and Technology Campus, Whitakers, NC
[2]SePRO Corporation, Orlando, FL

Specifically removing phosphorus is an important approach in positively shifting nutrient ratios (e.g., N:P; Si:P) which are commonly cited in governing algal types/densities. Addressing legacy sediment P accumulation is also needed as it is exploited by cyanobacteria. This research measured the impact of a specific P mitigation technology (Phoslock) at removing water column P and immobilizing sediment associated P in order to promote a better algal assemblage.

Multiple sites throughout the United States will be presented where Phoslock was applied. Phoslock was able to significantly ($p<0.005$) decrease total (>80 %) and free reactive (>95 %) phosphorus in the water column and significantly shift potentially releasable sediment phosphorus fractions to residual forms after treatment in field applications. This shift in P availability altered the subsequent N:P ratio as well as the influence of sediment P stores. Algal assemblages either maintained beneficial types (i.e. offset nuisance cyanobacteria from arising) or shifted away from cyanobacterial dominance. Specific targeting of *in situ* P sources is important to consider in algal management programs. Phoslock is a novel phosphorus locking technology that provides an effective and ecologically friendly approach to combat the eutrophication process and restore water quality.

RISKS OF ONLY MONITORING VERSUS MANAGING NOXIOUS CYANOBACTERIA

West M. Bishop, Ph.D., CLP[1], Kelli Gladding[2]
[1]SePRO Corporation, SePRO Research and Technology Campus, Whitakers, NC
[2]SePRO Corporation, Orlando, FL

With increased identification of cyanobacterial toxins and improved understanding of exposure routes, allowing cyanobacteria to dominate in water resources is not without risk. Recreational contact, inhalation, fish/crop consumption are toxin exposure routes that are difficult to mitigate through monitoring. Fish and wildlife impacts from toxins cannot be offset by putting up signs. Allowing cyanobacteria to exist allows for a chronic toxin exposure, potential hot spot accumulations and can alter the system to promote continued blooms. This presentation comparatively assesses risks of cyanobacterial infestations verses risks of implementing management programs. A case study from a Florida lake showed a regimented copper algaecide program could control chronic cyanobacterial blooms and restore designated water uses. Allowing blooms to continue unabated is not without risk; effectively controlling blooms is needed to ensure safety and usability of water resources.

A NEW IPM APPROACH FOR HYDRILLA MANAGEMENT: UPDATE

James P. Cuda[1], Emma N.I. Weeks[1], Jennifer Gillett-Kaufman[1], Mark V. Hoyer[2], and Mark A. Jackson[3]
[1]Entomology & Nematology Department, University of Florida, Gainesville, FL
[2]School of Forest Resources & Conservation, University of Florida Gainesville, FL
[3]USDA ARS Crop Protection Research Laboratory, Peoria, IL

The invasive aquatic weed hydrilla (*Hydrilla verticillata*) causes serious environmental and economic impacts in Florida. When left unmanaged, this aquatic weed creates damaging infestations that choke out native plants, clog flood control structures, and impede navigation and recreation. Millions of dollars are spent annually in Florida to control large infestations of hydrilla. However, during the past 15 years, hydrilla developed resistance to fluridone and endothall, two of the most commonly used herbicides approved for aquatic use. Since 2010, we have been testing novel IPM tactics for hydrilla control. Together these tactics form our IPM system that integrates selective insect herbivory by the hydrilla tip miner *Cricotopus lebetis* with a disease causing fungal pathogen *Mycoleptodiscus terrestris* (Mt), and low concentrations of the herbicide imazamox, an acetolactate synthase (ALS) inhibitor recently registered for aquatic use. Field testing was performed in limnocorrals (1 m diam. x 1 m depth) installed in three ponds. Four limnocorrals were placed in each of the three ponds, allowing four treatments to be replicated three times. Over a period of two years, all possible combinations of the three described tactics were tested to determine the most effective combination for use in hydrilla management. Establishment of the biological control agents and hydrilla damage were measured by collecting apical meristem samples at the beginning, halfway through and at the conclusion of the experiment. At the end of the experiment, hydrilla in each of the limnocorrals was collected and dried to calculate biomass. Although results varied seasonally, the tip miner *C. lebetis* and fungus Mt together or in combination with the herbicide imazamox significantly reduced hydrilla biomass compared to the untreated controls. Midge specific tip damage was evident in all treatments inoculated with the midge, which confirmed the insect was compatible with the fungus Mt and herbicide. A significant reduction in turions was observed in all treatment combinations during the fall season. Overall, these findings indicate that a combination of different tactics can be used to effectively manage hydrilla.

