INDIAN RIVER LAGOON OBSERVATORY

Connecting Users to IRL Data

June 30, 2016

Overview

The Indian River Lagoon (IRL) is located along Florida's east central coast, spanning 156 miles from Ponce Inlet in Daytona Beach to Jupiter Inlet and ranging from one-half to 5 miles wide. As with many other estuaries, the IRL has experienced accelerating adjacent human population growth and declining presence of natural plants and animals. Today, nearly 1 million people live and work in the IRL region. In 1995, the US Environmental Protection Agency recognized the IRL as an "estuary of national significance." The Lagoon is known for its high biological diversity. More than 3,500 species live in the IRL's watershed.

Coastal lagoons are separated from the ocean by a series of barrier islands that lie parallel to the shoreline, with limited connection to the ocean. Because of their unique physical characteristics, lagoons are frequently quiet, sheltered water bodies, with restricted mixing from water entering from the sea and land.

The IRL is an economic engine for the region. Based on a 2008 study, residents and visitors receive approximately $3.7 billion in economic benefits, including $2 billion in recreational use value and expenditures, $1 billion in annualized real estate values, $630 million in income and $91 million in restoration, research and education expenditures. Today the Lagoon and its economy are increasingly impacted due to human activities. The IRL is the receiving water body for rainwater and runoff and any land-based pollution stemming from human activity within its surrounding watershed of 2,284 square miles.

The *Connecting Users to IRL Data* initiative examined how IRL scientific data are collected, translated and shared with users and how to improve those processes. A workshop was convened on December 7-8, 2015, at Florida Atlantic University Harbor Branch Oceanographic Institute, with primary financial support from the Harbor Branch Oceanographic Institute Foundation, Inc., and River Branch Foundation. Participants represented federal, state and local agencies, academia, non-profit entities, elected officials and the business sector, and included estuarine scientists, urban planners, weather forecasters, resource managers and educators.

The initiative also included a pre-workshop online survey to help define how we collect, use, translate and share data for the IRL. More than 95 data collectors and/or users completed the survey, revealing what data are available and what new pathways (e.g., social media, web publishing, file sharing and storage) will allow more effective data sharing and dissemination to end users. The survey results and future outcomes of this initiative are available at: http://www.fau.edu/hboi/irlo/irl_data_workshop.php.

Connecting Users to IRL Data Workshop Steering Committee Members

M. Dennis Hanisak, Ph.D. (Co-Chair)
Research Professor & Director, Indian River Lagoon Observatory
FAU Harbor Branch Oceanographic Institute

Amy Adams (Co-Chair)
President
Cape Canaveral Scientific, Inc.

Megan Davis, Ph.D. (Special Advisor)
Interim Executive Director
FAU Harbor Branch Oceanographic Institute

Report editors: M. Dennis Hanisak, Ph.D. and Amy Adams, Steering Co

Consensus Recommendations of the Workshop

1. Work collaboratively to obtain the funding needed to maintain long-term data collection programs to meet scientific demands

2. Use scientific data to identify pollution source locations in the IRL watershed and stop the flow of pollution into the Lagoon

3. Identify and maintain an inventory of historic and ongoing IRL data sets

4. Increase efforts to archive IRL data sets and make them accessible to users

5. Organize and maintain a centralized listing of available IRL data sets and information on how to access them

6. Develop observation and prediction systems as tools that can be used by a variety of user groups

7. Identify threshold levels for critical environmental IRL data parameters and develop a way to automatically trigger flags when a threshold is exceeded

8. Process and translate the science data to inform and engage the community

Online Survey Results Summary

- Water quality, physical oceanography and meteorological data are the most-collected data categories.

- The most common data collection intervals are weekly and monthly.

- The most readily available data categories are GIS, water quality, seagrass, biological and meteorological.

- Archival data is the type of data most frequently provided by collectors to users.

- The most frequently provided data by collectors to users are water quality; the least frequently shared are biological and physical oceanography.

- About 70% of organizations collecting data in the IRL do not have a designated data steward to serve as the single point of contact for obtaining data from that organization.

- Environmental managers, university educators, environmental consultants, military, oceanographers, engineers, recreational boaters, recreational fishermen and informal educators are the professions that most use or access the data.

