Charlotte County RESTORE Act Funding Application

General Project Information			
Applicant Name	Florida Fish and Wildlife Conservation Commission		
Was the proposed activity included in any claim for compensation paid out by the Oil Spill Liability Trust Fund after July 6, 2012? If "Yes," the project is not eligible for funding		Yes ☐	No ☑
Person to be contacted regarding application	Name: Philip Stevens, PhD		
	Title: Research Administrator I		
	E-mail: Philip.Stevens@MyFWC.com		
	Phone: 941-613-0945		
Proposal Title	Implementation of fisheries monitoring in tidal tributaries downstream of major restoration projects in Charlotte Harbor		

Project Executive Summary: Provide a concise project summary or abstract in the space below (250 words max)

The purpose of the "Implementation of fisheries monitoring in tidal tributaries downstream of major restoration projects in the Charlotte Harbor estuary" is to provide resource managers with fishery community information associated with ongoing hydrologic and habitat restoration activities. The fisheries monitoring will be conducted by the Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute (FWC). FWC's renowned fisheries-independent monitoring program, which has been present in Charlotte Harbor estuary since 1989, will be expanded into tidal tributaries downstream of two major restoration projects: Coral Creek Restoration and Charlotte Harbor Flatwoods Restoration.
This project addresses the following RESTORE Act eligibility criteria:
"Implementation of a federally approved marine, coastal, or comprehensive conservation management plan, including fisheries monitoring".
Specifically, the fisheries monitoring implements the following Charlotte Harbor National Estuary Program Comprehensive Conservation Management Plan Up-Date 2013 Priority Actions and Environmental Indicators: 1) FW-F: Restore and protect a balance of native animal communities, and 2) FW-d: Fish community composition by strata.
This project addresses the following Charlotte County goals: 1) Quality of life: enhances community life through the conservation of wildlife, protection or restoration of natural resource and providing community amenities, and 2) Water Resource Protection: protects or restores water quality and quantity.

Project Location			
	Street: Charlotte Harbor Estuary (see approx. Lat/Long)		
	City: State:		
	Zip Code:		
	If no street address is available, please provide longitude/latitude	26 51.000	82 16.000

Project Eligibility

Select the one primary RESTORE Act eligible activity of the project in the first column and any others that apply in the second column by placing an X in the row corresponding to the qualifying eligible activity. Project must fulfill one eligible activity at a minimum to be eligibile for funding.

RESTORE Act Eligible Activity

Primary activity	All others that apply	Eligible Activity
☐	☑	Restoration and protection of the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast Region
☐	☐	Mitigation of damage to fish, wildlife, and natural resources
☑	☐	Implementation of a federally approved marine, coastal, or comprehensive conservation management plan, including fisheries monitoring
☐	☐	Workforce development and job creation
☐	☐	Improvements to or on State parks located in coastal areas affected by the Deepwater Horizon oil spill
☐	☐	Infrastructure projects benefitting the economy or ecological resources, including port infrastructure
☐	☐	Coastal flood protection and related infrastructure
☐	☑	Promotion of tourism in the Gulf Coast Region including recreational fishing
☐	☐	Promotion of the consumption of seafood harvested from the Gulf Coast Region

Project Eligibility

Select the one primary Charlotte County goal met by the project in the first column and any others that apply in the second column by placing an X in the row corresponding to the appropriate County goal. Project must meet a minimum of one County goal to be eligible for funding.

Charlotte County Goals

Primary Goal Met	All others that apply	Charlotte County Goal
☐	☑	Water Resource Protection: protects or restores water quality and quantity
☐	☐	Efficient and Effective Government: facilitates organization's capacity to govern and manage effectively
☑	☐	Quality of life: enhances community life through the conservation of wildlife, protection or restoration of natural resource and providing community amenties
☐	☐	Fiscal/ Financial Planning: increases effectiveness of local government and maintains strong financial condition
☐	☐	Growth Management: manages growth and change consistent with County's comprehensive plan
☐	☐	Public Safety: maintains a safe and healthy community
☐	☐	Economic Development: create a business climate that promotes a diversified, growing economy consistent with growth management plans and enhanced quality of life.
☐	☐	Human Services: pursue available funding sources to facilitate providing services to meet community needs.
☐	☐	Infrastructure: stabilize and maintain County-wide infrastructure.