ALGAE AND NUTRIENT REMOVAL USING BALLASTED FLOCCULATION TECHNOLOGY

James C. Steffen P.E., BCEE
Evoqua Water Technologies, Shallotte, NC

Ballasted flocculation technologies have proven to be able to remove algae from large bodies of water where traditional filtration has failed due to clogging and inability to handle large flows. This presentation will discuss how ballasted flocculation technology works and a presentation of a case study where the technology has been implemented.

The CoMag System is a high rate, clarification process utilizing chemical coagulation along with magnetite, a ballasting agent, which becomes embedded into the chemical floc and provides rapid settling to enhance TP and TSS removal. The CoMag System is the ideal solution for treatment facilities required to meet stringent TP limits

requiring a small footprint, while coping with wide fluctuations in feed TP and TSS concentrations plus handle wide swings in flowrates/treatment demands. By increasing the settling rate, the CoMag System requires a smaller footprint to treat similar flow rates compared to conventional systems.

The Village of Waterbury is located in the northwestern corner of Vermont. The existing facility was constructed in the 1980's and utilizes 3 lagoons for biological treatment and a chlorine contact chamber, with final effluent discharged into the Winooski River. The plant was designed for an average daily flow of 0.51 MGD (354 GPM) and peak hourly flow of 1.02 MGD (708 GPM). Historically, the Village of Waterbury, VT has seen seasonal algae blooms after the long winter season. During algae blooms, the plant encounters lagoon effluent high in TSS and visually bright green in color, which has led to treatment upsets and permit violations. The CoMag System has not only allowed the town to effectively treat these algae bloom cases, but do so without an increase in chemical requirements or a deviation from treatment results.

Session A3: Lake Assessments

Moderator: Serge Thomas
Friday, June 09, 2017. 9:00 am to 10:20 am

SUBMERGED AQUATIC VEGETATION IN LAKE APOPKA: HOW ARE WE DOING AND WHERE ARE WE GOING?

Dean R. Dobberfuhl, Pamela J. Bowen and Jodi Slater
St. Johns River Water Management District, Palatka, FL

Restoration of Lake Apopka began in earnest nearly thirty years ago with the purchase of multiple farms on the north shore. The farms, which had been converted from wetlands in the 1940's, were to be converted back to wetlands to eliminate pumped agricultural discharge and nutrient pollution from entering the lake. Today, we see a lake that is demonstrating the benefits of that original farm restoration along with many ancillary restoration projects and design modifications. Total phosphorus and chlorophyll have substantially decreased within the lake. Submerged aquatic vegetation (SAV) has responded to improved water quality by expanding to its greatest extent in three decades. While this expansion is great news, we estimate that the current footprint is only a small fraction of the possible extent of SAV habitat. So, we begin to consider other factors that may be limiting SAV colonization and expansion. Some data suggest that the qualitative nature of total suspended solids (TSS) may be changing and causing alterations in the light environment, particularly at lake level extremes. Other potential limitations may be related to depauperate seed bank, wave energy, grazing, or deleterious substrate quality. We are planning to assess the potential limitations and develop appropriate restoration strategies to enhance SAV colonization and expansion in Lake Apopka.

CONTINUING EFFORTS TO REDUCE LOADING TO LAKE BEAUCLAIR – WE'RE NOT DONE YET!

Lance M. Lumbard[1], Ron Hart[2], Sergio Duarte[2]
[1]Amec Foster Wheeler, Inc., Orlando, FL
[2]Lake County Water Authority, Tavares, FL

Lake Beauclair is a 1,134-acre impaired waterbody located immediately downstream of Lake Apopka. Lake Beauclair has benefited from more than two decades of upstream and in-lake restoration projects. Conditions are improving but changing weather patterns and recent lack of discharge from Lake Apopka have increased the importance of addressing loading sources downstream of the Lake County Water Authority's Nutrient Reduction Facility (NuRF) on the Apopka-Beauclair Canal. Two outfall ditches draining predominantly agricultural land discharge downstream of the NuRF and likely represent the most significant remaining source of untreated pollutant loading to the Apopka-Beauclair Canal and Lake Beauclair. A loading study was completed for the basin associated with the ditches to estimate the pollutant discharge and recommend any necessary load reduction strategy.

Base flow at the south ditch indicated significant total phosphorus loading of 1,574 pounds per year and total nitrogen loading of 6,628 pounds per year with an average flow of 2.4 cubic feet per second, or 1,766 acre-feet per year. The majority of phosphorus was in the bioavailable orthophosphate form. Base flow loading from the north ditch was not as significant but still contributes an estimated 429 pounds of total phosphorus (TP) per year and 6,125 pounds of total nitrogen (TN) per year with an average flow of 2.3 cubic feet per second, or 1,629 acre-feet per year. The combined estimated base flow discharge through these ditches is surprisingly high representing approximately one tenth of the long-term average discharge from Lake Apopka. It is also important to point out that the base flow from these two ditches is comparable to the minimum discharge that would typically be released from the Apopka-Beauclair Canal Dam.

Stormwater discharge was estimated to contribute an additional 931 acre-feet of discharge through the ABC North and South ditches each year. Stormwater contributes approximately 705 pounds of TP per year and 4,133 pounds of TN. TP and TN concentrations in the monitored locations were similar for stormwater and base flow.

Five alternatives were evaluated for nutrient load reduction including conventional stormwater treatment, pumping to the NuRF, and conversion of an existing mine pit. Because the TP concentration and annual flow rates were relatively high, the estimated reduction efficiencies are less than $200 per pound of TP and could be as low as $40 per pound depending on land acquisition costs.

ASSESSING VIABILITY OF SMOOTH CORD GRASS (*SPARTINA ALTERNIFLORA)* IN NUTRIENT RICH RETENTION POND WATER TO ESTIMATE SUCCESS IN FLOATING TREATMENT WETLAND MATS.

Nicole Llinas, Kelly J. Smith
University of North Florida, Jacksonville, FL

We assayed the health of *Spartina alterniflora* exposed to eutrophic water from urban retention ponds (University of North Florida campus) over two one- month periods in a greenhouse using PAM Fluorometry. In addition we monitored water quality to estimate nutrient uptake. Both of these parameters are being used to determine whether *S. alterniflora* is suitable for nutrient remediation in floating wetland mats and further, and whether these plants remain viable after post- mat transplantation for shoreline restoration. For plants grown in the greenhouse in retention pond water, initial experiments indicated fluorescent yield as high as that of plants in the field population (above 800). In contrast, plants under the same conditions grown in conditioned tap water had yields closer to 700. Greenhouse *Spartina* remove about 80% of the nitrate (starting level of 2.9ppm), but less than 20% of the phosphorus (starting level of 1.8pm) from the retention pond water in the greenhouse mesocosms. These greenhouse studies will be replicated over the summer with new plants, and floating mats will be deployed to assess plant health response. Construction, deployment, and monitoring of floating wetland mats of *S. alterniflora* in the previously studied ponds will occur from May through July of 2017. Plants from the first experiment will be deployed in a shoreline restoration project and monitored for health.

IMPROVED TOOLS FOR SHARING WATER QUALITY DATA IN NORTHEAST FLORIDA

Margaret Q. Guyette
St. Johns River Water Management District, Palakta, FL

One of the core missions of the St. Johns River Water Management District is to protect and improve water quality within the district. The district is responsible for managing water resources in all or part of 18 counties in northeast and east-central Florida, and as such it maintains an extensive water quality monitoring program to address water quality concerns across 12,283 square miles. The district has collected water quality data for more than three decades, and it currently samples regularly at over 400 surface water stations, including more than 20 active continuous water quality stations. It is important that these data are beneficial and accessible for any users, including members of the public, local and county governments, and district water managers and researchers. Recent technological advances have made communication about our water quality data easier with user-friendly, intuitive web tools. The district is working to incorporate more of these innovative tools into their systems. For example, the latest version of the district's Water Quality Status and Trends Report has recently been transformed from static maps and tables to an interactive geographic information system (GIS) based web app developed in-house. In addition, the district is acquiring off-the-shelf software to enhance users' experiences with the extensive continuous water quality network. This presentation will include brief

demonstrations of some of these new advances and will solicit feedback from the FLMS community to improve upon these systems.

LIMNOLOGICAL STUDY OF SEVEN STORMWATER PONDS (CITY OF SANIBEL ISLAND, FLORIDA)

Cayden Lawn, Serge Thomas
Florida Gulf Coast University, Fort Myers, FL

Sanibel Island contains 80 stormwater ponds scattered throughout the island which lies in the Gulf of Mexico off the coast of Fort Myers in southwest Florida. Some of these ponds are detention ponds which release water into the surrounding waters via their overflow box. Many of these ponds exhibit signs of eutrophication likely caused by inappropriate land use and stormwater runoff. This ongoing project limnologically assessed seven stormwater ponds which, based on previous analyzes initiated by the City of Sanibel Island are all but one eutrophic. With no real previous data available, the bathymetry of each pond was initially conducted with SONAR so that limnological stations could be positioned. SONAR would also give an idea of bed hardness (algorithm developed by www.cibiobase.com). Subsequently, water profiles of temperature, dissolved oxygen, temperature, pH, ORP and photosynthetically active radiations were conducted at the end of the dry season when ponds are possibly at their worst trophic state in conjunction with integrated water sampling for further nutrients analyses. The ponds' beds were also cored using a hand-held corer so that sediment characteristics (i.e. layers characterizations) could be determined and sediment as well as the flocculent layers be analyzed for nutrients, organic contents and bulk densities. Sediment thickness was used as a "ground truthing" of SONAR maps generated so that sediment volume could be precisely assessed in case dredging would be advisable. Results will be interpreted using the visual assessment of the watershed surrounding each pond, pond age as well as pond morphometry and should increase our limited knowledge of coastal stormwater ponds.

Session A4: Water Resources Management

Moderator: Ron Hart
Friday, June 09, 2017. 10:45 am to 11:35 am

THE IMPORTANCE OF CANALS FOR THE FLORIDA LARGEMOUTH BASS FISHERY IN LAKE GRIFFIN, FLORIDA

Scott M. Bispinq[1] *and Brandon C. Thompson*[2]

[1]Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute Quincy, FL
[2]Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Eustis, FL

Canal systems are commonly found across the country and are rarely constructed to increase fish habitat or angling opportunities. From 2009 to 2011, we assessed the benefits of canals to the fishery at Lake Griffin, Florida, by measuring and comparing the Florida largemouth bass *Micropterus salmoides floridanus* population and angler use to the main lake. We used electrofishing, angler creel surveys, and a high-reward tagging study. Results from electrofishing surveys revealed a high relative abundance of Florida largemouth bass in the canals, with similar electrofishing catch rates and size structure to those in the main lake. The canal creel showed that anglers used canals throughout the study, with peak use during the spawning season. The tagging study revealed anglers caught Florida largemouth bass in canals throughout the 12-mo study and that Florida largemouth bass migrated between the lake and canals. We conclude that the canals support a significant portion of the overall angler effort for the Lake Griffin fishery. Failing to consider the canals at Lake Griffin results in substantial underestimates of fish populations, angler use, and the fishery's economic impact. Our data suggest, however, that monitoring only the lake section still may represent trends occurring throughout the entire body of water, resulting in lowering sampling time and financial requirements. Fishery managers need to identify potential impacts canal systems or any additional sections may have upon their fishery.

FACTORS AFFECTING CATCH RATES AND APPARENT COMMUNITY COMPOSITION FOR TWO CENTRAL FLORIDA LAKES

Earl Lundy
Florida Fish and Wildlife Conservation Commission, DeLeon Springs, FL

Community composition is often used by managers as an index of overall lake health. While numbers of sportfishes such as Largemouth Bass *Micropterus salmoides*, Black Crappie *Pomoxis nigromaculatus*, and Sunfishes *Lepomis spp*. are commonly examined, preponderance of other species is also critical in assessing a fish community's health. Relatively high numbers of "rough fish" such as Gizzard Shad *Dorosoma cepedianum*, Bowfin *Amia calva*, and Gar *Lepisosteus spp*. are seen as indicative of a poor fish community and possibly system in poor health. Likewise the indices of forage fishes is often used in comparison with indices of predatory species

to determine if a system has a surplus or deficit of prey for desirable fishes. However, vulnerability of various species to the sampling method can skew the results, leading to erroneous conclusions. Electrofishing is a method commonly used by managers, but electrofishing vulnerability can be influenced by fish species, fish size, water conductivity, habitat, and other factors. Determining factors that influence catchability and their effects on the catch rate of a species is vital in assessing whether apparent changes in fish communities are a result of changing population size, species catchability, or other factors. This in turn gives managers the ability to assess the efficacy of regulations and management actions. Community composition and catch rates were examined in relation to physicochemical and environmental variables for lakes of the Lower St. Johns River system in Florida. Our data indicated that in Lake Monroe, a lake subject to relatively high water level variability, community composition varied with water levels. Crescent Lake, farther downstream and with some tidal influence, has been shown to have community composition affected by changing salinities, usually the results of freshwater inflows or rain events. Knowing how and what environmental variables influence individual species capture efficiency can better allow researchers and managers to interpret their data and make informed decisions.

TRANSFER OF STORMWATER POND CARE:
FROM RESTORATION - TO VOLUNTEERISM - TO PROFESSIONAL MAINTENANCE

Ernie Franke
Chairman - Wetlands Committee, The Shores of Long Bayou, St Petersburg, FL

When pressed with the demands of condo owners, the HOA manager must decide between a chemical (pond maintenance services), manual (volunteers), biological, or "blended" approach. We typically see a migration from initially hiring a professional for restoration, to volunteer help for manual clean-up, with the final responsibility turned over to the professional pond maintenance service.Each organization must develop an "exit strategy,"a method of handing over the reins to the ultimate stake-holders.

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