Duane E. De Freese, Ph.D.
Executive Director
IRL Council & Indian River Lagoon National Estuary Program

Grace Johns, Ph.D.
Project Manager, 2007 Indian River Lagoon Economic Valuation Report
Hazen & Sawyer

Kathleen O'Keife
Research Administer
Florida Fish & Wildlife Research Institute

Mitchell Roffer, Ph.D.
President
Roffer's Ocean Fishing Forecasting Service, Inc.

Vembu Subramanian
Manager, Regional Coastal Ocean Observing System
Southeast Coastal Ocean Observing Regional Association

Gary Zarillo, Ph.D.
Professor
Florida Institute of Technology

ng Committee Co-Chairs

Image courtesy of www.indianriverbyair.com

WORKSHOP PANEL 1:
DATA COLLECTION IN THE IRL

The first workshop panel addressed what, when, how and where IRL data are collected.

Speaker Presentation: *Setting the Stage* – Bob Virnstein, Ph.D., Owner, Seagrass Ecosystems Analysts, Inc.

Panel Moderator: Dennis Hanisak, Ph.D., Research Professor & Director, Indian River Lagoon Observatory, FAU Harbor Branch

Panelists: Dianne Hughes, Senior Ecosystem Specialist, Martin County Engineering Department; Jan Landsberg, Ph.D., Research Administrator, FWC Fish and Wildlife Health; Rich Paperno, Ph.D., Research Administrator, FWC Indian River Field Lab; Mitchell Roffer, Ph.D., President, Roffer's Ocean Fishing Forecasting, Inc.; and Vembu Subramanian, Manager, SECOORA

PANEL QUESTIONS

1. What types of data are collected and for what purposes? Who is the target audience?
2. What data are needed to make a decision or take action regarding Lagoon management?
3. How best can we translate and disseminate collected data?
4. What kinds of data are not collected, but might be useful?
5. Are there any restrictions on collected and translated data being shared?
6. Which users need data, metadata or translated data, and/or pictorial data (e.g., reports, charts, maps)?

Workshop organizer and FAU Harbor Branch scientist, Dennis Hanisak, explains to workshop participants the reasons for hosting the IRL data workshop.

"This workshop is the first organized effort to answer, where is IRL data housed? What types of data are collected? How are we using the data? And can we do a better job at collecting, organizing, translating and sharing the data? We need to answer these questions. If we do, then we may be able to understand how we can all work better together to share the knowledge and make changes in how we manage the Lagoon in the future."

Dennis Hanisak, Ph.D.
Research Professor & Director, Indian River Lagoon Observatory, FAU Harbor Branch

PANEL OUTCOMES

Panelists focused on how and at what frequency their data are collected, as well as how the data are translated and shared. Examples of data collection included stratified sampling of fish to determine population dynamics and species life history, event-driven sampling to determine harmful algal bloom effects, documentation of disease and mortality trends, water quality sampling to determine the presence of human *E. coli*, and collection of real-time weather and oceanographic data for forecasting. All recognized that managing IRL stressors (e.g., population growth, and pollution inputs) and maintaining an ecologically balanced IRL system depends largely on how we analyze and share the critical data we gather and translate for a variety of users.
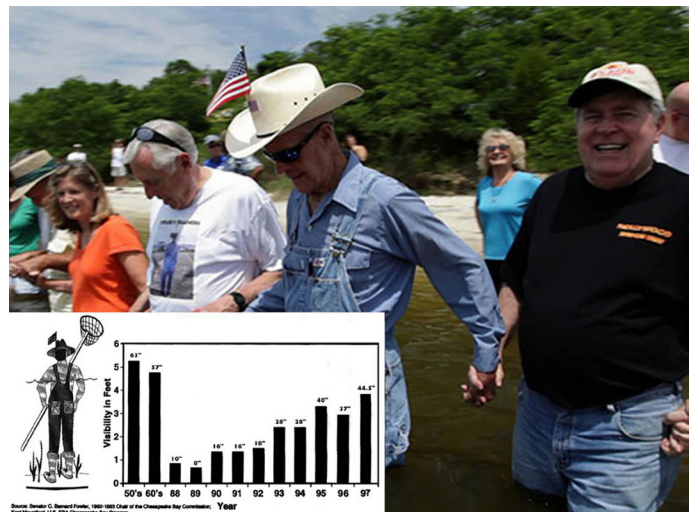
Large quantities of relevant data are collected; however, participants do not fully understand what is being collected and where it is being stored. Understanding who is collecting what type of data, whether the data is translated and where it is openly accessible would promote greater understanding of potential gaps in data collection, proper use of the data for management decisions and a cooperative approach for data collection, translation and sharing. As we refine our cooperative approach, we should deliver a centralized listing to clarify what data are being collected and their location, and to help reveal data gaps.