Project Cost

Project Cost	Value	Percent of project cost
Total Cost	$ 380,843	100.00 %
RESTORE Request	$ 283,800	74.52 %
Secured Match (include documentation)	$	%
In-kind match value	$ 97,043	25.48 %
Funding Gap	$ 0	0 %
Anticipated Cash Match	$	%

Project Timeline

Estimated Project Start Date	7/01/2016
Estimated Project Completion Date	6/31/2019

Range of Project Benefit

Select the range of benefit project is anticipated to have	Select One	Range of Benefit
	☐	Local
	☐	County-wide
	☑	Regional
	☐	Gulf-wide

Provide brief description of project scale in the space below (100 words max)
Methodology will follow fishery sampling that is occurring in northern Charlotte Harbor as part of a larger statewide effort. This will help to leverage additional reference tributaries for which to draw comparisons and broaden the scale of the study to one that is regional in scope. The implementation of this program in tidal tributaries subject to restoration will provide a monitoring component to evaluate the response of the biological community to restoration. The tributaries of interest are known to be critical habitat for economically-valuable fisheries (e.g., Common Snook and Red Drum) that are important to tourism in Charlotte County/Southwest Florida.

Does project provide added benefit when combined with	Yes/No	List projects in box below
Other **proposed** projects or programs?	Yes	State of Florida's Fisheries-Independent Monitoring Program Charlotte Harbor Flatwoods Restoration Coral Creek Restoration
Other **completed** projects or programs?	Yes	State of Florida's Fisheries-Independent Monitoring Program

Project Feasibility

	Yes/No
Does the project require federal, state, or local permits?	No, covered under FWC research

If yes, list permits required below

Permits required	Permit Type (federal, state, local)	Status (obtained, not obtained)

Existing Planning	Yes/No
Is the project part of an existing federally approved comprehensive conservation management plan?	Yes
Is the project part of a County or state plan?	Yes

If yes, list plan below
Federal - Charlotte Harbor National Estuary Program Comprehensive Conservation Management Plan and Sport Fish Restoration State - Fisheries-Independent Monitoring Program / Marine Fish Stock Assessments

Budget Justification				
Activity/Item	**Cost**	**Requested RESTORE Funds**	**Cash Match**	**In Kind Match**
Project Design				
Subtotal	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Project Permitting				
Subtotal	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Project Activity				
Subtotal	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Monitoring				
Tributary sampling	$ 380,843.00	$ 283,800.00		$ 97,043.00
Subtotal	$ 380,843.00	$ 283,800.00	$ 0.00	$ 97,043.00
TOTAL	$ 380,843.00	$ 283,800.00	$ 0.00	$ 97,043.00

Costs are in 2015 dollars and do not account for inflation

Title: Implementation of fisheries monitoring in tidal tributaries downstream of major restoration projects in Charlotte Harbor

Funding Opportunity: Charlotte County RESTORE Act Funding

Project duration: 3-years (Project start date: 7/1/2016; Project end date: 6/30/2019)

Applicant: Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
100 Eighth Avenue Southeast
St. Petersburg, FL 33701

Principle Investigator: Philip W. Stevens PhD, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Charlotte Harbor Field Laboratory, 585 Prineville Street, Port Charlotte, FL 33954; E-mail: Philip.Stevens@MyFWC.com; Phone = 941-613-0946 ext. 102; Fax = 941-613-0948.

Co-Principle Investigator: Timothy C. MacDonald, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th avenue SE, St Petersburg, Florida 33701; E-mail: Tim.MacDonald@MyFWC.com; Phone = 727-896-8626.

Project costs:

	Request	**Match**	**Total**
Year 1	$94,600	$32,348	$126,948
Year 2	$94,600	$32,348	$126,948
Year 3	$94,600	$32,348	$126,948
Total	$283,800	$97,043	$380,843

Project Narrative:

Scope of Work

Project need and compatibility

It is widely acknowledged that over 80% of economically important fisheries in the Gulf of Mexico are dependent on estuaries during their early life stages. Coastal wetlands and their associated tidal tributaries rank among the most productive estuarine habitats, particularly with respect to small-bodied fishes (Stevens et al. 2006a). The fish production is then consumed by larger fish that use the system and eventually leave. This “trophic relay” moves large quantities of wetland production from marshes to the open estuary and eventually to oceans like the Gulf of Mexico (Stevens et al. 2006a). Tidal tributaries are an important conveyer of this production. Rivers and tidal tributaries also serve as nursery habitat for several Gulf-spawning species (e.g., Red Drum, Common Snook, Spot, Blue Crab, Pink Shrimp; Idelberger and Greenwood 2005; Stevens et al. 2007). These species recruit to tidal tributaries as larvae and juveniles, grow, and leave the system ultimately contributing to adult populations in the Gulf of Mexico.

Among scientists and resource managers, there is increasing recognition that tidal tributaries can serve as important targets for management and restoration. Tributaries lie at the margin between land and open estuary and are on the front line of any environmental impact and water quality degradation. Impacts to tidal tributaries affect the prey base and nursery function of this habitat. For example, a study in Charlotte Harbor (Charlotte Harbor Flatwoods area) found that an important sport fish (Common Snook) using impacted tributaries as nursery

habitat had diets that were less diverse than those of natural tributaries nearby (Adams et al. 2009). This decreased prey diversity was suggested as an indicator of an overall change in ecosystem function. A decrease in prey diversity and nursery use associated with coastal development was also found in Tampa Bay tidal tributaries (Krebs et al. 2013). In recognition of potential impacts, several large-scale hydrologic restoration projects affecting tidal tributaries are underway in Florida estuaries. Specifically, the projects underway in Charlotte Harbor are Coral Creek Restoration and Charlotte Harbor Flatwoods Restoration.

To better understand the status of fish communities in tidal tributaries of Charlotte Harbor and to assess the impacts of the habitat restoration work, we propose the implementation of the Florida Fish and Wildlife Conservation Commission's (FWC) fishery monitoring program into this habitat. The core fisheries monitoring program has been operating in the open waters of the Charlotte Harbor estuary since 1989, and has been extremely useful in gauging both long-term changes and changes associated with stochastic events such as Hurricane Charley (Stevens et al. 2006b). Expansion of this program into other habitats and water bodies has been used to address fish community data needs for the State's minimum flows and levels on rivers including the Peace (e.g., Greenwood et al. 2007; Stevens et al. 2013), the reopening of Blind Pass near Sanibel (Milbrandt et al. 2012), and the status of the Caloosahatchee River, a water body downstream of the largest restoration project in the U.S. (Stevens et al. 2010). The implementation of monitoring in the Caloosahatchee River is quite relevant to the proposed research as it compared fish communities in tidal tributaries to those of open-facing shorelines. The fish communities between these habitats were very different; tidal tributaries had far more Common Snook, Striped Mojarra, Bluegill, and a variety of small forage base species. The objective of this study is to expand FWC's fishery monitoring into the tidal tributaries of Charlotte Harbor that are downstream of major restoration projects (Coral Creek Restoration and Charlotte Harbor Flatwoods Restoration) (Figure 1). Assessing the changes in fish communities in these restored tributaries can have far ranging implications, such as the design of future restorations and the improvement of fish stocks in the Gulf of Mexico. Successful restoration of impacted tidal tributaries and the protection of less altered tidal tributary habitats provides prey resources for piscivorous species (fish, reptiles, birds, and mammals) in the form of small wetland fishes, and provides critical juvenile habitats for many Gulf-spawning species that use tributaries as nurseries.

Project eligibility

This project addresses the following RESTORE Act eligibility criteria: "Implementation of a federally approved marine, coastal, or comprehensive conservation management plan, including fisheries monitoring". Specifically, the fisheries monitoring implements the following Charlotte Harbor National Estuary Program Comprehensive Conservation Management Plan Up-Date 2013 Priority Actions and Environmental Indicators: 1) FW-F: Restore and protect a balance of native animal communities, and 2) FW-d: Fish community composition by strata. The monitoring of tidal tributaries downstream of hydrologic restoration is currently not included in FWC's sampling design. This project will expand the fisheries monitoring into two of these tidal tributary systems, which will provide data on an environmental indicator (fish communities) in a strata (tidal tributaries) identified as a critical fish nursery habitat.

Project benefit

This project addresses the following Charlotte County goals: 1) Quality of life: enhances community life through the conservation of wildlife, protection or restoration of natural resource and providing community amenities, and 2) Water Resource Protection: protects or restores water quality and quantity. The tidal tributaries downstream of hydrologic restoration are points of conveyance of water to the Charlotte Harbor estuary. The restoration activities are aimed at

restoring water quality and quantity. This project provides an important monitoring component to ensure that the water quality and rates of water delivery enhance the populations of the tributary's inhabitants. The scale of these effects go beyond the boundaries of the tidal tributaries. Because several species are dependent on tidal tributaries as their primary nursery habitat, healthy tributaries contribute to stable fish populations at the scale of the Charlotte Harbor estuary (e.g., Common Snook), and even to the eastern Gulf of Mexico. Once juvenile fish grow into adults, many of them emigrate to Gulf of Mexico waters (e.g. Red Drum, Common Snook, Spot, Blue Crab, Pink Shrimp). Given the economic importance of the sport fisheries that are known to use tidal tributaries as their primary nursery habitat, this restoration goal affects eco-tourism in Charlotte County and Southwest Florida. Ensuring the conservation and restoration of tidal tributaries will promote healthy fisheries for which Charlotte Harbor and the Gulf of Mexico are known.

Study Design

Fish community data will be collected by scientific personnel through statistically-valid sampling methods. Sampling will be conducted on a monthly basis. Deployment of sampling gear will be based on standard procedures which are described in the program's procedure manual. A stratified-random sampling design will be used to select sampling locations. Methods used to collect fish community samples are habitat specific, but typically includes trawls or seines. In the case of these small tidal tributaries, trawls that target deeper-water species will not be necessary because of the shallow (<1 m deep) waters. Thus, sampling will be limited to the use of seines. Gear selection (seine length and mesh size) and total number of hauls will be finalized during the first 3 months of this study. Based on similar work elsewhere, we anticipate that the project design will yield approximately 23 samples per month (276 samples per year). All sampling will be conducted during daytime hours (one hour after sunrise to one hour before sunset).

Environmental data on water quality, habitat characteristics, and physical parameters such as tidal conditions will be recorded for each sample. All fish and selected invertebrate species (i.e., Blue crab, Stone Crab, and penaeid shrimp) will be identified to the lowest practical taxonomic level, counted, and measured (standard length for fish, disk width for rays, carapace width for crabs, and post-orbital head length for shrimp). Animals will be released except for representative samples of each taxon (for laboratory confirmation of field identifications) and samples required for specific research projects. Abundance estimates will be standardized to number of animals per 100 m^2, or number of animals per 100 m of shoreline, and data will be summarized separately for all taxa and for taxa of special recreational or commercial importance.

Project Feasibility

Personnel

The proposed project will be managed by FWC staff. The Principle Investigator is Dr. Philip Stevens and the Co-Principle Investigator is Mr. Tim MacDonald. Dr. Stevens is responsible for all technical oversight and implementation of the approved work plan as delineated in the proposal. Mr. Tim MacDonald currently oversees the estuarine sampling conducted statewide by FWC's fishery monitoring program and will ensure compliance of this project with statewide standards, procedures, and protocols. One full-time FWC staff and one part-time FWC staff will be hired to assist in all phases of this project. The biologists will be responsible for conducting field surveys, data management, and equipment maintenance. Dr. Stevens will supervise project staff and ensure adherence to all procurement and budgetary requirements.

Project staff are highly qualified to conduct the proposed research. Dr. Stevens received his PhD degree from the University of Florida in 2002 and has been developing and overseeing fisheries monitoring programs in the Charlotte Harbor estuary for 12 years. To date, Dr. Stevens and his staff at FWC's Charlotte Harbor Field Lab have published over 50 articles in peer-reviewed journals. These include articles pertaining to freshwater inflow to estuaries, use of tidal tributaries by fish, critical nursery habitat, fish movements, and response of fish communities to restoration and disturbance. Mr. MacDonald received his MS degree from the University of South Florida in 1998. He has over 25 years of experience with FWC's fishery monitoring program. Mr. MacDonald is very familiar with developing sampling designs to assess fish abundance and distribution, database management, and statistical analysis of complex fishery and environmental data. He has presented at numerous scientific meetings and has published peer-reviewed manuscripts related to estuarine fish abundance, distribution, and habitat associations.

Timeline

Year 1 (Start July 1, 2016)

	Month											
Task	1	2	3	4	5	6	7	8	9	10	11	12
Hire biologist and select sites	X	X	X									
Implement monthly fish sampling				X	X	X	X	X	X	X	X	X

Year 2

	Month											
Task	1	2	3	4	5	6	7	8	9	10	11	12
Implement monthly fish sampling	X	X	X	X	X	X	X	X	X	X	X	X

Year 3

	Month											
Task	1	2	3	4	5	6	7	8	9	10	11	12
Implement monthly fish sampling	X	X	X	X	X	X	X	X	X			
Complete Final Report										X	X	X

Progress to date

The FWC fisheries monitoring program has been in place in the Charlotte Harbor estuary since 1989. Data obtained by this program is actively used in State stock assessments for a variety of species. The program has already developed methods for sampling tidal tributaries. Tidal tributaries are being sampled in the northern portion of Charlotte Harbor as part of a statewide juvenile Common Snook survey. Expansion of this work to include the tidal tributaries downstream of Coral Creek and Charlotte Harbor Flatwoods Restoration could be implemented within 3 months. Fish sampling conducted by FWC does not require additional permitting. Any research permits required to conduct research in Aquatic Buffer Preserves can be obtained within the 3 month planning period.

Some pre-restoration fish community data is available. For example, Coral Creek was sampled by FWC for a period of one year (2014/2015). Two of the creeks downstream of the Charlotte Harbor Flatwoods Restoration (Yucca Pens) were sampled by Mote Marine Laboratory (2004-2011; Adams et al. 2009). We are requesting funds for a 3-year study to characterize the tidal tributaries for the period 2016-2019. The restoration projects are expected

to be completed during this period (Coral Creek is already well underway). Regardless of the restoration timelines, this sampling effort when combined with the previously mentioned efforts ongoing in upper Charlotte Harbor will provide bay-wide coverage of fish communities using Charlotte Harbor tidal tributaries over a multi-year period. Also provided will be a large dataset on water conditions that occurred during the period (i.e., water temperature, salinity, dissolved oxygen taken during fish sampling).

Cost-effectiveness

This project benefits from a statewide effort to sample habitat for juvenile fishes. The statewide effort, including tidal tributaries in northern Charlotte Harbor, provides additional reference sites for the project for which to gauge whether any discerned changes are related to restoration, regional dynamics in rainfall patterns, or recruitment of larval fish. Adding this study on to a larger effort greatly reduces the cost of the project. Infrastructure such as vehicles, research boats, laboratory space and equipment, computers, and freezers are already in place at FWC's Charlotte Harbor Field Laboratory located in Port Charlotte, Florida. Procedures and protocols related to sampling are already established and vetted through the scientific community. We are only requesting funds to expand the program into tidal tributaries downstream of two major restoration projects. This sampling cannot be conducted without the requested funds. The proposed effort provides a biological monitoring component to two large, multi-million dollar restoration projects.

Project sustainability

Beyond assessing the impact of ongoing restoration efforts, the characterization of these fish communities over a multi-year period is critical for evaluating the health of these systems for a wide variety of other purposes (e.g., numeric nutrient criteria, stock assessments, larval transport modeling). A multi-year dataset helps to reduce the likelihood that any differences in the fish community are due to anomalous factors (e.g., a strong recruitment year for a particular species, an environmental event such as hurricanes, drought, or red tide). Once this comprehensive, 3-year dataset is completed, the work can be revisited at later date to gauge changes in the fish community. Thus, the study as a whole will have far-reaching (bay-wide coverage of tidal tributaries) effects and long-term value.

Compliance with local, state, and federal regulations

Because fish sampling will be conducted by the State's fish and wildlife agency, all sampling is in compliance with local, state, and federal regulations. The fisheries monitoring program at the Charlotte Harbor Field Laboratory of FWC has been in place in Port Charlotte since 1989.

Achievable permitting

Fish sampling conducted by FWC does not require additional permitting. Any research permits required to conduct research in Aquatic Buffer Preserves can be obtained within the 3 month planning period.

<u>Provide Best Available Science</u>

FWC's fisheries monitoring data collection techniques, database standards, quality control, and statistical approaches have been fully vetted by the scientific community as demonstrated by several peer-reviews of the program and a highly respected volume of published work in peer-reviewed journals. Over 250 peer-reviewed articles have been produced by the program statewide. In the region of interest, Dr. Stevens and his staff at FWC's Charlotte Harbor Field Lab have published over 50 articles in peer-reviewed journals. These include

articles pertaining to freshwater inflow to estuaries, use of tidal tributaries by fish, critical nursery habitat, fish movements, and response of fish communities to restoration and disturbance. At a larger scale, the literature describing the importance of tidal tributaries in providing nursery habitat for fishes is too vast to cover. Below we select ten publications that 1) illustrate the importance of tidal tributaries as fish habitat, or 2) demonstrate a fisheries monitoring program's ability to detect change in the context of disturbance or restoration.

Stevens, P.W., M.F.D. Greenwood, and D.A. Blewett. 2013. Fish assemblages in the oligohaline stretch of a southwest Florida river during periods of extreme freshwater inflow variation. Transactions of the American Fisheries Society 142:1644-1658.

FWC's fisheries monitoring was extended into the zone of the Peace River where fresh and salt water first meet (area near the water treatment facility). These data are being used by the water management district to help set minimum flows and levels in the Peace River.

Milbrandt, E.C., R.D. Bartleson, L.D. Coen, O. Rybak, M.A. Thompson, J.A. DeAngelo, and P.W. Stevens. 2012. Local and regional effects of reopening a tidal inlet on estuarine water quality, seagrass habitat, and fish assemblages. Continental Shelf Research 41:1-16.

FWC's fisheries monitoring was expanded into San Carlos Bay to capture changes in fish communities associated with reopening Blind Pass (pass that connects Sanibel and Captiva). The effects of reopening a relatively small ocean inlet on water quality were apparent in the immediate vicinity of the inlet (within 1.7 km), but far reaching effects on water quality, seagrass metrics, and fish assemblages were not immediately apparent in this well-flushed estuary.

Krebs, J.M., C.C. McIvor, and S.S. Bell. 2013. Nekton community structure varies in response to coastal urbanization near mangrove tidal tributaries. Estuaries and Coasts DOI 10.1007/s122737-013-9726-9.

A component of a large tidal tributary study in Tampa Bay. Results suggest that urban development in coastal areas has the potential to alter the quality of habitat for nekton in small tidal tributaries as reflected by variation in the nekton community.

Stevens, P.W., Greenwood, M.F.D., and C.F. Idelberger. 2010. Mainstem and backwater fish assemblages in the tidal Caloosahatchee River: implications for freshwater inflow studies. Estuaries and Coasts 33:1216-1224.

FWC's fisheries monitoring was expanded into the Caloosahatchee River, an area downstream of the largest restoration effort in the U.S. This study is very relevant to the proposed research as it compares fish communities in tidal tributaries to those of open-facing shorelines. The fish communities between these habitats were very different. Tidal tributaries had far more Common Snook, Striped Mojarra, Bluegill, and a variety of small forage base species.

Adams, A.J., R.K. Wolfe, and C.A. Layman. 2009. Preliminary examination of how human-driven freshwater flow alteration affects trophic ecology of juvenile snook (Centropomus undecimalis) in estuarine creeks. Estuaries and Coasts 32:819-828.

This paper by a colleague, and four other papers, demonstrates the need for hydrologic restoration for a pair of tributaries in Charlotte Harbor. Common Snook using the impacted tributaries as nursery habitat had diets that were less diverse than those of natural tributaries nearby. This decreased diversity was suggested as an indicator of an overall change in

ecosystem function. The impacted tributaries are downstream of the Charlotte Harbor Flatwoods Restoration, and so there is potential to greatly improve habitat for Common Snook in these tributaries.

Stevens, P.W., D.A. Blewett, and G.R. Poulakis. 2007. Variable habitat use by juvenile common snook, *Centropomus undecimalis*: applying a life-history model in a southwest Florida estuary. Bulletin of Marine Science 80: 93-108.

This study illustrates the importance of tidal tributaries and wetland ponds to Common Snook. In Charlotte Harbor, these habitats represent the primary nurseries for Common Snook, which is an important sport fish in South Florida.

Greenwood, M.F.D., R.E. