5th Bay Area Scientific Information Symposium: Agenda-at-a-Glance

"Using our Knowledge to Shape our Future"

<table>
<tr><th>Start</th><th>Day 1 (October 20, 2009)</th><th>Day 2 (October 21, 2009)</th><th>Day 3 (October 22, 2009)</th><th>Day 4 (October 23, 2009)</th></tr>
<tr><td>7:30 AM</td><td>Registration Opens</td><td>Daily Registration Opens</td><td>Daily Registration Opens</td><td>Daily Registration Opens</td></tr>
<tr><td>7:30 AM</td><td rowspan="2">BREAKFAST</td><td rowspan="2">BREAKFAST</td><td rowspan="2">BREAKFAST</td><td rowspan="2">BREAKFAST</td></tr>
<tr><td>7:45 AM</td></tr>
<tr><td>8:00 AM</td><td rowspan="3">BASIS 5 Opening Remarks
(Dick Eckenrod)</td><td>Focus of the Day</td><td>Focus of the Day</td><td>Focus of the Day</td></tr>
<tr><td>8:15 AM</td><td rowspan="6">Ecosystem Restoration & Management
(Brandt Henningsen & Doug Robison)</td><td rowspan="7">Integrating Watershed Management Iniatives
(Suzanne Cooper)</td><td rowspan="3">Archaeology & Anthropology
(Bill Burger)</td></tr>
<tr><td>8:30 AM</td></tr>
<tr><td>8:45 AM</td><td rowspan="4">Geology & Sediments
(Gregg Brooks)</td></tr>
<tr><td>9:00 AM</td><td>BREAK</td></tr>
<tr><td>9:15 AM</td><td rowspan="3">Science Communication
(Nanette O'Hara)</td></tr>
<tr><td>9:30 AM</td></tr>
<tr><td>9:45 AM</td><td>BREAK</td><td>BREAK</td></tr>
<tr><td>10:00 AM</td><td rowspan="2">Circulation</td><td rowspan="4">Tampa Bay Biota
(Ann Hodgson & Bob McMichael)</td><td>BREAK</td><td>BREAK</td></tr>
<tr><td>10:15 AM</td><td rowspan="4">Environmental Regulations & Protections
(Rhonda Evans & Clark Hull)</td><td rowspan="7">BASIS 5 Synthesis & Next Steps Towards Maintaining Progress
(Panel Discussion)</td></tr>
<tr><td>10:30 AM</td><td rowspan="6">Water Quality & Primary Production
(Richard Boler & Roger Johansson)</td></tr>
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<tr><td>11:00 AM</td><td>BREAK</td></tr>
<tr><td>11:15 AM</td><td rowspan="3">Tampa Bay Biota
(cont'd)</td><td rowspan="3">Panel Discussion: Environmental Regulations & Protections
(Rhonda Evans)</td></tr>
<tr><td>11:30 AM</td></tr>
<tr><td>11:45 AM</td></tr>
<tr><td>12:00 PM</td><td rowspan="4">LUNCH</td><td rowspan="4">LUNCH</td><td rowspan="4">LUNCH</td><td rowspan="21">Meeting Adjourned</td></tr>
<tr><td>12:15 PM</td></tr>
<tr><td>12:30 PM</td></tr>
<tr><td>12:45 PM</td></tr>
<tr><td>1:00 PM</td><td rowspan="5">Water Quality & Ecosystem Implications
(Richard Boler & Roger Johansson)</td><td rowspan="5">Integrated Assessments: Tidal Tributary Studies
(Justin Krebs)</td><td rowspan="3">BASIS 5 General Call
(Ed Sherwood)</td></tr>
<tr><td>1:15 PM</td></tr>
<tr><td>1:30 PM</td></tr>
<tr><td>1:45 PM</td><td>BREAK</td></tr>
<tr><td>2:00 PM</td><td rowspan="7">Climate Change & Future Challenges
(Ernie Estevez)</td></tr>
<tr><td>2:15 PM</td><td>BREAK</td><td>BREAK</td></tr>
<tr><td>2:30 PM</td><td rowspan="6">Seagrass Resources & Management
(Robin Lewis, Roger Johansson & Walt Avery)</td><td rowspan="5">Integrated Assessments: Tidal Tributary Studies
(cont'd)</td></tr>
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<tr><td>4:00 PM</td><td>BREAK</td><td rowspan="5">Panel Discussion: Tidal Tributary Integrated Assessments
(Justin Krebs)</td><td rowspan="5">Panel Discussion: Climate Change & Future Challenges
(Ernie Estevez)</td></tr>
<tr><td>4:15 PM</td><td rowspan="4">Panel Discussion: Seagrass Resources & Management
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5th Bay Area Scientific Information Symposium: Daily Agenda
"Using our Knowledge to Shape our Future"

BASIS 5: DAY 1 (October 20,2009)

Start	Presenter	E-Mail	Presentation Title
8:00 AM	Dick Eckenrod	Eckenrodtbc@verizon.net	BASIS 5 Opening Remarks
8:15 AM			
8:30 AM			
			Geology & Sediments
8:45 AM	Gregg Brooks	brooksgr@eckerd.edu	High-Resolution Geologic Investigations in Tampa Bay: Advances and Limitations.
9:00 AM	Ernst Peebles	epeebles@marine.usf.edu	Nitrogenous Organic Matter Accumulation in Safety Harbor, Florida: Sources and Decadal-Scale Trends.
9:15 AM	Beau Suthard	bsuthard@coastalplanning.net	A Siliciclastic-Filled Sedimentary Basin in a Mid-Carbonate Platform Setting, Tampa Bay, Florida.
9:30 AM	Stan Locker	stan@marine.usf.edu	Progress in the application of acoustic bottom classification methods for mapping and characterizing Tampa Bay benthic environments.
9:45 AM			**BREAK**
			Circulation
10:00 AM	Lianyuan Zheng	lzheng@marine.usf.edu	The Circulation of Tampa Bay Driven by Buoyancy, Tides and Winds, and its Connection with the Adjacent Gulf of Mexico
10:15 AM	Bob Weisberg	weisberg@marine.usf.edu	Storm Surge of Ivan-Like Hurricane Making Landfall Near Tampa Bay
			Water Quality & Primary Production
10:30 AM	Keith Hackett	khackett@janickienvironmental.com	Hydrodynamic and Water Quality Modeling of Hillsborough Bay, Florida
10:45 AM	Noreen Poor	npoor@health.usf.edu	Trends in Atmospheric Nitrogen Oxides Concentrations and Implications for Nitrogen Deposition to Tampa Bay
11:00 AM	Richard Boler / Mark	boler@epchc.org	Water Quality Monitoring in Tidal Tributaries
11:15 AM	Max Moreno	mmoreno@health.usf.edu	Temporal Trends in Trophic State Parameters for Lakes Clustered in Northwestern Hillsborough County
11:30 AM	Chuanmin Hu	hu@marine.usf.edu	High temporal Resolution Assessments of Tampa Bay Water Quality Using Satellites
11:45 AM	Roger Johansson	Roger.Johansson@ci.tampa.fl.us	Long-Term and Seasonal Trends of Phytoplankton Production in Tampa Bay, Florida
12:00 PM			**LUNCH**
12:15 PM			
12:30 PM			
12:45 PM			
			Water Quality & Ecosystem Implications
1:00 PM	Anthony Janicki	anthony_janicki@janickienvironmental	Chlorophyll-a Responses in Tampa Bay to Varying Nitrogen and Hydrologic Loads: Implications to the Assessment of Water Quality Targe
1:15 PM	Chris Anastasiou	Christopher.Anastasiou@dep.state.fl.u	Understanding the Underwater Light Field and Its Relevance to Seagrass Sustainability and Resource Management in Tampa Bay
1:30 PM	Kristen Maki-	KLMJenkins@pbsj.com	Water Quality and Biology in Tampa Bay During Six years of Desalination Facility Operation
1:45 PM	Ray Pribble	rpribble@janickienvironmental.com	Management of Piney Point Facility Closure and Effects on Water Quality in Bishop Harbor and Adjacent Regions of Tampa Bay
2:00 PM	Jim Griffin	griffin@arch.usf.edu	Rapid Assessments of Lakes and River Stream Reaches in Hillsborough County, Florida
2:15 PM			**BREAK**
			Seagrass Resources & Management
2:30 PM	Cliff Hearn	clifford_hearn@yahoo.com	Longshore Bars on the Tampa Bay Shoreline
2:45 PM	Lindsay Cross	lcross@tbep.org	Managing Seagrass in Tampa Bay, Florida: a Multi-scale Approach
3:00 PM	Kristen Kaufman	Kristen.Kaufman@swfwmd.state.fl.us	Twenty Years of Tampa Bay Seagrass Mapping and Analyses
3:15 PM	Michael Dema	mdema@janickienvironmental.com	Seagrass Persistence Analysis in Tampa Bay, 1988-2008
3:30 PM	Walt Avery	walt.avery@ci.tampa.fl.us	Trends in Tampa Bay Seagrass: 1998-2008
3:45 PM	Roger Johansson	Roger.Johansson@ci.tampa.fl.us	Restoration of Seagrass Habitat in Tampa Bay Using Large Manatee Grass (*Syringodium filiforme*) Sod Units and a Discussion of Plantin
4:00 PM			**BREAK**
4:15 PM			***Panel Discussion: Seagrass Resources & Management***
4:30 PM			
4:45 PM			
5:00 PM			

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BASIS 5: DAY 2 (October 21,2009)

Start	Presenter	E-Mail	Presentation Title
8:00 AM			Focus of the Day
			Ecosystem Restoration & Management
8:15 AM	Lindsay Cross	lcross@tbep.org	History of Habitat Restoration Efforts in Tampa Bay - The Tampa Bay Habitat Restoration Database
8:30 AM	Doug Robison	derobison@pbsj.com	Goals and Strategies for Ecosystem Restoration and Preservation in the Tampa Bay Watershed
8:45 AM	Forest Turbiville	turbivillej@hillsboroughcounty.org	Land Acquisition and Management in the Tampa Bay Watershed – Past, Present, and Future
9:00 AM	Brandt Henningsen	brandt.henningsen@swfwmd.state.fl.us	The Watershed Approach to Ecosystem Restoration – Linking Bay and Watershed Habitats
9:15 AM	Tom Ries	tries@scheda.com	Restored Habitats: Lessons Learned and the Importance of Management
9:30 AM	Brad Weigle	bweigle@photoscience.com	Long-Term Monitoring and Assessment of Native and Restored Habitats
9:45 AM			**BREAK**
			Tampa Bay Biota
10:00 AM	Dave Karlen	karlen@epchc.org	Benthic Macroinvertebrates of Tampa Bay revisited
10:15 AM	Steve Geiger	Steve.Geiger@MyFWC.com	Commercially or Recreationally Important Invertebrates in Tampa Bay
10:30 AM	Ann Hodgson	ahodgson@audubon.org	Twenty-Five Years After BASIS I: An Update on the Current Status and Recent Trends in Bird Populations of Tampa Bay
10:45 AM	Ed Matheson	Eddie.Matheson@MyFWC.com	A Brief History of the Fish Fauna of Tampa Bay
11:00 AM			**BREAK**
11:15 AM	Chip Deutsch	Chip.Deutsch@MyFWC.com	An Overview of Recent Research on the Florida Manatee in Tampa Bay: Population, Ecology, and Behavior.
11:30 AM	Dave Chagaris	Dave.Chagaris@MyFWC.com	Using an Ecosystem Model to Assess the Impact of Bottom-up and Top-down Processes on Selected Species in Tampa Bay.
11:45 AM	Kerry Flaherty	Kerry.Flaherty@MyFWC.com	Nekton Communities Associated with Seagrass in Tampa Bay: The Effects of Seagrass Bed Architecture, Seagrass Species Composition
12:00 PM			
12:15 PM			**LUNCH**
12:30 PM			
12:45 PM			
			Integrated Assessments: Tidal Tributary Studies
1:00 PM	Ernie Estevez	estevez@mote.org	Trends Detected with a Tidal Creek Condition Index Based on Ecological Variables and Rapid Survey Methods, in Southwest Florida
1:15 PM	Tim MacDonald	tim.macdonald@fwc.state.fl.us	Tidal Creeks As Nekton Habitat in the Tampa Bay Estuary
1:30 PM	Adam Brame	abrame@usgs.gov	A More Comprehensive Approach for Determining Juvenile Snook Nursery Habitat in a Tampa Bay Wetland
1:45 PM	Janet Ley	Janet.Ley@MyFWC.com	Defining Fish Nursery Habitats: An Application of Otolith Elemental Fingerprinting in Tampa Bay, Florida
2:00 PM	Elon Malkin	emalkin@marine.usf.edu	Using Estuarine Fish Stable Nitrogen Isotopes to Pinpoint Land-Cover Nutrient Origins
2:15 PM			**BREAK**
2:30 PM	Justin Krebs	jkrebs@mail.usf.edu	Coastal Development Reduces the Quality of Tidal Creeks as Fish Habitat
2:45 PM	Ed Sherwood	esherwood@tbep.org	2006 Tampa Bay Tidal Tributaries Habitat Initiative
3:00 PM	Bob Woithe	RDWoithe@pbsj.com	What Have We Learned From 10 Years of Hydrobiological Monitoring on the Alafia River?
3:15 PM	Mike Wessel	MWessel@JanickiEnvironmental.com	Examining the Relationships between Freshwater Flows, Nutrient Loads, Chlorophyll-a Concentrations and the Distribution of Benthic Mac
3:30 PM	Sid Flannery	sid.flannery@swfwmd.state.fl.us	The Determination of Minimum Flows and Levels for Tributary Rivers to Tampa Bay
3:45 PM			**BREAK**
4:00 PM			
4:15 PM			
4:30 PM			***Panel Discussion: Tidal Tubutary Next Steps***
4:45 PM			
5:00 PM			

BASIS 5: DAY 3 (October 22,2009)

Start	Presenter	E-Mail	Presentation Title
8:00 AM			Focus of the Day
			Integrating Watershed Management Initiatives
8:15 AM	Suzanne Cooper	suzanne@tbrpc.org	Overview of Tampa Bay's Management 'Structure' and a Case Study of Collaboration
8:30 AM	Jennette Seachrist	jennette.seachrist@swfwmd.state.fl.us	SWFWMD Roles
8:45 AM	Chris Anastasiou	Christopher.Anastasiou@dep.state.fl.u	FDEP Roles
9:00 AM	Holly Greening	hgreening@tbep.org	TBEP & TBNMC Roles
9:15 AM	Avera Wynne	avera@tbrpc.org	TBRPC, One Bay, TBARTA Roles
9:30 AM	Gerold Morrison	gmorrison@bcieng.com	Using a 'Decision Matrix' Approach to Develop a Fecal Coliform BMAP for Impaired Waters in the Hillsborough River Watershed
9:45 AM	Donald Duke	ldduke@fgcu.edu	Industrial Storm Runoff and Florida Receiving Waters - Adequacy of Data for Watershed Planning
10:00 AM			**BREAK**
			Environmental Regulations & Protections
10:15 AM	Bob Stetler	stetlerb@epchc.org	Local protections
10:30 AM	Clark Hull	clark.hull@swfwmd.state.fl.us	State protections
10:45 AM	Cynthia Wood	Cynthia.J.Wood@usace.army.mil	Federal protections
11:00 AM	Robert Toth	rtoth@birkitt.com	Meeting Restoration Goals in the Tampa Bay Basin through Mitigation Banking
11:15 AM			
11:30 AM			***Panel Discussion: Environmental Regulations & Protections***
11:45 AM			
12:00 PM			
12:15 PM			**LUNCH**
12:30 PM			
12:45 PM			
			BASIS 5 General Call Papers
1:00 PM	Teresa Restom-Gaskill	gaskiltg@eckerd.edu	Distribution of Native Plant Species on Islands of the Tampa Bay Area
1:15 PM	Randy Runnels	randy.runnels@dep.state.fl.us	Forty Years of Tampa Bay's Aquatic Preserves - A Retrospective
1:30 PM	Chuck Walters	Chuck.Walter@ci.tampa.fl.us	Stormwater Re-use: City of Tampa Experience
1:45 PM			**BREAK**
			Climate Change & Future Challenges
2:00 PM	Ernie Estevez	estevez@mote.org	Effects of Climate Change: Overview of FOCC Findings and Implications to Tampa Bay
2:15 PM	Dave Tomasko	DATomasko@pbsj.com	Potential Impacts of Sea Level Rise on Sarasota Bay seagrasses
2:30 PM	Gordon Hamilton	gordon.hamilton@maine.edu	Ice Sheets and Sea Level Rise: It's Not Just the Melting That Matters
2:45 PM	Brooks Yeager	byeager@cleanair-coolplanet.org	Accelerated Sea Level Rise & Implications to Tampa Bay
3:00 PM	David Hastings	hastindw@eckerd.edu	Holocene Climatic and Hydrologic Variability as Recorded in the Benthic Foraminifera *Ammonia beccarii* from Tampa Bay, FL
3:15 PM	Adam Hosking	hoskingas@halcrow.com	Estuarine Adaptation: The Incorporation of Climate Change into Estuary Management Planning
3:30 PM	Ed Sherwood	esherwood@tbep.org	Tampa Bay - Preparing for a Climate Ready Estuary.
3:45 PM			**BREAK**
4:00 PM			
4:15 PM			
4:30 PM			***Panel Discussion: Climate Change & Future Challenges***
4:45 PM			
5:00 PM			

BASIS 5: DAY 4 (October 23,2009)

Start	Presenter	E-Mail	Presentation Title
8:00 AM			Focus of the Day
		Tampa Bay's Archaeology & Anthropology (*Bill Burger*)	
8:15 AM	Bill Burger		
8:30 AM	Phyllis Kolianos	pkoliano@pinellascounty.org	
8:45 AM	Jeff Moates	jmoates@cas.usf.edu	
9:00 AM			**BREAK**
		Relaying the Message – Science Communication (*Nanette O'Hara*)	
9:15 AM	Nanette O'Hara	nanette@tbep.org	Can Science and Sound Bites Coexist? Improving Communication Between Scientists, the Public and the Media.
9:30 AM			
9:45 AM			
10:00 AM			**BREAK**
10:15 AM	Holly Greening	hgreening@tbep.org	Tampa Bay Estuary's Progress Towards Goals
10:30 AM			
10:45 AM			
11:00 AM			***Panel Discussion: BASIS 5 Synthesis & Next Steps***
11:15 AM			
11:30 AM			
11:45 AM			
12:00 PM			**MEETING ADJOURNED**

“Using our Knowledge to Shape our Future”

Preliminary Program

DAY ONE (Tuesday, October 20, 2009)

7:30AM – 4:00PM	**Registration** **Breakfast (7:30AM – 8:00AM)**

TIME	**SESSION (*Organizer*)**
	BASIS 5 Opening Remarks
8:00AM – 8:40AM	**DICK ECKENROD, Former TBEP Executive Director.**
	Geology/Sediments (*Gregg Brooks*)

Planned Agenda:

8:45AM – 9:45AM

High-Resolution Geologic Investigations in Tampa Bay: Advances and Limitations. *G.R. BROOKS* & *R.A. LARSON (Eckerd College).* While, with few exceptions, the geology of Tampa Bay has likely changed little since the last BASIS, our ability to detect geologic events at much higher resolution, sub-decadal to sub-annual temporal scales, and mm-cm spatial scales, has increased dramatically. Consequently, we can more accurately link causes/effects, and determine controls/processes of geological events preserved in the sedimentary record. However, there is also a greater potential for “over interpretation,” so we must view data cautiously and critically, which, increasingly, requires a multidisciplinary approach.

A case in point is the recently completed Safety Harbor Sediment Project. Objectives included identifying the source, accumulation rates, and distribution patterns of organic-rich sediments (initially termed “muck”) entering Safety Harbor. A multidisciplinary approach consisting of sedimentology/geochronology, bottom type classification/mapping, geochemistry, and biology, was undertaken to address these objectives. The sedimentology/geochronology was based on a dense sampling grid of 60 core sites. It was found that organic-rich, fine-grained sediments have been accumulating in deep, open portions of Safety Harbor proper and in isolated, sheltered depressions along the western shore. In most cases, these sediments have been accumulating for thousands of years (i.e. since being flooded by the last sea-level rise), but rates of accumulation have increased steadily since the early 1900’s, with a dramatic increase (~ 3x) since ~1960. All sedimentological data point to the Lake Tarpon Outfall Canal (LTOC) as the primary sediment source. Geochemical analyses, however, indicate a marine source for the organic fraction. It was concluded that the LTOC was the source for the land-derived, mud-sized sediments, as well as nutrients, entering Safety Harbor. The nutrients in turn enhanced biologic productivity creating the organic detritus that was deposited along with the land-derived muds, because they both reacted the same hydrodynamically. Without a multi-disciplinary approach it would have been very easy to misinterpret the multiple sources of these two fine-grained sediment components.

Nitrogenous Organic Matter Accumulation in Safety Harbor, Florida: Sources and Decadal-Scale Trends. *E.B. PEEBLES* & *D.J. HOLLANDER (USF).* Microscopic and geochemical analyses of surface sediments and sediment cores were used to identify the source of organic-rich sediments that are reported to be accumulating within the Safety Harbor region of Tampa Bay. The geochemical analyses included organic C:N, total organic carbon, total organic nitrogen, stable isotopes of carbon and nitrogen, and analysis of decay-resistant plant biomarkers. All microscopic and geochemical analyses were consistent with microalgae being the predominant form of organic matter in the sediments, although vascular plants (e.g., mangrove, seagrasses) were common in nearshore locations and were present during some time periods in offshore locations. Microalgal sedimentation may occur either directly or indirectly as unassimilated material within fecal pellets that primarily originate from planktonic crustaceans. Hydrilla and other plants from Lake Tarpon were not substantial contributors to organic deposits in Safety Harbor. Likewise, sewage (whether treated or untreated) and animal feces were not dominant contributors to nutrient accumulation. Increasing trends in sediment accumulation rate, total organic carbon, and total organic nitrogen from the 1920s to around 1960 are consistent with the effects of bridge construction that started during the 1920s. Increased nutrient loading during this period also contributed to this trend. Since the 1960s, the area of Safety Harbor near the mouth of the Lake Tarpon Outfall Canal has experienced increased accumulation rates for sediment, total organic carbon and total organic nitrogen. Since the 1940s, sediments in Safety Harbor have been trending away from isotopic signatures associated with Tampa Bay microalgae and toward increased terrestrial sources, as indicated by carbon isotopes, and increased inorganic fertilizer sources, as indicated by nitrogen isotopes.

A Siliciclastic-Filled Sedimentary Basin in a Mid-Carbonate Platform Setting, Tampa Bay, Florida. *B.C. SUTHARD*[1]*, A.C. HINE*[2]*, S.D. LOCKER*[2]*, D.S. DUNCAN*[3] *& R.A. MORTON*[4] *([1]Coastal Planning & Engineering, Inc., [2]USF, [3]Eckerd College, [4]USGS).* Tampa Bay, a 40 km long shallow (4 m average depth) estuary situated along the west Florida coast, is underlain by a sedimentary basin of Neogene age, but of uncertain origin. This basin formed in the middle of one of the largest carbonate platforms on earth and, along with other Florida valleys and basins became a depocenter mostly filled by siliciclastic sediments during the Neogene siliciclastic invasion, as the Peninsular Florida carbonate platform became inundated with terrigenous quartz shed off the southern Appalachians.

Over 800 km of seismic reflection data collected within Tampa Bay was correlated to surrounding stratigraphic control in order to create a geologic framework of the underlying basin and fill. This framework defined a topographically-irregular (>40 m relief), subsurface basin formed sometime between Arcadia Formation limestone deposition (mid-Miocene, open-marine) and the Peace River Formation siliciclastic deposition (mid-to-late Miocene/early Pliocene fluvio-deltaic). The basin was not formed by fluvial-incision, but by deep-seated, structurally-controlled, karst processes, creating an irregular topographic low. Two main depocenters within the basin have been filled by a total of nine sedimentary units during five distinct phases of multiple Neogene and Quaternary sea-level cycles. The existence of this interior-platform basin during multiple sea-level cycles allowed it to control highstand and lowstand sedimentary deposition and erosion. In particular, the existence of this interior-platform basin at times when remobilized siliciclastics were already being transported along the Florida Platform created a unique situation whereby this basin recorded the local deposition of these siliciclastics.

The Tampa Bay basin is unique in its formation, location, and fill, and does not fit any existing interior-platform examples. This newly described example of a midplatform basin begins with the open-marine deposition of a carbonate platform. Structurally-focused, deep-seated karst processes dissolve voids within the center of this carbonate platform. Subsequent sea-level lowstands allowed for the destabilization and collapse of these voids, transferring the deformation vertically through the overlying strata, creating an irregular topographic low. After the formation of this basin, sea-level highstands allowed fluvio-deltaic and marine deposition, and, during lowstands, erosion of the existing sedimentary units, minor karst deformation, and restricted freshwater deposition.

Progress in the Application of Acoustic Bottom Classification Methods for Mapping and Characterizing Tampa Bay Benthic Environments. *S.D. LOCKER*[1]*, S.C. DUNN*[1]*, A.C. HINE*[1]*, L.L. ROBBINS*[2] *& E. WATKINS*[3] *([1]USF, [2]USGS, [3]A&E Project Man., LLC).* Over the past several years a number of bottom-type mapping projects in Tampa Bay have been conducted for exploratory or site-specific mapping objectives. These efforts have included sidescan sonar and QTC single-beam acoustic classification. The Quester Tangent (QTC) acoustic classification method has been applied to both single-beam and sidescan data sets. The sidescan sonar results have proven useful for mapping bottom types such as submerged aquatic vegetation (SAV), hard bottom, and sediment type. The QTC single-beam acoustic classification has proven to be particularly useful for mapping sediment type distribution patterns. A few large-area projects have been conducted that provide insight into the benthic variability, both nearshore and across the Bay. These projects, such as the Gulfstream gas pipeline benthic survey, and the Safety Harbor Sediment Project, will be reviewed in terms of what methods are most useful and what has been learned for application to future mapping efforts. The importance of multidisciplinary investigations is emphasized.

STUDENT POSTER: Historical Bathymetric Analysis of Tampa Bay. *P. JULIAN (FGCU) & E.D. ESTEVEZ (Mote Marine Lab).* Estuarine depth is the product of coastal sediment budgets that involve terrestrial, marine, and autochthonous sources and sinks. Most previous accounts of estuarine depth changes usually have been related to anthropogenic changes to sediment dynamics via dredging activities or alteration of natural hydrology. Through the last century, Tampa Bay's bathymetry has been altered

TIME	SESSION (*Organizer*)
	drastically. A previous study which confirms our findings determined that the mean depth of Tampa Bay has increased by more than 5% in the past century. However at a finer scale, some areas of the Tampa Bay estuary have become more shallow, such as Boca Ciega Bay and a special study area labeled MacDill AFB, which is located at the southern shoreline of the Interbay Peninsula. Whether the depth of Tampa Bay will change as a result of climate change is an open but important question. Changes in the depth characteristics of Tampa Bay could affect water quality; water quantity; water circulation; sediment types; the dispersion, abundance, or productivity of seagrasses; and possibly benthic communities including intertidal oysters.
9:45AM – 10:00AM	***BREAK: Review Submitted Posters***
	Tampa Bay Circulation
10:00AM – 10:30AM	**General Call:** **The Circulation of Tampa Bay Driven by Buoyancy, Tides and Winds, and Its Connection with the Adjacent Gulf of Mexico. *L. ZHENG & R. H. WEISBERG (USF).*** A three-dimensional, density-dependent, finite volume coastal ocean model (FVCOM) with high spatial resolution is used to investigate the circulation of the Tampa Bay estuarine complex, including Tampa Bay, the intra-coastal waterway, Sarasota Bay, and the inner portion of the West Florida Shelf. Model performance over the three-month interval, September to November, 2001 was assessed against tide gauge and velocity profiler data before using the model to describe the circulation driven by rivers, tides and winds. Because of a mean wind velocity vector directed down the estuary axis during this time interval we ran a parallel experiment without winds to distinguish the estuarine circulation by gravitational convection from the mean wind effects. With or without winds, Tampa Bay exhibits a robust, two-layered estuarine circulation that concentrates on the deep channels. The mean outflow at the surface converges on the channels where the free surface elevation is locally a minimum. The mean inflow near the bottom also concentrates in the channels where the baroclinic pressure gradient is largest. Geometry thus guides the mean circulation; hence the salinity and all other water properties. At the bay mouth, mean outflows exist both in the deeper Egmont Channel and the shallower South Pass, whereas a mean inflow is limited to Egmont Channel. A residence time based on the Egmont Channel influx is estimated to be about 100 days. Consistent with previous studies we conclude that gravitational convection is a major contributor to the water property distributions of Tampa Bay. Additionally, by resolving all of the major water conveyances into and out of the bay, the model provides a fundamental framework for addressing problems of environmental concern for the greater Tampa Bay area, as well as for other estuarine systems along Florida's west coast. **Storm Surge of Ivan-Like Hurricane Making Landfall Near Tampa Bay. *R.H. WEISBERG, L. ZHENG & Y. HUANG (USF).*** What may have occurred in the vicinity of Tampa Bay had Hurricane Ivan made landfall here instead of at the Alabama/Florida border? This question is explored using a three-dimensional, primitive equation, finite volume coastal ocean model. The results show that Tampa Bay storm surges are potentially large, especially for landfalls located to the north of the bay mouth. The worst case considered is for landfall at Tarpon Springs, such that the maximum wind is positioned at the bay mouth. By coupling a wave model with the circulation model we find an incremental increase in surge height via the wave radiation stress that adds to the wind stress. Significant wave height distributions also show substantial wave impacts throughout the bay region. Together, the surge and wave results suggest that the Tampa Bay region is as susceptible to damage and destruction as was coastal Mississippi during Hurricane Katrina. Along with such regional findings, we consider the dynamics of hurricane storm surge and in particular the differences that ensue from the use of three-dimensional, versus two dimensional (vertically integrated) models. With hurricane storm surge deriving from the vertically integrated pressure gradient force tending to balance the differences between the surface and bottom stresses, we show that three-dimensional structure is intrinsically important, and that two-dimensional models, by overestimating bottom stress, tend to underestimate surge height. Such

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	underestimation for our Tampa Bay Ivan-like simulations amounted to as much as 30%. This leads to the recommendations that agencies charged with hurricane storm surge simulation should consider transitioning to fully three-dimensional models and that additional studies are necessary to improve upon the surface and bottom stress parameterizations required by these models.

Water Quality/Primary Production (*Roger Johansson & Richard Boler*)

10:30AM – 12:00PM

Planned Agenda / General Call:

Hydrodynamic and Water Quality Modeling of Hillsborough Bay, Florida. *K. HACKETT[1], R. PRIBBLE[1], A.J. JANICKI[1] & C. TSOKOS[2] ([1]Janicki Env. Inc., [2]USF).* Significant improvements in the water quality of Hillsborough Bay, Florida have been documented in the recent past as a result of the concerted efforts of the Nitrogen Management Consortium under the auspices of the Tampa Bay Estuary Program. With the projected increase in human population living in the watershed, it is important to identify the most cost-effective methods of controlling loadings. The implementation of these methods of controlling loadings should allow for the continued improvement of water quality in Hillsborough Bay and greater Tampa Bay. In order to better predict the results of future management actions, the Environmental Fluid Dynamics Code (EFDC) has been developed and employed to predict hydrodynamics and water quality in Hillsborough Bay and the estuarine portion of the three main tributaries to Hillsborough Bay, the lower Hillsborough River, the Tampa Bypass Canal/McKay Bay, and lower Alafia River. A synopsis of hydrodynamic and water quality model calibration will be presented.

Trends in Atmospheric Nitrogen Oxides Concentrations and Implications for Nitrogen Deposition to Tampa Bay. *N.D. POOR (USF).* In recent years, atmospheric concentrations of nitrogen oxides (NO_x) in Hillsborough County have significantly declined. For example, annual average NO_x-NO_2 concentrations at an urban monitoring site decreased by ~50% between 2002 and 2008, from 27 $\mu g/m^3$ to 12 $\mu g/m^3$. During this time frame, NO_x emissions from local power plants were reduced by ~18,000 tons/year. CALPUFF atmospheric transport modeling suggested that local power plant emissions reductions corresponded to a ~130 ton/year decrease in nitrogen deposition to Tampa Bay. In 2008, recessionary economics coupled with higher gas prices appeared to reduce local motor vehicle emissions, based on a significant shift in weekday average NO_x-NO_2 concentrations. CALPUFF modeling was used to estimate the magnitude of the motor vehicle reductions needed to see a 1 $\mu g/m^3$ change in NO_x at an urban monitor and the corresponding change in nitrogen deposition to Tampa Bay.

Water Quality Monitoring in Tidal Tributaries. *R. BOLER (EPCHC) & M.E. FLOCK (PCDEM).* Water quality is a fundamental component needed to assess tidal tributaries for environmental resources management decisions. The Environmental Protection Commission of Hillsborough County (EPC) has been measuring water quality in Tampa Bay and Hillsborough County's tributaries since 1974. All major tributaries are monitored monthly for a broad array of water quality variables. Other minor tributaries are monitored quarterly. We will present the locations, frequency and parameters for the tidal tributaries that EPC samples. We will seek to determine if there are spatial and temporal monitoring gaps around the Bay. We will seek to identify additional parameters for measurement that might improve our ability to understand and manage tidal tributaries. Additionally, Pinellas County Department of Environmental Management (DEM) has been measuring water quality in Tampa Bay and Pinellas County tributaries since 1991. Tributary water quality was monitored monthly from 1991-2002. In 2003, sampling frequency was reduced and a number of tributary stations were moved so volume discharge measurements could be added for TMDL purposes. We will present the locations, sampling frequency and water quality variables for DEM tributary stations from 1991-2002 and changes in the program since 2003. Water quality and load results will be summarized for the current set of stations.

Temporal Trends in Trophic State Parameters for Lakes Clustered in Northwestern Hillsborough County. *M.J. MORENO & N.D. POOR (USF).* Temporal trends of 10 lakes located within the Tampa Bay watershed in northwestern Hillsborough County were investigated. These lakes were classified as oligotrophic or mesotrophic. Water quality data for 1990 to 2007 was obtained from the Hillsborough County

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Water Atlas. Water quality data were divided into two periods: Period 1, 1990 to 1998; and Period 2, 1999 to 2007. A randomized complete block design was used for this analysis. Period was the treatment. To account for lake (drainage basin) effect, the data were blocked by lake. The response was lake water concentrations of total phosphorus (TP) and chlorophyll-a, and the ratio of total nitrogen to total phosphorus (TN:TP). The experimental unit was lake water in the Tampa Bay watershed. A two-way analysis of variance (ANOVA) was conducted with SYSTAT® to test the research hypotheses under an assumption that samples were collected at random (randomly distributed in time). A two-tailed t-test was applied to detect differences between periods within each lake at the 95% confidence level. With few exceptions, concentrations of TP and chlorophyll-a significantly increased and the TN:TP ratio significantly decreased between periods and within lakes over the 17-year period. Annual rainfall was positively correlated with annual average TP and chlorophyll-a concentration, and negatively correlated with annual average TN:TP ratio, when these trophic state parameters were averaged across all lakes and suggested that storm runoff may contribute to higher nutrient concentrations.

High Temporal Resolution Assessments of Tampa Bay Water Quality Using Satellites. *C. HU*[1]*, Z. CHEN*[2]*, F. MULLER-KARGER*[1] *& C. KOVACH*[3] *([1]USF, [2]SWFWMD, [3]FDEP).* The present monitoring of Tampa Bay water quality is largely based on monthly *in situ* surveys. Using data collected from the Moderate Resolution Imaging Spectraradiometer (MODIS), the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), and the Advanced Very High Resolution Radiometer (AVHRR), we show the advantages and shortcomings of satellite remote sensing in estimating several water quality parameters. Sea surface temperature from MODIS and AVHRR showed Root-Mean-Square (RMS) difference of about 0.5°C from *in situ* measurements. Water turbidity from MODIS showed RMS uncertainties of <30% (r^2=0.73, n=43, 0.9-8.0 NTU). Similarly, using SeaWiFS data and a semi-analytical algorithm, we estimated water clarity (SDD, Secchi Disk Depth in meters) and 20% percent surface light depths (PSL) with RMS uncertainties also within 30% (r^2>0.67, n=80, 0.9<SDD<8 m). The data were used to construct long-term time series to study the seasonal patterns and inter-annual variability. Compared with those from the *in situ* measurements, the satellite time-series showed stronger seasonal patterns (e.g., best water clarity in May) because of the increased number of observations (on average, more than once per week). Further, there appears an overall improvement in water clarity from the 1997-2001 period to the 2002-2007 period for the lower bay, with concurrent improvement in seagrass coverage. The satellite-derived water quality data provides valuable information that complements the *in situ* surveys. However, several limitations remain, including: 1) the data accuracy significantly degraded for shallow waters (< 2-3 m) due to interference by light reflected from the bottom; 2) we were unable to obtain reliable estimates of chlorophyll-a concentration or abundance of colored dissolved organic matter (CDOM). These issues will be addressed in the future. Our present effort is to routinely generate high quality products from the satellite sensors to help manage the bay's water quality.

Long-Term and Seasonal Trends of Phytoplankton Production in Tampa Bay, Florida. *J.O.R JOHANSSON, W.M. AVERY, K.B. HENNENFENT & J.J. PACOWTA (City of Tampa, Bay Study Group)*. Phytoplankton production is a basic process in aquatic ecosystems that converts inorganic carbon into organic matter and provides an important indicator of trophic state. The City of Tampa Bay Study Group maintains a 30 year long monthly record of phytoplankton production rates in Hillsborough Bay (HB) and Middle Tampa Bay (MTB), and a recent record over the last nine years for Old Tampa Bay (OTB). Measurements are conducted using the classic *in situ* 14C method with samples incubated vertically in the water column. Annual production rates over the most recent decade are about 410gC/m^2 for HB, 350gC/m^2 for MTB, and 390gC/m^2 for OTB. The current rates for the two former bay segments are near half of the rates measured during the 1980-1985 period. The decrease in production, and also reductions in phytoplankton abundance and biomass, is reflected in a large reduction in anthropogenic nitrogen loading to the bay that primarily occurred in the late 1970s and early 1980s, clearly indicating that the long-term trend in Tampa Bay phytoplankton production and biomass has been driven by the supply of "new" nitrogen from external sources. However, similar to other productive estuarine and coastal systems, in-bay nutrient cycling supplies a large fraction of the nitrogen needed to maintain the production. The vertical distribution of phytoplankton production in HB and MTB has shifted over the study period, most noticeable during the wet summer seasons, from a large proportion of total water column production occurring in the upper meters to a more even distribution with depth. Further, seasonal water column production generally reaches maximum during the summer months and appears to strongly follow variations in water temperature. Finally, a comparison of

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	current phytoplankton and seagrass production in the bay segments studied shows that the open-water phytoplankton community dominates production and it will most likely continue to do so in the foreseeable future.
12:00PM – 1:00PM	***LUNCH***
	Water Quality / Ecosystem Implications

1:00PM – 2:15PM	**Planned Agenda / General Call:** **Chlorophyll-a Response in Tampa Bay to Varying Nitrogen and Hydrologic Loads: Implications to the Assessment of Water Quality Target Compliance.** ***A.J. JANICKI[1], R. PRIBBLE[1], K. HACKET[1], H. GREENING[2] & E.T. SHERWOOD[2] ([1]Janicki Env. Inc., [2]TBEP).*** For more than 20 years, the management of water quality in Tampa Bay has focused on achieving nitrogen load reductions despite an ever-increasing population in the surrounding watershed and airshed. Specifically, the efforts of the Tampa Bay Nitrogen Management Consortium have been to maintain nitrogen loads to the four major bay segments at levels observed during the 1992-1994 period. The premise was that this "hold the line" strategy would maintain chlorophyll-a concentrations at levels conducive to the growth and reproduction of seagrasses in the bay. Bay segment-specific chlorophyll-a targets were established in 1996 and proposed as appropriate indicators for the Reasonable Assurance accepted by the Florida Department of Environmental Protection in 2002. With few exceptions that were typically tied to anomalous meteorological conditions, these chlorophyll-a targets have been met since 1996. Over this same time period, the Consortium members identified and implemented a series of action plans that have cumulatively met the desired preclusion of 17 tons/year TN loads to the bay. Over the past two years, the Consortium has been working with FDEP and the U.S. Environmental Protection Agency to update the 2007 Reasonable Assurance plan. There are two critical elements in this plan. First, is the need to establish nitrogen load allocations to the entities that contribute to the nitrogen loading to the Bay. This is to ensure that the nitrogen loading targets are being managed at desired levels, i.e., the 1992-1994 average annual loads. Second, is the framework for assessing compliance in both water quality (i.e., chlorophyll-a concentrations) and average annual TN loads over a 5-year period. Examination of recent updates of TN loads to the bay showed that the TN load targets were exceeded in several years from 2003-2007. The increased loads were shown to have resulted primarily from higher than average hydrologic loads. Despite the increase in loads, chlorophyll-a targets were met in all four bay segments for the first time during both 2006 and 2007. Therefore, there was a "disconnect" between the management targets for the bay as the water quality targets were being met despite the elevated TN loads. Further examination of the TN loading-chlorophyll-a relationship showed that there is an apparently significant influence of varying residence time due to varying hydrologic loads on this relationship. The observed response in chlorophyll depends in part to both the amount of nitrogen entering the bay as well as the hydrologic inputs. Additional analysis of these loads shows that the amount of nitrogen load per unit of hydrologic load has been declining in all four major bay segments, which is in agreement with the observed bay water quality. We propose that this "nitrogen delivery rate" (TN load:hydrologic load ratio) is a defensible method for tracking compliance with the desired TN loads to Tampa Bay. **Understanding the Underwater Light Field and Its Relevance to Seagrass Sustainability and Resource Management in Tampa Bay.** ***C. ANASTASIOU[1], J. KUNZELMAN[2] & J.O.R JOHANSSON[3] ([1]FDEP, [2]FWRI, [3]City of Tampa, Bay Study Group).*** The Tampa Bay Estuary Program together with its partners is refining seagrass depth and light targets as part of the Seagrass Restoration and Protection Master Plan. One

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element of this plan is to characterize the subsurface light field and its impact on seagrass sustainability. Because seagrass absorb light at specific blue and red wavelengths, simply measuring the quantity of light can be misleading. Knowing the quality of the light field also provides invaluable insight into the causes of light loss. For example, while Tampa Bay, as a whole, is considered a chlorophyll dominated estuary, results from this work confirm that light attenuation in shallow waters is driven mostly by colored dissolved organic matter. This conclusion has profound effects on how we manage the Bay for seagrass and argues for a shift in the current nitrogen management paradigm. Today the tools for measuring light quality are relatively simple to use and are becoming more cost effective. Some of these tools have already been integrated into routine monitoring programs in Tampa Bay.

Water Quality and Biology in Tampa Bay During Six Years of Desalination Facility Operation. ***K.L. MAKI-JENKINS*[1], *R. WOITHE*[1], *A. WILLIS*[1], *R. MCCONNELL*[2], *M. WESSEL*[3], *K. HACKETT*[3] *& A.J. JANICKI*[3] *([1]PBS&J, [2]Tampa Bay Water, [3]Janicki Env. Inc.).*** The Tampa Bay Seawater Desalination Facility (Facility) has operated intermittently during its first six years of operation and provides an opportunity to evaluate potential effects of desalination on water quality and biology under different operational conditions. Up to 44 mgd of the power plant's 1.4 billion gallons per day of cooling water is withdrawn to produce 25 mgd of drinking water. The remaining 19 mgd of brine concentrate is mixed with cooling water and subsequently discharged. Models completed for permitting the Facility predicted minor salinity changes in the bay due to concentrate discharges. A hydrobiological monitoring program was implemented in 2002 to test model predictions and ensure that Facility operations did not adversely affect Tampa Bay. Continuous records of salinity from the intake and discharge canals were used to evaluate the effects of increasing production. Observed salinity differences at the discharge canal were less than predicted by the model, and comprised five percent of the natural salinity variation in the vicinity of the Facility during the monitoring period. Data collected in four biological monitoring areas did not indicate any significant spatial or temporal changes in salinity or other water quality parameters. Dominant taxa, diversity, and community structure of benthic macroinvertebrate assemblages varied spatially, but variables not related to discharge from the facility explained the spatial heterogeneity observed. Seasonal and operational period patterns in fish community diversity in the vicinity of the facility were similar to patterns occurring elsewhere in Tampa Bay. Monitoring remains ongoing.

Management of Piney Point Phosphate Facility Closure and Effects on Water Quality in Bishop Harbor and Adjacent Regions of Tampa Bay. ***R. PRIBBLE*[1], *R. BROWN*[2] *& A.J. JANICKI*[1] *([1]Janicki Env. Inc., [2]Manatee Co.).*** FDEP assumed responsibility for the environmental security of the Piney Point phosphate mining facility in Manatee County near Bishop Harbor in 2001, including the untreated wastewater stored at the facility. Manatee County began collecting water quality data in October 2001 in Bishop Harbor. Unusually high rainfall in December 2002 caused concern that one of the wastewater containment berms might fail, resulting in a catastrophic release of highly acidic and nutrient-laden untreated wastewater into Bishop Harbor. Treated wastewater was discharged to the harbor to alleviate this possibility. FDEP requested an assessment of the potential water quality responses to the discharge of treated wastewater into Bishop Harbor. Because of the need for timely technical guidance on the most appropriate discharge strategy, Janicki Environmental provided this assessment through a three-step approach, with each additional step more complex. These steps included development of empirical loading limits obtained by using a statistical model relating ammonia loads to chlorophyll, use of a two-dimensional water quality model to evaluate the findings of the empirical model, and use of a three-dimensional water quality model linked to the three-dimensional hydrodynamic model developed by USF for the bay and harbor. Discussion of the methodologies used to set loading limits using these steps is followed by examination of the resulting loadings to and water quality in Bishop Harbor.

Rapid Assessments of Lakes and River Stream Reaches in Hillsborough County, Florida. ***D. EILERS*[1], *J. GRIFFIN*[1], *J. MCGEE*[2] *& D. GLICKSBERG*[2] *([1]USF, [2]Hillsborough Co.).*** Hillsborough County and the University of South Florida have over ten years of experience in the use of rapid lake assessments methods and have completed assessments and re-assessment on over 100 lakes in the County between 1998 and 2009. The objective of these assessments is to catalog the general health of small to medium size lakes by taking a snapshot of the lake's morphology, vegetation and water chemistry through an intense, one-day data collection effort. This method is now being adapted for rivers and streams. In 2009 a large number of river

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	reaches in the Hillsborough and Alafia Rivers will be assessed. These assessments will assist the University and Hillsborough County to better understand the general health of the resource and will allow estimates of plant species diversity, river volumes and general morphology and water chemistry. All these data will be made available for public view on the *Hillsborough River and City of Tampa Water Atlas* (www.hillsborough.wateratlas.org). This report discusses changes to the assessment methodology and the expansion of the program to include stream reach assessments. The field methods that will be discussed include: (1) bathymetry to determine bottom contour; (2) bathymetry and the use of side looking sonar imaging to determine submerged vegetation; (3) determination of percent volume infestation (PVI) and percent area coverage (PAC); (4) identification and mapping of invasive and non-native as well as native aquatic plants; (5) semi-quantitative assessment of submerged vegetation biomass and the parallel determination of nutrients held in vegetation; (5) physical profiling with the use of a multi-probe; (6) water quality sampling; and (7) the estimate of sediment volume. The general findings of this first year of stream assessments are also discussed. **POSTER: Near-Shore Water Quality and Seagrass Depth Limits in Upper Tampa Bay, Florida. J.*O.R JOHANSSON, W.M. AVERY, K.B. HENNENFENT & J.J. PACOWTA (City of Tampa, Bay Studies Group).*** Periodic setbacks occur in Tampa Bay seagrass coverage following periods of prolonged rainfall. The setbacks are not unexpected because the increased rainfall causes high tributary discharges of dissolved and particulate matter that affect the light climate of bay waters. However, several near-shore and shallow *Halodule wrightii* meadows in the upper areas of the bay, many bordering mangrove and salt marshes, have been stagnant or have shown very limited expansion for a decade or longer; a time which has included both dry and wet periods. Light availability at the deep edge of these near-shore *H. wrightii* meadows, estimated from an optical model, appears to average about 50 to 60% of surface incident (I_o) photosynthetically available radiation (PAR). This light level would appear sufficient for the meadows to grow and expand into deeper waters. In contrast, deep edges of *H. wrightii* meadows that are temporarily established during extended dry periods, which are located near the offshore edge of the estuarine shelf, receive lower average light levels of about 30 to 40% I_o. An ongoing study of shallow water quality in southeastern Hillsborough Bay shows that CDOM absorbance is consistently higher in waters above the near-shore seagrass bed than in waters above the offshore meadows. Chlorophyll and turbidity generally show increasing trends with distance from shore. Results from the study suggest that reductions of high energy blue light from relatively high CDOM absorbance, in addition to losses caused by phytoplankton, other particulate matter, and epiphytes may limit the near-shore meadows to the shallow depths they currently inhabit. **POSTER: Trend Analyses of Nitrogen and Phosphorus Loads to Tampa Bay for 1985 – 2007. *P.A. VAAS & A.J. JANICKI (Janicki Env. Inc.).*** Trend analyses of nitrogen and phosphorus loads to Tampa Bay will be presented for the period 1985 to 2007 by bay segment and for the entire bay. Analysis of the total loads summed over all sources will be presented, as well as the loads from individual sources. Results of the analyses of loads will be presented for the mainstem bay segments: Old Tampa Bay, Hillsborough Bay, Middle Tampa Bay, and Lower Tampa Bay plus three additional segments including Boca Ciega Bay, Terra Ceia Bay, and the estuarine portion of the Manatee River. It is essential to detect trends in nitrogen and phosphorus loading to Tampa Bay to show progress toward meeting the standards set by the total maximum daily load (TMDL) limits as required by the USEPA and for Reasonable Assurance for the Florida DEP. Based on models developed for the Tampa Bay Estuary Program (TBEP), reductions in nutrient loads will reduce chlorophyll-a concentration and improve the light availability in the bay to allow the re-establishment of seagrasses, one of the primary goals of the TBEP. Total loads of nitrogen and phosphorus are estimated from nonpoint sources, domestic and industrial point sources, groundwater and springs, atmospheric deposition, and fertilizer handling losses. Methods for calculation of nitrogen and phosphorus loads are described in a report by Janicki Environmental, Inc. (2009). The trend analyses are conducted on the monthly load estimates using seasonal Kendall's Tau trend analysis, a set of nonparametric trend analysis techniques that make adjustments for seasonality and autocorrelation in the data.
2:15PM – 2:30PM	***BREAK: Review Submitted Posters***

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	Seagrass Resources & Management (*Robin Lewis, Roger Johansson & Walt Avery*)

Planned Agenda / General Call:

Longshore Bars on the Tampa Bay Shoreline. *C.J. HEARN (Working Science Cons.).* This presentation concerns a study of longshore bars on the shorelines of Tampa Bay. It is based on a series of measurements by the US Geological Survey at the Florida Integrated Science Center in St. Petersburg of currents and waves together with bathymetry surveys from the years 2003 to 2008. Of some special interest are a series of longshore bars that exist in shallow water next to the shorelines of the central basin of the Bay. There is evidence that these bars may be degraded from their historical form. Furthermore, the bars may be important to the stability of the shoreline through their role in creating suitable habitats for seagrass meadows which are themselves still below their historical areal coverage in the Bay. We have looked at these bars in detail along the coast of Mariposa Key (Terra Ceia Aquatic Preserve). Modeling was performed of both the nearshore processes and seagrass habitat. Together with historical data and aerial photographs, this has resolved the long term (decadal) migration of the bars as well as the short term (annual) wiggling of the bar structure due to alongshore instabilities. The long term export of material from the shoreline emphasizes the importance of anthropogenic influences on the structure of these longshore bars. The results are of general applicability to coastal studies in low-energy, strongly tidal, embayments which support substantial commercial shipping and recreational boating and are heavily urbanized.

2:30PM – 4:00PM

Managing Seagrass in Tampa Bay, Florida: A Multi-Scale Approach. *L.M. CROSS, H.S. GREENING & E.T. SHERWOOD (Tampa Bay Estuary Program).* Managing seagrass resources in Tampa Bay, Florida has evolved from a bay-wide approach, focused mainly on nutrient management, to incorporating localized impacts in smaller management areas. Recovery of seagrass acreage to levels observed in 1950 (15,400 ha) is a long-term goal adopted by local, state, federal and private partners participating in the Tampa Bay Estuary Program. A cooperative effort to reduce nitrogen loading from wastewater treatment facilities, stormwater runoff, fertilizer manufacturers, and power plants was initiated in 1980 and has resulted in a 60% TN load reduction compared to the mid-1970s. As a result, annual regulatory water clarity and chlorophyll-a targets are being met, and seagrass coverage in 2008 was the highest recorded since 1950 (but still 3,400 ha lower than 1950 estimates). However, seagrasses in all areas of the bay are not recovering at the same rate. Increased wave energy and the loss of longshore sandbars may coincide with poor seagrass recovery in some areas. Localized water quality factors, including CDOM and turbidity may also have impacts on seagrass growth. To reach the long-term recovery goal bay managers will have to move beyond merely managing nutrient inputs. A multi-scale adaptive research and application approach is currently underway to ensure continuation of the gains in Tampa Bay seagrass coverage. Specific research areas include defining smaller management areas, examining light quality as a function of depth and seagrass presence, characterizing the underwater light field, identifying persistent and ephemeral seagrass beds, and developing a bio-optical model for Tampa Bay. It is anticipated that seagrass targets will be set for specific management areas, as well as evaluating whether the current bay-wide restoration target is still applicable.

Twenty Years of Tampa Bay Seagrass Mapping and Analyses. *K. KAUFMAN & M.G. HEYL (SWFWMD).* The Southwest Florida Water Management District (District) boundaries include five contiguous estuaries, including Tampa Bay, necessitating a large scale approach to monitoring the status of seagrass resources. Seagrass extent and distribution are surveyed biannually using aerial mapping. The objective of the mapping effort is to produce spatially and thematically accurate GIS coverages used to estimate total seagrass area. The program has documented temporal and spatial changes throughout the Tampa Bay study area over a twenty year period. The 2008 seagrass estimates for Tampa Bay's seven bay segments totaled 11,998 ha. This is a 27 percent increase in Tampa Bay seagrass coverage compared to estimates from the District's first mapping effort in 1988. A review of changes in the program's use of mapping technologies and data analysis techniques in relation to mapping results over the last twenty years will be examined. Bay segment data was normalized using z-scores for detection of trends. Three bay segments have positive linear trends each with an r^2 greater than 0.5.

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Seagrass Persistence Analysis in Tampa Bay, 1988-2008. *M. DEMA & A.J JANICKI (Janicki Env. Inc.).* It is estimated that seagrass meadows covered approximately 40,400 acres of Tampa Bay in the 1950s. By 1982, that number had declined by nearly half, to 21,653 acres. Seagrass data from 1988 through 2008 indicate seagrass coverage has varied in the years since. In order to better understand the patterns of seagrass coverage in Tampa Bay, a persistence rule was developed and used to determine what the areal extent was by bay segment and which areas were most constant over the period of record. The persistence rule involved converting the seagrass coverage into a grid format. Each grid cell was designated as having seagrass for a given survey if more than 50% of the grid cell contained seagrass. Persistence maps were created based on these recent surveys and used to characterize trends in seagrass throughout Tampa Bay. The most persistent seagrass areas are located near the shore in the shallowest portions of the estuary, whereas the least persistent areas are in the middle of the channel, where light attenuation is at its highest levels, due to the increased depths in these locations. The results of this analysis show that some areas have never been, nor will be, well-suited for seagrass growth and that bay-wide persistence is variable by bay segment. Boca Ciega Bay and Lower Tampa Bay have the most widespread persistent patches of seagrasses in the study area. Hillsborough Bay has the least persistent seagrass communities, with most patches present for only one or two of the available surveys. The highly urbanized watershed of Hillsborough Bay receives a vast array of inputs, thereby negatively impacting the ability of seagrasses to grow in this bay segment.

Trends in Tampa Bay Seagrass: 1998-2008. *W.M. AVERY* (*City of Tampa, Bay Study Group*). Under the auspices of the Tampa Bay Estuary Program, ca. 60 fixed transects have been monitored since 1998 to document changes in seagrass species composition, abundance, and zonation throughout Tampa Bay. *Halodule wrightii* has been the most common species, found at twice the frequency of *Thalassia testudinum*. Also, *Syringodium filiforme* has been a significant contributor to seagrass composition while *Halophila engelmanni* and *Ruppia maritima*, and the attached alga *Caulerpa* spp. (primarily *C. prolifera*) have been minor constituents. Seagrass frequency was stable between 1998 and 2004 with nearly 50 percent of meter square placements containing seagrass; however, since that time, the frequency has increased to about 60 percent primarily due to *H. wrightii* expansion. Bay-wide abundance as determined by the Braun Blanquet class coverage assignations has been relatively stable. The greatest abundance variability has been seen with Hillsborough Bay *H. wrightii*.

Restoration of Seagrass Habitat in Tampa Bay Using Large Manatee Grass (*Syringodium filiforme*) Sod Units and a Discussion of Planting Site Sediment Dynamics. *J.O.R JOHANSSON, W.M. AVERY, K.B. HENNENFENT & J.J. PACOWTA* (*City of Tampa, Bay Study Group*). Extensive losses of seagrass meadows occurred during the 1960s in the off-shore portions of the shallow estuarine shelf in the upper sections of Tampa Bay. The losses most likely resulted from declining water quality and prevalent dredging activities. Considerable sediment erosion has also occurred in many areas of the bay with large seagrass losses. Over the last 25 years, water quality has improved substantially as a result of anthropogenic oligotrophication and many areas have been re-colonized by shoal grass. Re-colonization by manatee grass has generally been weak or lacking and a planting project was initiated to restore this species to an area where it historically likely was present. Planting area bathymetry was also monitored using kinetic DGPS to evaluate sediment dynamics and to test the ability of the planted manatee grass to accumulate sediments and alleviate sediment losses. Approximately 1200 manatee grass sod units with a total area of about 48m^2 were harvested in summer 2006 from a permitted donor area in western Old Tampa Bay and planted in six 10x20m plots located on the offshore portion of the estuarine shelf in northern Middle Tampa Bay. After two years, the total planted manatee grass ground cover was 1340m^2. Growth and coalescence had occurred in all plots and several restored meadows were expanding in area coverage at rates similar to natural manatee grass meadows. Further, the above ground biomass of the restored grass in several plots was similar to, or exceeded, that of the donor grass at the time of harvest. The two year study did not clearly demonstrate that substantial sediment accretion was associated with the restored manatee grass meadows. However, relative fast acting negative impacts on manatee grass persistence were clearly evident in areas of substantial sediment erosion and accretion, demonstrating that areas with low sediment dynamics provided the most favorable planting locations. These findings have assisted in identifying suitable planting locations for ongoing and future Tampa Bay manatee grass restoration efforts.

TIME	SESSION (*Organizer*)
4:00PM – 4:15PM	***BREAK: Review Submitted Posters***
4:15PM – 5:00PM	***Panel Discussion:*** **Seagrass Resources & Management (*Robin Lewis, Roger Johansson & Walt Avery*)**

“Using our Knowledge to Shape our Future”

Preliminary Program

DAY TWO (Wednesday, October 21, 2009)

7:30AM – 4:30PM	**Registration** **Breakfast (7:30AM – 8:00AM)**

TIME	**SESSION (*Organizer*)**
	Focus of the Day
8:00AM – 8:15AM	Tampa Bay Habitat, Biota, and Integrated Monitoring/Management Approaches
	Ecosystem Restoration & Management (*Brandt Henningsen/Doug Robison*)
8:15AM – 9:45AM	**Planned Agenda:** **History of Habitat Restoration Efforts in Tampa Bay – The Tampa Bay Habitat Restoration Database.** ***L. CROSS (TBEP).*** **Goals and Strategies for Ecosystem Restoration and Preservation in the Tampa Bay Watershed.** ***D. ROBISON (PBS&J).*** **Land Acquisition and Management in the Tampa Bay Watershed – Past, Present, and Future.** ***F. TURBIVILLE (Hills. Co.).*** **The Watershed Approach to Ecosystem Restoration – Linking Bay and Watershed Habitats.** ***B. HENNINGSEN (SWFWMD).*** **Restored Habitats: Lessons Learned and the Importance of Management.** ***T. RIES (Scheda Ecol. Ass., Inc.).*** **Long-Term Monitoring and Assessment of Native and Restored Habitats.** ***B. WEIGLE (Photo Science).***

9:45AM – 10:00AM	***BREAK: Review Submitted Posters***
	Tampa Bay Biota *(Ann Hodgson/Bob McMichael)*
10:00AM – 12:00PM	**Planned Agenda / General Call:** **Benthic Macroinvertebrates of Tampa Bay Revisited.** ***D.J. KARLEN (EPCHC).*** Simon and Mahadevan presented a literature review of benthic macroinvertebrate studies in Tampa Bay at the first BASIS meeting in 1982. Based on their review they made several general conclusions on the spatial and temporal patterns of the Tampa Bay benthic community and estimated that approximately 1,200 infaunal and epifaunal species were found in the bay. They also made several recommendations for future studies including the need for “quantitative, comprehensive, and long-term studies of the Bay benthos to better understand (and formulate management plans for) the long-term effects of urban runoff, domestic wastes and industrial discharges to the Bay.” This recommendation has since been met with the initiation of the Tampa Bay Estuary Program’s Bay-wide Benthic Monitoring program in 1993. Since the start of the Bay-wide Benthic Monitoring Program over 1,450 sediment grab samples have been collected throughout Tampa Bay and over 1,500 macroinvertebrate taxa have been identified; seven taxa accounted for 25% or the overall benthic

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abundance. The cephalochordate *Branchiostoma floridae* was the most abundant species and accounted for 5% of the total benthic abundance. The other numerically dominate taxa included the polychaete *Monticellina cf. dorsobranchialis*, the brachiopod *Glottidia pyramidata*, unidentified tubificid oligochaetes, the gastropod *Caecum strigosum*, the amphipod *Ampelisca holmesi* and the bivalve *Mysella planulata*. Results from the monitoring program have confirmed several of the observations made by Simon and Mahadevan including the trend of increasing species richness towards the mouth of the Bay and the influence of sediment type in controlling the distribution of benthic species. Long-term trends in the benthic macroinvertebrate community in Tampa Bay since the first BASIS meeting appear to indicate general improvements throughout the Bay and in Hillsborough Bay in particular, although isolated areas of habitat degradation still persist.

Commercially or Recreationally Important Invertebrates in Tampa Bay. ***S. P. GEIGER, C.R. CRAWFORD, T. KANASZKA & S. P. STEPHENSON (FWRI).*** Several monitoring programs exist within the Marine Fisheries Research section at the Florida Fish and Wildlife Research Institute which collect data on commercially or recreationally important invertebrates in Tampa Bay. Each program either targets specific species or collects data on invertebrates in association with other studies. The Crustacean Fisheries group established a trap-based study of the stone crab (*Menippe mercenaria*) fishery in 1989 which is ongoing. The Fisheries-Independent Monitoring (FIM) program has conducted intensive sampling of fish and selected invertebrates (*Callinectes* spp., *Menippe* spp., *Limulus polyphemus*, *Portunus* spp., *Farfantepenaeus* spp., *Rimapenaeus constrictus*, *Sicyonia* spp., and *Argopecten* spp.) since 1989. Year-round monthly stratified-random samples (SRS) have been collected throughout Tampa Bay and the tidal portions of four eastern Tampa Bay rivers. Grass shrimp have been identified and counted from additional rivers since 2000. The Molluscan Fisheries group began an ongoing study of bay scallops (*Argopecten irradians*), based on recruit data, in 1998. For many species, such as oysters (*Crassostrea virginica*), baseline data have been established, but long term data sets span insufficient time periods to draw meaningful conclusions about trends. Another important source of data lies in commercial harvest data sets. In some cases partial records extend to the late 1800s. Many other sources of data exist, but there is clearly a need for a comprehensive compilation of the findings from diverse, short-term studies. Non-indigenous species are becoming an increasingly important component of many Tampa Bay benthic communities, but no single entity focuses on their abundance or distribution.

Twenty-Five Years After BASIS I: An Update on the Current Status and Recent Trends in Bird Populations of Tampa Bay. ***A.B. HODGSON & A.F. PAUL (Florida Coastal Islands Sanctuaries, Audubon of Florida).*** Representatives of four orders dominate the avifauna of Tampa Bay: Pelecaniformes (pelicans, cormorants, anhingas); Ciconiiformes (herons, ibis, spoonbills, storks); Anseriformes (waterfowl); and Charadriiformes (shorebirds, gulls, and terns). The first bay-wide assessment of colonial waterbird and shorebird populations was presented at BASIS by Paul and Woolfenden (1985), based on their synthesis of recent surveys of nearly all breeding colonies in the region. We continued those systematic surveys of known colonies through the present, and added other colonies, as they were discovered through the years, to our survey schedule. Some nesting colony sites were abandoned over the years due to various causes of habitat loss, so that the number of active nesting colonies has remained similar during the past 25 years. Using annual breeding bird surveys, Christmas Bird Counts, and migration and winter surveys we have compiled and updated the status and recent trends in the populations of over 30 bird species breeding in Tampa Bay, 13 of which are categorized by the federal or state governments as deserving enhanced conservation protection through their listing as "endangered" or "threatened" species, or "species of special concern". We also comment on the status of several passerines of special interest due to their rarity and restricted distribution. The breeding population totals 30,000-52,000 nesting pairs, averaging 39,000 annually at approximately 30 sites. Up to half the total nesting occurs in Hillsborough Bay; the remainder is distributed at colony sites around Tampa Bay. The Hillsborough Bay Important Bird Area was designated an "Important Bird Area of Global Significance" in 2009. Lower Tampa Bay is the other globally significant Important Bird Area in the region. Human disturbance has become the most significant cause of nesting failure annually, accompanied by anthropogenically-induced predator population increases. We provide a suite of habitat and population management recommendations that should be implemented to conserve the bay's avifauna.

A Brief History of the Fish Fauna of Tampa Bay. ***R.E. MATHESON, JR., R.H. MCMICHAEL, JR., T.C. MACDONALD & G. MCLAUGHLIN (FWRI).*** Although there have been large changes in abundance for some species, the composition of the ichthyofaunal community in Tampa Bay has remained relatively stable since it was last comprehensively reviewed in the early 1960s. Since the 1960s, Tampa Bay has been subjected to multiple stressors, including, but not limited to, multiple red tides, industrial spills, changes in nutrient loading, changes in seagrass coverage, changes in freshwater inflow, changes in current patterns due to activities such as bridge and causeway construction, and losses of shallow water habitat due to activities such as dredging-and-filling. Nevertheless, the primary components of the Tampa Bay fish community seem to remain intact. A review of the historical literature indicates that approximately 40% of the fish species currently known from Tampa Bay had been recorded from the system by 1900, another 40% was documented by the early 1960s, and approximately 20% of the fauna has been documented since the early 1960s. Most of the species in the latter group are represented by one or a few specimens and are species long known from nearby freshwater or marine habitats. A few of the new species are established exotics, and a few more are apparently recent invaders that have established populations in the bay. In addition to the few new species, there have been changes in abundance for various species, and we will use literature and the long-term database of Fisheries-Independent Monitoring Program of the Florida Fish and Wildlife Research Institute to explore some of these changes and suggest causative factors.

An Overview of Recent Research on the Florida Manatee in Tampa Bay: Population, Ecology, and Behavior. ***C.J. DEUTSCH & H.H. EDWARDS (FWCC).*** This overview of recent studies on the Florida manatee in the Tampa Bay region covers long-term population monitoring and short-term ecological/behavioral research. Population monitoring activities include: photo-identification of distinctly scarred individuals to estimate adult survival rate; carcass salvage and necropsy to determine causes of death; and aerial surveys to assess distribution and abundance. The major challenge with using surveys to estimate abundance and infer population trends has been the difficulty in assessing spatio-temporal variation in detection rate. To address this problem FWRI is developing new aerial survey methodologies that should provide statistically unbiased estimates of population size; pilot studies are being conducted in the Tampa Bay area. Behavioral studies have focused on manatee winter use of warm-water aggregation sites, as these provides critical habitat for long-term population viability. We investigated manatee foraging movements and attendance patterns at industrial warm-water refugia in Tampa Bay by tracking 32 manatees over four winters using Argos-linked GPS tags. Manatees behaved as central-place foragers, using a power plant's discharge canal as a focal point from which to make feeding trips to seagrass beds throughout the bay. During winter manatees spent an average of 47% of their time in a thermal refuge. Peak presence at the power plant occurred during mid-day, whereas manatees primarily foraged at night. Access to shallow, nearshore grassbeds was limited to times of higher tidal levels, which typically occurred at night. While traveling across the bay manatees often followed the bottom contour; they reached depths of 16.3 m, corresponding to the bottom of the shipping channel. An FWRI study to assess the effects of manatees on seagrass communities around the aggregation site using exclosures found that biomass and leaf productivity were reduced overwinter and recovered during the growing season, but the impacts of manatee foraging were confounded with those of ray activity.

Using an Ecosystem Model to Assess the Impact of Bottom-Up and Top-Down Processes on Selected Species in Tampa Bay. ***D. CHAGARIS & B. MAHMOUDI (FWRI).*** Drastic changes have occurred in Tampa Bay over the last 50-60 years such as an increase and then decline in nutrient loads to the bay, loss and recovery of seagrass habitat, and the evolution of fishing regulations in response to declining fish stocks. To explore the combined impacts of these changes on fish and invertebrate populations in Tampa Bay, we constructed a multi-species/fleet ecosystem model using Ecopath with Ecosim (EwE). Our model consists of 74 trophically linked biomass "pools" in the form of functional groups, single species, or age classes of single

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	species and ranging from detritus to top predators. The underlying Ecopath model was parameterized using the most recent information available for biomass, consumption, production, diet composition, and fishery landings collected by various county, state, and federal agencies, conservation groups, and academic researchers. In Ecosim, time series of fishing mortalities and fishing effort were used to calibrate the model for the period 1950-2007 in order to replicate historical trends in abundance and catch. Nitrogen load estimates to Tampa Bay were included in Ecosim as an environmental forcing function. Seagrass decline and recovery was modeled through mediation effects that simulated lower light attenuation due to high phytoplankton biomass during periods of increased nutrient loads. The influence that bottom-up and top-down mechanisms has on certain species was evaluated using the weighted sum of squares of deviations (SS) between observed and predicted biomass. The SS for adult spotted seatrout was reduced by about 50% when annual fishing mortalities were included and by an additional 13% when accounting for seagrass habitat loss indicating stronger top-down than bottom-up control. In contrast, the fit to blue crab biomass was improved by only 10% using annual fishing mortalities and an additional 46% when the nitrogen load forcing function was included signifying stronger bottom-up control over this species. **Nekton Communities Associated with Seagrass in Tampa Bay: The Effects of Seagrass Bed Architecture, Seagrass Species Composition, and Varying Degrees of Freshwater Influence. *K.E. FLAHERTY, R.E. MATHESON, JR., F.X. COURTNEY & R.F. JONES (FWRI).*** Seagrass beds provide refuge and feeding areas for various species of nekton. Several studies have indicated that seagrass bed architecture, seagrass species composition, location, and water quality can affect the use of seagrass habitats by nekton. To document patterns of spatiotemporal distribution and abundance of nekton in seagrass beds throughout Tampa Bay and determine nekton community changes associated with variations in the vegetation community and in freshwater influence, we analyzed long-term fisheries independent data (1989-2007) and conducted a short-term synoptic study of small-bodied seagrass-associated nekton in Tampa Bay. The long-term data showed a strong seasonality in community structure partly due to recruitment patterns of abundant species such as *Lagodon rhomboides* and *Orthopristis chrysoptera*. Short-term synoptic data showed a clear difference in community structure associated with long-term salinity variation, which was used as a proxy for freshwater influence. The aboveground biomass of seagrass beds sampled during the synoptic study was lower in areas influenced by freshwater. Despite this reduced amount of seagrass cover, some species, such as *Cynoscion nebulosus* and *Farfantepenaeus duorarum*, preferred seagrass beds in areas with greater freshwater influence. The value of seagrass as habitat transcends the mere presence or absence of vegetation, and management decisions regarding seagrass beds, especially those involving mitigation by acre-for-acre substitution of one seagrass bed for another, need to be made with full consideration of the complex relationships governing the value of a particular seagrass bed for nekton.
12:00PM – 1:00PM	***LUNCH***
	Integrated Assessments: Tidal Tributary Studies (*Justin Krebs*)
	Planned Agenda:
1:00PM – 2:15PM	**Trends Detected with a Tidal Creek Condition Index Based on Ecological Variables and Rapid Survey Methods, in Southwest Florida. *E.D. ESTEVEZ[1], K.L. MEAUX[2], J.K. CUTLER[1], J. SPRINKEL[1] & R. JANNEMAN ([1]Mote Marine Lab., [2]Sarasota Co.).*** The southwest Florida coast is a homogeneous ecological landscape characterized by numerous, usually short tidal creeks located in natural to urban settings. Watershed managers seek rapid-survey methods to accurately describe the ecological condition of tidal creeks in order to document their status and trends. A 4-year project produced a creek index based on

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oyster, other mollusk, other invertebrate, fish, and nuisance algae variables measured in 16 tidal creeks in Sarasota and Charlotte counties, FL. Creeks are tributaries of Sarasota, Little Sarasota, Blackburn, and Lemon bays. Additional surveys were made in Manatee and Hillsborough counties. Data were compared by transformations to unit-less values and values were combined as geometric means. The index sorted creeks into a large group in intermediate condition and smaller groups that were better and worse, but all creek scores were less than 50% of possible maxima. Pearson correlations of index scores to benthic infaunal community data (used as an independent reference standard) were significant ($p<0.05$) for faunal density and highly significant ($p<0.01$) for species richness. Three paradoxes uncovered by this investigation will be discussed. First, the index was not significantly correlated with available abiotic measures of creek or watershed condition, but benchmark characteristics of the benthic community were. Second, benthic community characteristics were not significantly correlated with sediment properties. Third, an apparent increase in creek condition after 2 successive years of drought was reversed by a third dry year. This project was supported by Sarasota County and the Southwest Florida Water Management District.

Tidal Creeks As Nekton Habitat in the Tampa Bay Estuary. ***T.C. MACDONALD*[1], R.E. MATHESON, JR.[1], E.B. PEEBLES[2], R.H. MCMICHAEL, JR.[1] & M.F.D. GREENWOOD[3] ([1]FWRI, [2]USF, [3]ICF Jones & Stokes).** Creeks, streams, and canals which are tidally influenced and flow into the open estuary or into tidal rivers (collectively called tidal creeks) are numerous in the Tampa Bay estuary (>100), are susceptible to human-induced alteration, and are poorly understood in terms of their role in nekton production. Since 2005, the Fisheries-Independent Monitoring program has been involved in several multi-agency studies of tidal creeks in the Tampa Bay estuary. During these studies, fifteen tidal creeks and their receiving water bodies were sampled monthly and another twenty-five tidal creeks were sampled semiannually (May and September). Sampling was conducted with a 9.1-m raft seine and collected nekton were identified, counted, and measured and a subsample was returned to the lab for diet and stable isotopes analyses. These samples were collected to 1) assess the importance of tidal creeks to nekton; 2) evaluate effects of habitat parameters on nekton resources in tidal creeks; 3) determine effects of food and sources of food production on nekton resources in these habitats; 4) identify potential impacts of physical, chemical and biological factors on habitat condition and trophic pathways in tidal creeks; and 5) identify potential impacts of the non-native piscivorous pike killifish on native taxa. Results from these studies include: 1) nekton communities appear to differ as a result of tidal creek morphology and geographic location; 2) common snook are a prominent species that uses tidal creeks as a nursery habitat; 3) benthic microalgae and particulate organic matter provide the trophic base for tidal creeks; and 4) nonnative species such as pike killifish have the potential to alter native nekton assemblages.

A More Comprehensive Approach for Determining Juvenile Snook Nursery Habitat in a Tampa Bay Wetland. ***A. BRAME*[1], C. MCIVOR[1], E.B. PEEBLES[2] & D. HOLLANDER[2] ([1]USGS, [2]USF).** It is widely accepted that wetlands serve as nursery habitat for numerous estuarine fish species, however few studies look past simple measures of abundance to define these habitats. In the fall of 2006 we set out to better define nursery habitat of common snook, *Centropomus undecimalis,* by sampling a tidal creek and connected ponds in both upstream and downstream portions of a single Tampa Bay wetland. We collected snook and measured habitat variables in each habitat, taking standard fish measurements (i.e., abundance, condition, size) to determine relationships between habitat, density, and growth. We also retained whole snook for stable carbon and nitrogen isotopic analysis. We found higher densities of juvenile snook in ponds (5.2 ± 1.06 snook/100m^2) and upstream locations (5.5 ± 1.10) compared to creek sites (2.2 ± 0.47) and downstream portions of the wetland (2.0 ± 0.34). Snook collected from ponds were on average smaller (55.3 ± 1.17 mm SL) than those collected from the creek (66.7 mm SL ± 1.71), but condition (K) and growth rate did not differ between the two site types. Isotopic compositions of snook were distinctly different between ponds and the creek suggesting little movement between habitat types. Snook collected in ponds were isotopically enriched in nitrogen and depleted in carbon ($\delta^{13}C = -25.36 \pm 0.10$, $\delta^{15}N = 12.06 \pm 0.11$) relative to those collected in creeks ($\delta^{13}C = -24.77 \pm 0.15$, $\delta^{15}N = 10.93 \pm 0.18$). This result suggests more nutrient recycling occurred in the ponds, likely due to reduced flushing in these habitats. Based on isotopic composition, juvenile snook

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feed on small fishes or invertebrates at the 2nd trophic level and obtain carbon from benthic microalgae and particulate organic matter. Stable isotope ratios in conjunction with more frequently used variables such as abundance and growth seem to produce a clearer description of snook nursery habitat through the interpretation of fish diet and movements.

Defining Fish Nursery Habitats: An Application of Otolith Elemental Fingerprinting in Tampa Bay, Florida. ***J.A. LEY**[1], C.C. MCIVOR[2], E.B. PEEBLES[3] & H. ROLLS[1,3] ([1]FWRI, [2]USGS, [3]USF).* Fishing in Tampa Bay enhances the quality of life of the area's residents and visitors. However, people's desire to settle along the Bay's shorelines and tributaries has been detrimental to the very habitat believed to be crucial to prime target fishery species. Snook (*Centropomus undecimalis*) and red drum (*Sciaenops ocellatus*) are part of the suite of estuarine fishes that 1) are economically or ecologically prominent, and 2) have complex life cycles involving movement between open coastal waters and estuarine nursery habitats, including nursery habitats that are located within upstream, low-salinity portions of the Bay's tidal tributaries. We are using an emerging microchemical technique – elemental fingerprinting of fish otoliths – to determine the degree to which specific estuarine locations contribute to adult fished populations in Tampa Bay. In ongoing monitoring surveys, over 700 young-of-the-year snook and red drum have already been collected from selected Tampa Bay tributaries. Using laser ablation-inductively coupled plasma – mass spectrometry (LA-ICP-MS), we are currently processing a subsample of these archived otoliths to identify location-specific fingerprints based on elemental microchemistry. We will then analyze older fish from the local fishery in order to match them to their probable nursery areas, as defined by young-of-the-year otoliths. We expect to find that some particularly favorable nursery locations contribute disproportionately large numbers to the fished population. In contrast, other nursery areas may be degraded, or act as "sinks", thereby decreasing their contribution to the fish population. Habitat managers can direct strategic efforts to protect any nursery locations that are found to be of prime importance in contributing to adult stocks.

Using Estuarine Fish Stable Nitrogen Isotopes to Pinpoint Land-Cover Nutrient Origins. ***E. MALKIN**, E.B. PEEBLES & D. HOLLANDER (USF).* A novel, stable-isotope-based methodology is described that will allow comparison of the nitrogen connectivity of different land-cover types in estuarine watersheds to nitrogen in estuarine organism tissues. This approach (1) identifies nitrogen control points in the watershed that can be used for effective nitrogen reductions, and (2) provides a criterion for evaluating the effect of new best management practices for land cover or hydrologic alterations to the watershed. The method is based on using forward stepwise multiple regression to fit variation in local tributary fish nitrogen isotopes to variation in local tributary proportional land-cover areas. In a mechanistic sense, empirical coefficients fitted in this process represent the products of multiplying nitrogen connectivity (i.e., the delivery of nitrogen from land-cover to receiving waters) by mean land-cover nitrogen isotope ratios. These products (fitted coefficients) are repeatedly (n = 10,000) estimated by bootstrapping proportional area and fish-isotope data from different combinations of local tributaries. The bootstrapped product distributions can then be divided by measured mean land-cover isotope ratios (as $\delta^{15}N$ in dissolved inorganic nitrogen) to produce bootstrapped land-cover nitrogen connectivity coefficients even if different land covers have similar isotope ratios. This methodology has undergone successful initial testing in 14 west-central Florida estuarine tributaries, which indicated row crops and citrus have much higher nitrogen connectivities to estuarine organisms than other non-urban land-covers, despite their low relative areas. Wetlands, on the other hand, had negative nitrogen connectivity, as might be expected.

2:15PM – 2:30PM	***BREAK: Review Submitted Posters***

TIME	SESSION (*Organizer*)
	Integrated Assessments: Tidal Tributary Management (*Justin Krebs*)
2:30PM – 3:45PM	**Planned Agenda:** **Coastal Development Reduces the Quality of Tidal Creeks as Fish Habitat. *J.M. KREBS* *(USF).*** To evaluate the quality of small tidal tributaries (i.e., creeks and mosquito-control ditches) as habitat for nekton, we estimated species composition, abundance, and condition of nekton in eleven tributaries from natural and altered watersheds in Tampa Bay, FL. Nekton assemblages were most similar and species richness and density were highest in three natural creeks characterized by unmodified channel geomorphology, natural shoreline vegetation, and limited development in the surrounding watershed. Altered tributaries classified as industrial creeks and mosquito ditches had nekton assemblages with high similarity among tributaries within this group, but density and species richness were comparatively lower than in natural creeks. Three urban creeks (also altered) characterized by modified channels, hardened shorelines, high-density urban development and high impervious surface in the surrounding drainage showed high variability in species richness and nekton density and low community similarity among these creeks and compared to other tidal creeks. Most of the statistically significant differences in body condition (measured as length-weight relationships) were observed when nekton in natural and altered tributaries were compared (i.e., five of the nine most common nekton species, including sailfin molly, *Poecilia latipinna*, were heavier at a given length in natural creeks compared to altered creeks). The other four species did not differ in condition among natural and altered tributaries. Physiological condition, measured as percent total lipid content, of juvenile *P. latipinna*, was similar for most of the tributaries (27-32%), but lower values were observed for three of the tributaries (i.e., natural, urban, mosquito ditches; 20-23%). Based on our observations of greater species richness, higher abundances, and better condition in natural tidal creeks compared to some altered tributaries, we suggest that coastal development has the potential to reduce the quality of tidal tributaries as habitat for estuarine nekton. Understanding the mechanisms that cause these differences in habitat quality will be key to the conservation and management of small tidal tributaries. **2006 Tampa Bay Tidal Tributaries Habitat Initiative. *E.T. SHERWOOD* *(TBEP).*** Tidal tributaries within the Tampa Bay estuary encompass a collection of system types including coastal and riverine creeks with and without direct freshwater input, dredged inlets, and other "backwaters." Relative to other larger riverine systems, the ecological condition and function of the >100 small tidal tributaries flowing into the bay is not well understood. In 2006, the Tampa Bay Estuary Program embarked on a collaborative research project to assess the importance of these systems to estuarine processes. Water and sediment quality, benthos, and nekton species were found to be variable across the 9 small tidal tributaries studied. Landscape development intensity along the tributary corridors was associated with water and sediment quality degradation. Position of the tributaries along the estuarine gradient appeared to influence the variability in observed ecology, and seasonal shifts in benthic microalgae production played an important role in nitrogen pathways to nekton. Common snook (*Centropomus undecimalis*), an important fisheries species, were significantly more abundant in these tributaries than adjacent habitats. Preliminary management actions developed from the results included: 1) maintaining connectivity between open bay waters, tidal rivers, and smaller, tidal tributaries to allow fish movement, water flow and nutrient flux between systems, 2) reducing "flashiness" of water flow to tidal tributaries to promote natural flow patterns and foster the productivity of fish food sources within these systems, 3) tracking the condition of additional tidal tributaries to further assess their uniqueness, and 4) improving public education and stewardship of tidal tributaries by promoting the importance of these systems as key habitats to important estuarine fish species. Based on these recommendations, local partners are currently investigating the feasibility and implications of salinity barrier removal as a restoration option for Tampa Bay tidal tributaries. **What Have We Learned From 10 Years of Hydrobiological Monitoring on the Alafia River? *R. WOITHE*[1], *K.L.M. JENKINS*[1], *A. WILLIS*[1], *R.G. MCCONNELL*[2], *D. ROBISON*[1] *&* *R. MONTGOMERY*[1] *([1]PBS&J, [2]Tampa Bay Water).*** When the Alafia River Hydrobiological Monitoring Program (HBMP) was first

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designed in 1999, multiple stakeholder, research, and regulatory groups came to the consensus that data and monitoring programs then in existence were not sufficient to define baseline conditions or assess potential impacts of freshwater withdrawals in the Alafia River. One purpose of the Alafia River HBMP was to address these data gaps. Ten years of data and analyses are now available to determine how well the Alafia River HBMP has achieved its objectives. HBMP components have included water quality indicators (sampled via fixed, stratified-random, and automated continuous-recording stations) and biological indicators (vegetation, benthic macroinvertebrate, fish, ichthyoplankton, and birds). Results from the monitoring program have been used both for regulatory monitoring of potential adverse impacts and resource management purposes (e.g. developing minimum flows and levels). This presentation summarizes the current state of knowledge for the Alafia River relative to resource management and regulatory assurance purposes.

Examining the Relationships between Freshwater Flows, Nutrient Loads, Chlorophyll-a Concentrations and the Distribution of Benthic Macroinvertebrates in the Lower Alafia River. ***M.R. WESSEL*[1]*, A.J. JANICKI*[1] *& R.G. MCCONNELL*[2] *([1]Janicki Env. Inc., [2]Tampa Bay Water).*** The Alafia River is one of the most nutrient enriched rivers in southwest Florida and subsequently has some of the highest chlorophyll-a concentrations on the coast of west Florida (SWFWMD 2007). Deposition and decomposition of phytoplankton is a major source of organic carbon that is utilized by detritus feeding organisms in the benthos driving secondary productivity and providing a base in the food chain for higher trophic levels (Dauer et al. 2000, Herman et al. 1999). The objective of this project was to examine the empirical data collected as part of the HBMP program to quantify the relationships between freshwater inflows, nutrient concentrations or loadings, chlorophyll-a concentrations and benthic macroinvertebrate distribution and abundance. A nonparametric model was developed to estimate a chlorophyll response surface as a smooth multivariate function of inflow, season and location within the river. Model predictions were generated based on the empirical data and used to estimate chlorophyll concentrations at 0.5 kilometer intervals throughout the Alafia River. These predictions were then integrated over various time scales and an index was developed to assess the areas of predominant chlorophyll biomass. Benthic macroinvertebrate abundances were then correlated with the chlorophyll biomass index. Polychaete worms, shrimps and decapod crustaceans were found to exhibit the highest concordance with areas and times of high organic deposition. These taxa serve as important prey items for higher trophic levels stimulating estuarine production up the food web. Future studies will investigate the correlation of zooplankton densities and chlorophyll biomass estimates as well as validating the model with new data.

The Determination of Minimum Flows and Levels for Tributary Rivers to Tampa Bay. ***M.S. FLANNERY, M.G. HEYL, X. CHEN & M.H. KELLY (SWFWMD).*** The Southwest Florida Water Management District has adopted, or is in the process of adopting, minimum flows and levels (MFLs) for all the major rivers that flow to Tampa Bay. MFLs establish the limit at which further withdrawals would be significantly harmful to the natural resources of the area. MFLs are determined separately for the non-tidal and tidal reaches of individual rivers using hydrobiological analyses and metrics that are appropriate for freshwater and estuarine systems, respectively. MFLs have been adopted or proposed for the fresh and estuarine portions of the Hillsborough and Alafia Rivers and the tidal reach of the Tampa Bypass Canal, and are currently under evaluation for the Little Manatee and Manatee Rivers. In establishing MFLs for the Lower Hillsborough River and the Tampa Bypass Canal, the District took into account the extensive, existing structural alterations to those water bodies. For rivers that have not been so altered, the District has employed the percent-of-flow method to determine MFLs. This method determines daily percentages that the natural baseline flow of the river can be reduced. These percentages can be determined within flow ranges or seasons and can be combined with a low flow threshold below which no withdrawals are allowed. Ecological analyses that have been used for the determination of MFLs for tidal estuarine rivers have emphasized relationships of freshwater inflow with: the area, shoreline length and volume of biologically important salinity zones; the abundance and distribution of key fish and invertebrate species; and chlorophyll-a and dissolved oxygen concentrations.

TIME	SESSION (*Organizer*)
3:45PM – 4:00PM	***BREAK: Review Submitted Posters***
4:00 PM – 5:00 PM	***Panel Discussion:*** **Tidal Tributary Integrated Assessments (*Justin Krebs*)** To synthesize current knowledge on tidal tributary ecology and to identify the logical "next steps" for the study, management and conservation of tidal tributaries. • Mike Weinstein, Montclair State University, NJ • Ernst Peebles, USF College of Marine Science

DAY THREE (Thursday, October 22, 2009)

7:30AM – 4:30PM	**Registration** **Breakfast (7:30AM – 8:00AM)**

TIME	SESSION (*Organizer*)
	Focus of the Day
8:00AM – 8:15AM	Watershed Management Initiatives, Environmental Regulations & Protections, Climate Change and Future Challenges
	Integrating Watershed Management Initiatives *(Suzanne Cooper)*

Planned Agenda:

Overview of Tampa Bay's Management 'Structure' and a Case Study of Collaboration. *S. COOPER (TBRPC).*

- **Southwest Florida Water Management District Roles. *J. SEACHRIST (SWFWMD).***
- **Florida Department of Environmental Protection Roles. *C. ANASTASIOU (FDEP).***
- **Tampa Bay Estuary Program and Nitrogen Management Consortium Roles. *H.S. GREENING (TBEP).***
- **Tampa Bay Regional Planning Council, One Bay, and Tampa Bay Area Regional Transit Authority Roles. *A. WYNNE (TBRPC).***

General Call:

8:15AM – 10:00AM

Using a 'Decision Matrix' Approach to Develop a Fecal Coliform BMAP for Impaired Waters in the Hillsborough River Watershed. *G. MORRISON (BCI), H. SWANSON (HSW), V.J. HARWOOD (USF), C.M. WAPNICK (PBS&J), T. HANSEN (FDEP) & H.S. GREENING (TBEP).* This project applied a decision-support tool — conceptually similar to the 'decision matrix' that is currently used by the Tampa Bay Estuary Program to assess water quality in Tampa Bay — to help guide the development of a Basin Management Action Plan (BMAP) to address fecal coliform impairments and TMDLs for six impaired stream segments in the Hillsborough River watershed. The decision-support framework used in the project is based on technical approaches and resource management strategies recommended by the World Health Organization (WHO) and the U.S. National Research Council (NRC). In addition to fecal coliform counts and information on the frequency of exceedance of State water quality standards, the framework also includes an assessment of the types of potential fecal contaminant sources affecting each stream segment and an estimate of their potential human health risk. A weight-of-evidence approach based on the 'Annapolis protocol', which was developed by the WHO to address the limitations of fecal coliforms and other bacterial indicators for assessing and managing health risks associated with recreational waters, is used to organize and summarize the indicator and source category information. In addition to this application to Class III (recreational) waters, it appears that similar conceptual approaches based on the Annapolis protocol could also be used for managing waterborne health risks associated with Class I (potable supply) and Class II (shellfish harvesting) waters.

Industrial Storm Runoff and Florida Receiving Waters – Adequacy of Data for Watershed Planning. *L.D. DUKE (FGCU).* Effective decision-making for watershed planning and the BMAP process, in urban or industrialized watersheds, needs to include realistic estimates of pollutant loads originating with industrial storm runoff. This research investigates the sufficiency of available data on pollutants in industrial runoff, using: 1) statewide data about compliance with requirements under the NPDES program of the U.S. Clean Water Act; 2) information about municipal programs in various parts of Florida; and 3) a telephone survey of a sample of facilities in Pinellas County. Results demonstrated that a small portion of industrial facilities subject

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	to NPDES stormwater regulations in Florida comply with the basic requirements of self-identification and monitoring of a limited number of constituents in facility runoff. Among those that self-identify, exemptions and allowed exclusions allow most to avoid monitoring. Data are insufficient to form a reasonable estimate of loadings to receiving waters or to reliably identify the location of the largest potential sources in any given watershed. Municipal programs in various parts of Florida are very unevenly implemented. Some watersheds have effective information and institutions in place to reduce pollutants if needed, while others have neither. Examples of active and effective outreach and technical support include Hillsborough County's efforts for the Port of Tampa and Jacksonville's inspection program for all industrial facilities. Other municipalities implement a diligent best-judgment effort to focus on facilities considered likely to contribute pollutants to receiving waters. Others implement the minimum activities that satisfy regulations. Finally, interviews with industrial facility operators suggest a few use monitoring data to identify and reduce pollutants in runoff, but many do not. Many newer facilities escape monitoring requirements by discharging to on-site retention or detention ponds, and do not substitute site-specific observations that would characterize source activities pollutants that may enter groundwater.
10:00AM – 10:15AM	***BREAK: Review Submitted Posters***
	Environmental Regulations & Protections (Rhonda Evans/Clark Hull)
10:15AM – 11:15AM	**Planned Agenda:** **Overview of Federal Agency Policies and Regulations to Protect Wetlands. *R. EVANS*[1] *& C.J. WOOD*[2] *([1]US EPA, [2]US ACOE)*** **Overview of State/Regional Policies and Regulations to Protect Wetlands. *C. HULL (SWFWMD).*** **Overview of Local Agency Policies and Regulations to Protect Wetlands. *B. STETLER (EPCHC).*** **General Call:** **Meeting Restoration Goals in the Tampa Bay Basin through Mitigation Banking. *R. TOTH, L. PROENZA & B.F. BIRKITT (Birkitt Env. Serv. Inc.).*** A key driver for development of mitigation banks is the new federal compensatory mitigation rule. This rule identifies the use of a mitigation bank as the preferential choice for mitigation for wetland impacts. State regulations are expected to follow this approach. This recognition of the benefits of mitigation banks provides opportunities to establish banks that meet goals identified within the Tampa Bay region. Proposed mitigation banks must demonstrate regional ecological benefits, effective management in perpetuity including financial responsibility, and a high probability of meeting success criteria, among others. Mitigation banks typically provide higher quality habitat than most on-site mitigation. With the current regulatory focus on mitigation banking and the significant ecological benefits they provide, it is anticipated that banking will play an increasing role in the future restoration and enhancement of Tampa Bay. The Tampa Bay Mitigation Bank is the first mitigation bank established in the Tampa Bay Basin. The 161 acre bank is located in southeastern Hillsborough County adjacent to Cockroach Bay Aquatic Preserve. The headwaters of Andrews Creek are being restored, tidal creeks excavated, and approximately 42 acres of estuarine salt marsh and mangrove habitat created. Significant natural recruitment of mangroves and other estuarine vegetation has also occurred on site. Red mangroves and estuarine vegetation have been planted. Grading of oligohaline and freshwater portions of the property has been completed and native wetland vegetation will be planted in the near future creating 85 acres of freshwater wetlands. Adaptive land management techniques are being utilized to ensure establishment of this important regional habitat.

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	Successful establishment of mitigation banks requires a marriage of science and economics. Many opportunities for restoration and enhancement of natural systems occur throughout the region. Other prospective mitigation banks involving significant areas of mangrove and aquatic habitat restoration within the Tampa Bay Basin are being evaluated.
11:15AM – 12:00PM	***Panel Discussion: Environmental Regulations & Protections (Rhonda Evans/Clark Hull)***
12:00PM – 1:00PM	***LUNCH***
	BASIS 5 General Call Presentations (*Ed Sherwood*)
1:00PM – 1:45PM	**General Call:** **Distribution of Native Plant Species on Islands of the Tampa Bay Area. *T. RESTOM-GASKILL*[1], *J. WOLF*[1] & *R. RUNNELS*[2] ([1]Eckerd College, [2]FDEP).** Understanding the factors that affect the natural distribution of plants on islands is essential to the restoration success of severely disturbed insular ecosystems. The objective of this project was to understand the distribution of plants within and among islands located in the Tampa Bay area according to physical factors that could easily be measured by restoration crews. The factors chosen were soil salinity, soil texture and elevation. We surveyed vegetation on 12 islands in Pinellas (Anclote Key, Caladesi Island, "Plant Island" and Shell Key), Hillsborough (Big Pass Key, Camp Key, Egmont Key, Pine Key, Sand Key and Snake Island) and Manatee (Harbor Key and Mariposa Key) counties. Approximately 145 plant species were identified from 458 1-m^2 plots surveyed for ground cover (plants smaller than 1 m), and 449 25-m^2 plots surveyed for vegetation taller than 1 m. Species were found to occur in different ranges of soil salinity and elevation, and in different types of soil. Ordination techniques were used to identify species assemblages and how the different environmental variables affect their distribution. The results obtained will be used to formulate guidelines to improve the restoration success of island ecosystems in Tampa Bay. **Forty Years of Tampa Bay's Aquatic Preserves – A Retrospective. *R. RUNNELS* (FDEP).** August 1, 2009 represents the 40th anniversary of the establishment of Tampa Bay's first Aquatic Preserve in Boca Ciega Bay. Under the auspices of DEP's Office of Coastal and Aquatic Managed Areas, the Tampa Bay Aquatic Preserves program manages four areas of submerged lands designated by the legislature as state aquatic preserves in three counties. To some extent, Tampa Bay's aquatic preserves are a microcosm of management needs and strategies of Florida's network of forty one Aquatic Preserves. Ranging from densely urbanized to relatively pristine, each of these areas presents a unique and dynamic suite of management needs. As with Florida's other aquatic preserves programs, the Tampa Bay program is place-based, science-based and adaptive. With information from scientists and citizens, the program identifies habitat degradation and other resource management issues within the preserve boundaries. Input from scientists and citizens is also used in developing and implementing strategies to address those issues. By looking at landscape-level ecological function within relatively large areas, the Tampa Bay Aquatic Preserves program fills a unique niche that complements the missions of, and enhances the actions of, a variety of governmental and nongovernmental organizations. The program's outreach efforts include sharing information and ideas throughout the state and the Gulf of Mexico.

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	Stormwater Re-use: City of Tampa Experience. *<u>C. WALTERS</u> (City of Tampa).* The City of Tampa beneficially uses 38% of the stormwater generated City-wide. The City of Tampa is 109 square miles. The population of 325,500 makes it the 55th largest city in America and the third largest in the State of Florida. The potable water customer base is approximately 500,000 as there are significantly more daytime visitors than full time residents and the service area for the potable water system is significantly larger than the City limits. The City of Tampa is a highly urbanized area. It grades less urban and more suburban from its midpoint to the north and south respectfully. The northern 1/3 of the City drains to a City reservoir. Further, large portions of urbanized City of Temple Terrace and development in unincorporated Hillsborough, Pasco and Polk Counties all drain to the reservoir. The water in this reservoir system is treated at the David Tippin water treatment plant and is distributed as potable water to the City's potable water customer base. Runoff calculations from the entire City of Tampa considering normal rainfall conditions are 1,500,000,000 gallons per year. Tampa water customers consume 2,000,000,000 gallons per year. A detailed water budget will demonstrate the economic use of stormwater for potable water demand in the City of Tampa. Plans to maximize performance of the stormwater catchments systems will also be discussed.
1:45PM – 2:00PM	***BREAK***
	Climate Change & Future Challenges (*Ernie Estevez*)
2:00PM – 3:45PM	**Planned Agenda:** ***Effects of Climate Change on Ocean and Coastal Resources: An Overview of FOCC Findings and Implications for Tampa Bay. <u>E.D. ESTEVEZ</u> (Mote Marine Lab.).*** ***Potential Impacts of Sea Level Rise on Sarasota Bay Seagrass. <u>D.A. TOMASKO</u> (PBS&J).*** In Sarasota Bay, correlations between chlorophyll-a and water clarity allow for the development of chlorophyll-a targets to protect seagrass resources as a bio-indicator of system health. Based on a comparison of techniques, it was found that surveyed offshore edges of seagrass meadows are typically 17 cm deeper than offshore edges delimited from seagrass maps. These surveyed edges typically extend 30 to 40 meters farther offshore than edges delimited from seagrass maps. Based on a comparison between predicted depths from a 1950s-era bathymetric map and current depth measurements, it appears that the waters of Sarasota Bay are approximately 17 cm deeper in 2007 than was the case in the 1950s, which is consistent with estimates of the degree of sea level rise (SLR) expected over a 50 year timeline. If future SLR occurs at a similar rate, water clarity would have to improve, to allow the same light level to penetrate to the offshore edges of future seagrass meadows. Bay-wide, chlorophyll-a levels would have to decrease by 13 to 35 % by the year 2020, to allow seagrasses to maintain their present-day coverage in the future, deeper, waters of Sarasota Bay. **Ice Sheets and Sea Level Rise: It's Not Just the Melting That Matters. *<u>G.S. HAMILTON</u>[1]* & *<u>B. YEAGER</u>[2]* *([1]University of Maine, [2]Clean Air-Cool Planet).*** The most recent IPCC projection for sea level rise calls for 18-59 cm (7-23 inches) by the end of this century. A large portion of this rise is attributed to reductions in ice sheet volume, but the projections only include the melting of ice (i.e., the transfer of liquid water to the ocean). Research carried out since the IPCC report was compiled shows that ice sheets are losing mass at a much faster rate due to dynamic effects (i.e., the transfer of solid mass -- icebergs -- to the ocean). This dynamic thinning is being driven by the synchronous and rapid speed-up of several large outlet glaciers

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draining the Greenland and West Antarctic ice sheets. The causes for the speed-ups are not fully understood, but they most likely represent a non-linear response to climate forcing (either atmospheric warming, or an increase in ocean temperatures). These dynamic effects raise sea levels much faster than melting effects alone, so it is critical that they are included in sea level forecasts. Current best estimates based on recent observations indicate a 1 m rise (40 inches) by 2100 is a more realistic planning scenario.

These are serious predictions that will have severe repercussions on U.S. coastal communities. For the Tampa Bay region, already facing a great threat from sea level rise, these new estimates increase the urgency for us to respond at both national and local levels. In order to slow the rate of warming and melting in the Arctic, we must act quickly to mitigate further pollution. We must also have a serious discussion about which areas of Tampa Bay are most likely to be impacted given these estimates, and what can be done to facilitate regional adaptation efforts moving forward.

Holocene Climatic and Hydrologic Variability as Recorded in the Benthic Foraminifera *Ammonia beccarii* from Tampa Bay, FL. *K.J. HOOVER[1], D.W. HASTINGS[2], B.P. FLOWER[3]& G. BROOKS[2] ([1]University of Nevada, [2]Eckerd College, [3]USF).* We present a Holocene length reconstruction of natural and human induced climate and hydrological variability in Tampa Bay, FL. Reconstructions were developed using benthic foraminifera, *Ammonia beccarii,* collected from a series of sediment cores from Hillsborough Bay. Stable isotope paired with foraminifera Mg data provide records of temperature and salinity changes. The chronology is constructed using a series of AMS ^{14}C dates on samples of *A. beccarii* and ostracods.

The data allow us to assess temperature and salinity changes during the last several thousand years, including the Little Ice Age and the interval of human influence. Our record does not show a strong correlation between Mg/Ca and $\delta^{18}O_{carbonate}$, suggesting changes in $\delta^{18}O_{seawater}$ of Tampa Bay, and thus substantial hydrologic variability on a sub-centennial-scale. Maxima in foraminiferal Mg indicate high temperatures during the Medieval Warm Period; the lowest foraminiferal Mg at 1600 AD suggests a possible association with the Little Ice Age. Current research is underway to develop a temperature calibration for foraminifera Mg in *A. beccarii*.

Estuarine Adaptation: The Incorporation of Climate Change into Estuary Management Planning. *A. HOSKING (Halcrow Inc.).* Climate change and relative sea level rise have the potential to significantly affect the physical, natural and human environments of our estuaries and hence change the way we manage and use these valuable resources. Recognition of this potential is critical to the definition of technically sound management solutions, and in turn to the delivery of future sustainability for estuaries such as Tampa Bay.

In support of the draft US 'Clean Energy and Security Act 2009', ongoing work by the US Government Accountability Office to provide recommendations for climate change adaptation in the US has identified the UK as an international leader in this field and are reviewing UK practices to inform their recommendations (http://www.gao.gov/new.items/d09534t.pdf).

In the UK a strategic planning process has evolved that considers potential changes over a 100 year period (typically to 2100) and determines the potential consequences for human and natural resources. Through this process, the potential for significant changes in landforms, habitats and flooding and erosion risks are identified. This enables review of the sustainability of current management practices, identification of more sustainable approaches where necessary, and provides opportunity to initiate those responses which necessarily have a long lead-time (such as relocation of buildings). The pioneering 'Foresight Future Flooding' study (2004) demonstrated that by adopting an 'integrated' approach to risk management we can manage risks down to tolerable levels at significantly less cost than approaches relying solely on existing solutions.

Climate change adaptation has evolved as an integral feature of the UK coastal and estuarine management process over the last 20 years. This presentation will review key elements of the UK framework related to

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	climate change adaptation to identify lessons that could benefit the management of Tampa Bay, at this time when climate adaptation is set to become a far more prominent feature of US processes. **Tampa Bay—Preparing for a Climate Ready Estuary.** ***E.T. SHERWOOD* & *H.S. GREENING (TBEP).*** The Tampa Bay Estuary Program, Sarasota Bay Estuary Program, Charlotte Harbor National Estuary Program and the other four Gulf of Mexico NEPs are collaborating on an EPA Climate Ready Estuaries project to Develop a Handbook for Gulf Coast coastal communities to assist in incorporating climate change effects into habitat restoration and protection plans. The Handbook would be based on the results from ongoing and upcoming funded projects addressing climate change resiliency in habitat restoration projects in the Gulf NEPs and other relevant case studies. We envision that the Handbook would build on very recent guidelines (including NOAA's Local Strategies for Addressing Climate Change – Feb. 2009; ICLEI Local Governments for Sustainability's Climate Change Outreach and Communications Guide – Jan. 2009), but would provide a more specific focus on incorporating resiliency into habitat restoration and protection strategies for Gulf Coast communities using the results from ongoing evaluations in each of our estuaries.
3:45PM – 4:00PM	***BREAK***
4:00PM – 5:00PM	***Panel Discussion:*** **Climate Change & Future Challenges (*Ernie Estevez*)**

DAY FOUR (Friday, October 23, 2009)

7:30AM – 9:00AM	**Registration** **Breakfast (7:30AM – 8:00AM)**
TIME	**SESSION (*Organizer*)**
	Focus of the Day
8:00AM – 8:15 AM	Tampa Bay's Anthropology & Archaeology; Science Communication; Meeting Synthesis & Next Steps
	Tampa Bay's Archaeology & Anthropology (*Bill Burger*)
8:15 AM – 9:00 AM	**Planned Agenda:** **The People in Between: Tampa Bay Natives from Contact to Extinction. *B.W. BURGER.*** Archival research of primary European documents has resulted in remarkably detailed accounts about some of Florida's last native inhabitants. While 16^{th} century documentation broadly related to the entire peninsula, more detailed information from the following centuries, while chiefly centering upon north Florida and the panhandle, provides glimpses into native cultures of the Tampa Bay region. Ethnographic data for the central peninsular Gulf Coast are quite limited. A review is presented of presently available information and related speculations about the Uzita, Yagua, Tocobaga, and Pohoy, the Tampa Bay peoples (caught) between the Timucua to the north and the Calusa to the south. **Prehistoric Coastal Habitation and Early Maritime Travel on Old Tampa Bay. *P. KOLIANOS (Weedon Island Preserve, Pinellas Co.).*** The vast natural resources of Old Tampa Bay, part of the largest open estuary in Florida, enabled the development of fairly large prehistoric populations. Recent research by Weedon Island Preserve Cultural and Natural History Center in partnership with other professionals and volunteers has led to new information about early occupation sites and subsistence, and an exciting investigation into a discovery of the first open-water Gulf coast dugout canoe. This presentation will focus first on the Shoreline Midden (8Pi1154) public archaeology restoration project and then reveal the unique find of the Shoreline Canoe (8Pi1164), a 1,100 years old, saltwater dugout canoe documented to be more than 40 feet long. **Underwater Tampa Bay and Beyond Submerged Cultural Resources. *J. MOATES (Fl. Public Archaeology Network).*** Interest in and commitment to Tampa Bay's maritime past has accelerated. A dugout canoe and shoreline middens, interpretation of an historic arrival in 1528, and the first time a local youngster embarks on a near shore journey aboard a traditional sailing craft helps bring Tampa Bay's maritime heritage to light. With the efforts of regional groups and organizations, more and more of our submerged and locally known maritime-related remains are being documented. *Underwater Tampa Bay and beyond Submerged Cultural Resources* is a sketch of the bay area's maritime connections as seen through its archaeological and historical remains. Since modern water levels emerged five to six thousand years ago, people's continued occupation along the margins of Tampa Bay has generated indelible marks on and off its shorelines.
9:00AM – 9:15AM	***BREAK***
	Relaying the Message – Science Communication (*Nanette O'Hara*)
9:15AM – 10:00AM	**Planned Agenda:** **Can Science and Sound Bites Coexist? Improving Communication Between Scientists, the Public and the Media. *N. O'HARA (TBEP).*** Recent research shows that science literacy is declining in America. In one

recent survey, only 59% of those queried knew that dinosaurs and humans did not live at the same time. This problem is compounded by a quantum shift in mass media – the major source of science knowledge for most Americans – brought on by competition for the public's attention in the information-saturated digital age, as well as an economic upheaval in journalism that has seen a dramatic decline in science coverage in general. The good news is that U.S. adults strongly believe that science education is important and, moreover, they hold scientists in very high regard. Capitalizing on this attitude will require the scientific community to embrace new communication tools and techniques, and to strengthen dialogue with the media messengers who deliver information to the public.

10:00AM – 10:15AM ***BREAK***

BASIS 5 Synthesis & Next Steps Towards Maintaining Progress

10:15AM – 10:30AM

Planned Agenda:

Tampa Bay Estuary's Progress Towards Goals. ***H.S. GREENING, E.T. SHERWOOD, L.M. CROSS & N. O'HARA (TBEP).***

10:30AM – 12:00AM

Panel Discussion: **BASIS 5 Wrap-Up/Synthesis, Identify New Knowledge / Management Gaps, Develop Needed Next Steps**

- Holly Greening, Tampa Bay Estuary Program
- Suzanne Cooper, Tampa Bay Regional Planning Council
- Dr. Ernie Estevez, Mote Marine Laboratory
- Dr. Ernst Peebles, University of South Florida
- George Henderson, FWRI (Retired)