RECOMMENDATIONS

1. Identify and maintain an inventory of historic and ongoing IRL data sets

2. Increase efforts to archive IRL data sets and make them accessible to users

"My job is usually event-driven. We arrive to find the fish are showing up with many, many lesions and we don't know why. Because we don't have all the pieces, all the data, we actually have to take the approach of a CSI investigation and work backwards to figure out what is happening in the system."

Jan Landsberg, Ph.D.
Research Administrator
FWC Fish and Wildlife Health

"We need to agree that the solutions to the IRL need to be diverse, because the problems are diverse. Some politicians look at the IRL as one single place in need of one solution. The solutions are more diverse than that, and we need to recognize that we all need to work together to share the information to get to the solutions to the issues that we're facing."

Mitchell Roffer, Ph.D.
President
Roffer's Ocean Fishing Forecasting Service, Inc.

Keynote speaker, Bob Virnstein, shared the story of former Maryland State Senator Bernie Fowler's "sneaker index," the deepest point at which he can still see his shoes as he wades into the Patuxent River. In the 1950s, Fowler could wade up to his chest and see fish, shellfish, and underwater grasses. Poor water quality reduced that value through time. The 1950s sneaker index of 63 inches now serves as a target for a restored Patuxent River.

WORKSHOP PANEL 2:
IRL DATA – WHAT DO END USERS WANT?

The second workshop panel addressed what types of IRL data are needed by users and the challenges and benefits of using these data.

Speaker Presentation: *Challenges in Connecting Users to Data* – Clay Henderson, Director, Stetson University Institute for Water & Environmental Resilience

Panel Moderator: Grace Johns Ph.D., Economist of IRL Valuation Study, Hazen and Sawyer

Panelists: Ron Edwards, President & CEO, Evans Properties; Richard Gillmor, Chair, Treasure Coast Regional League of Cities and Mayor, City of Sebastian; Patti Gorman, Science Supervisor, Coastal Ecosystems Section, South Florida Water Management District; Steve Lazarus, Ph.D., Professor, Florida Institute of Technology; and Mark Perry, President, Florida Oceanographic Society

PANEL QUESTIONS

1. What channels would you prefer to use to locate archival and/or real-time IRL data?
2. What are the biggest challenges in maintaining a long-term data collection program?
3. What are the benefits of users accessing IRL data swiftly and easily?
4. Have you needed specific IRL data, but could not find it or access it? If so, what did you do?
5. What data types will be needed in the future?
6. What data needs are critical to restoring and protecting the IRL, but are not being addressed?

Panelist Clay Henderson explains how to convey a concise message to policy makers to gain understanding and funding.

"*This workshop is an opportunity to get the data organized and accessible, and to make a difference in the Lagoon's story. Yes, there will always be debate and discourse out there about the science, but it's important to recognize discourse is part of the process. Most important for our Lagoon, we need to agree on several actions necessary to restore it. These will not be all the actions, but they will be the start. They will help us form our message that we can push through to the policy makers to inform them about what needs to be done to restore our Lagoon.*"

Clay Henderson
Director
Stetson Institute for Water and Environmental Resilience

PANEL OUTCOMES

Panelists conveyed the challenges in connecting users to scientific data. Data are not always easily accessible, nor in the user's preferred format. Current pathways for sharing data are not well understood, and new pathways or electronic portals connected to existing pathways are needed for easier access. All agreed that maintaining specific long-term data sets is valuable to the IRL region, in part to help guide the decisions of users and elected officials. Types of users vary greatly, making new delivery pathways and innovative sharing techniques essential.

The panel also concluded that there can be issues to sharing data. For example, since the IRL is a diverse estuary, it is necessary to rely on multiple programs and sources of data to answer complex questions and find diverse solutions. Furthermore, relying on data collected by others can be problematic because users are not in control of the data collectors' priorities, bias and data input streams or whether collections will continue.

RECOMMENDATIONS

1. Organize and maintain a centralized listing of available IRL data sets and information on how to access them

2. Use scientific data to identify pollution source locations in the IRL watershed and stop the flow of pollution into the Lagoon

3. Identify threshold levels for critical environmental IRL data parameters and develop a way to automatically trigger flags when a threshold is exceeded

> *"The science questions show us what we need to know about what is happening in the Lagoon, but the societal questions are not as straightforward. In fact they are much more difficult to understand: how what we are doing connects to what is happening in the Lagoon."*
>
> **Bob Virnstein, Ph.D.**
> *Owner*
> Seagrass Ecosystems Analysts, Inc.

> *"The fact of the matter is there's already a lot of data out there. What I'm hearing today is it that maybe we're not doing a good job at sharing it. Time is critical for the Lagoon. We need to bring an organized list forward to our elected officials in Tallahassee that includes projects for restoration, pollutant removal, studies to understand what pollutants we have and their source locations and monitoring."*
>
> **Joseph Capra**
> *President*
> CAPTEC Engineering

Panelists discussed the need to deliver context and pictures to policy makers and the public to help explain the impact of pollution, such as discharges of highly colored, nutrient-rich freshwater on the Lagoon's water quality and biological resources.

WORKSHOP PANEL 3:
THE BENEFITS OF SHARING DATA – A NEW APPROACH

The third workshop panel addressed greater sharing of translated scientific data across users to foster a more informed decision-making process among all in the Lagoon region.

Speaker Presentation: *Pathways for Sharing Data for Decision Making* – Gary Zarillo, Ph.D., Professor, Florida Institute of Technology

Moderator: Duane De Freese, Ph.D., Executive Director, IRL Council & IRL National Estuary Program

Panelists: Matt Corey, Senior Scientist, Weather Flow; Doug Daniels, County Councilman, Volusia County; Eve Samples, Opinion Editor, Treasure Coast Newspapers-TC Palm; Leesa Souto, Ph.D., Director, Marine Resources Council; and Nia Wellendorf, Director, DEP Aquatic Ecology and Quality Assurance

PANEL QUESTIONS

1. How are we doing as an IRL scientific community cooperating and sharing data? Within disciplines? Across diverse disciplines?
2. How are we doing as an IRL scientific community translating data that can be understood across users and applied? How do we share IRL knowledge today?
3. Do we understand the information needs of our target audiences? Who is this audience (e.g., other scientists, funding agencies/organizations, resource managers, policy makers, citizens, journalists)?
4. How do we as scientists, technical experts and engineers become better storytellers?
5. What are the opportunities and risks of new technologies and communication tools (e.g., social media)? Where do you see transformational opportunities?
6. Make one recommendation that would improve the way we communicate.

"We need both the written narrative and the visual of the translated data to have context and full understanding to be effective in pushing our message. We need to know when we see a posted aerial of a long, black slick flowing out St. Lucie Inlet that this discharge moved down the St. Lucie River to the Lagoon after they opened the locks at Lake Okeechobee. We need the narrative to give us context and tell us what the picture is showing."

Eve Samples
Opinion Editor
TC Palm Newspapers

"You need to have a message to share with policy makers. It needs to be our story. It needs to be compelling. Finally, it needs to have real scientific data behind it from the Palm Beach County line to the north Volusia County line in order to gain the money out of the Legislature. Money is what our restoration needs."

Doug Daniels
Councilman
Volusia County Council

Panelist Doug Daniels conveys the effect that a powerful message has in fostering Lagoon restoration funding decisions.

PANEL OUTCOMES

Panelists focused on the benefits of sharing data. Keynote speaker Gary Zarillo spoke about the Internet grid and where data are stored for user access. The panel agreed on the need for improved access for a diverse group of users to aid Lagoon restoration decisions. There is also a need to better communicate a clear, succinct science message about the state of the Lagoon and the supporting data. There was strong consensus that the IRL science community needs to become better storytellers to translate complex biological, chemical and physical characteristics of the IRL in ways that are understandable to citizens, stakeholders and elected officials.

Panelists agreed that social and traditional media are powerful outlets to reach users and non-users of data, including policy makers who can provide funding for Lagoon restoration. Observation and prediction systems can provide visual tools to relay different layers of complexity for different users.

RECOMMENDATIONS

1. Work collaboratively to obtain the funding needed to maintain long-term data collection programs to meet scientific demands
2. Develop observation and prediction systems as visual tools that can be used by a variety of user groups
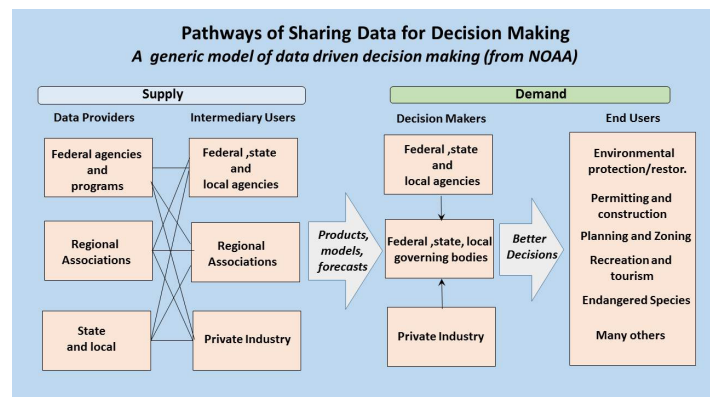3. Process and translate the science data to inform and engage the community

"I would give a letter grade of C for how we are currently communicating, cooperating and sharing data within the scientific community. This is because we have room to grow, to get better. I would give us a B+ for our data sharing abilities among scientists. Where we are lacking is communicating the data effectively to the Lagoon managers and policy makers. Yes, we have data sets uploaded online. But we are lacking the data interpretation and communication to those who decide on funding."

Leesa Souto, Ph.D.
Executive Director
Marine Resources Council

Panelists agreed that the region needs a single access point for all existing data portals, as well as an atlas that shows who is gathering data, where are the data stored and how to access the data. There was agreement that verbal and visual translations of data and access to the translations are most important for broadcasting messages that foster Lagoon restoration and funding allocation. Tailoring stories that relate system benefits and threats is needed to ensure proper management of the IRL. The panel concluded that financial challenges are the largest hurdle in sharing data. Current funding levels for data collection and maintenance of long-term collection programs are inadequate to meet scientific demands and need to be a higher priority.

"I have been a benthic seagrass scientist in the IRL for 30 years and collected a lot of data that I thought was important for us to understand the health of the Lagoon. I still think collection is very important, but we need to be converting data to stories. Everyone can relate to a story. We need to tell them in a format that links them by three words: And, But, and Therefore. An example is that the IRL is long AND narrow AND it flushes poorly, AND has many different plant and animal species, BUT we add a lot of nutrients to the system that can cause problems, THEREFORE, we need to do something about reducing the amount of nutrients."

Bob Virnstein, Ph.D.
Owner
Seagrass Ecosystems Analysts, Inc.

Pathways of Sharing Data for Decision Making
A generic model of data driven decision making (from NOAA)

Speaker Gary Zarillo presented this schematic adapted from NOAA that outlines pathways of sharing data for decision-making and shows the linkage of data providers and data users.

IRL MAP & DATA SUPPLIERS
THE BENEFITS OF SHARING DATA – A NEW APPROACH

DATA COLLECTED BY ORGANIZATIONS IN THE NORTHERN AND CENTRAL IRL

	Biological	Habitat	Physical	Meteorological	Water Quality	Extreme Events	Human Use	Geological
Brevard County					•		•	
City of Palm Bay			•	•	•			
City of Sebastian					•			
FAU Harbor Branch	•	•	•	•	•	•		
Florida Department of Health			•	•	•	•		
Florida Fish and Wildlife Conservation Commission	•		•					
Florida Institute of Technology	•	•	•	•	•	•		•
Indian River County					•			
NASA Kennedy Space Center	•	•	•	•	•	•	•	•
Ocean Research & Conservation Association		•	•	•	•	•		
Seagrass Ecosystems Analysts, Inc.		•						
Smithsonian Marine Station	•	•			•			
Southeast Coastal Ocean Observing Regional Association							•	
St. Johns River Water Management District	•	•	•	•	•	•		•
United States Fish and Wildlife Service		•						
United States Geological Survey					•			
University of Central Florida	•	•					•	
Volusia County	•		•	•	•	•		

DATA COLLECTED BY ORGANIZATIONS IN THE SOUTHERN IRL

	Biological	Habitat	Physical	Meteorological	Water Quality	Extreme Events	Human Use	Geological
FAU Harbor Branch	•	•	•	•	•	•		
Florida Fish and Wildlife Conservation Commission	•		•		•			
Florida Department of Health			•	•	•	•		
Florida Oceanographic Society	•	•	•	•	•	•		
Martin County					•			
Ocean Research & Conservation Association	•	•	•	•	•	•	•	
Smithsonian Marine Station	•	•		•	•			
South Florida Water Management District	•	•	•	•	•			

This is not an exhaustive list of IRL data providers, but those identified from the pre-workshop survey.

Data types as listed in the survey and tables:

Biological (e.g., plankton, catch data by species, sea turtle nesting)

Habitat (e.g., submerged aquatic vegetation, hard bottom)

Physical Oceanographic (e.g., water temperature, currents)

Meteorological (e.g., winds, rainfall, atmospheric pressure)

Water Quality and Chemistry (e.g., dissolved oxygen, bacteria, pH, pCO2)

Human Use (e.g., fishing, scuba diving, military use)

Extreme Events (e.g., harmful algal blooms, hurricanes, spills)

Geological (e.g., bathymetry, sediment type)

Connecting Users to IRL Data Workshop Participant List

Amy Adams – Cape Canaveral Scientific, Inc.

Erick Ault – Florida Fish & Wildlife Conservation Commission

Jeff Beal – Florida Fish & Wildlife Conservation Commission

Bryan Botson (Workshop Tech Support) – FAU Harbor Branch

Joe Capra – CAPTEC Engineering

Matt Corey – Weather Flow

Doug Daniels – Volusia County Council

Kristin Davis (Workshop Scribe) – FAU Harbor Branch

Megan Davis – FAU Harbor Branch

Duane De Freese – IRL Council & IRL National Estuary Program

Debra Drumm – Martin County Engineering

Ron Edwards – Evans Properties

Victor Faconti – Florida Department of Health

Warren Falls – Ocean Research & Conservation Association

Kathy Fitzpatrick – Martin County Coastal Engineering

Alexandra Fries – University of Maryland

Grant Gilmore – Estuarine, Coastal and Ocean Science, Inc.

Richard Gillmor – City of Sebastian & Treasure Coast League of Cities

Patti Gorman – South Florida Water Management District

Jason Hallstrom – FAU I-SENSE & College of Engineering & Computer Science

Dennis Hanisak – FAU Harbor Branch

Clay Henderson – Stetson Institute for Water & Environmental Resilience

Nancy Higgs – HBOI Foundation

Kathy Hill – IRL National Estuary Program

Dianne Hughes – Martin County Engineering Department

Kelli Hunsucker – Florida Institute of Technology

Chuck Jacoby – St. Johns River Water Management District

Grace Johns – Hazen and Sawyer

George Jones – Ocean Research & Conservation Association

Katha Kissman – HBOI Foundation

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Mike Middlebrook – Martin County Natural Resources Management

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Mark Perry – Florida Oceanographic Society

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Eve Samples – TC Palm

Adam Schaefer – FAU Harbor Branch

Doug Scheidt – InoMedic Health Applications

P.J. Smith – East Coast Regional Planning Council

Leesa Souto – Marine Resources Council

Vembu Subramanian – SECOORA

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Geoffrey Swain – Florida Institute of Technology

Robert Virnstein – FAU Harbor Branch & Seagrass Ecosystems Analysts, Inc.

Joshua Voss – FAU Harbor Branch

Abbey Wakely (Workshop Scribe) – SECOORA

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Jim Whittington – Florida Fish & Wildlife Conservation Commission

Beau Yeiser – Florida Fish & Wildlife Conservation Commission

Joy Young – Florida Fish & Wildlife Conservation Commission

Gary Zarillo – Florida Institute of Technology

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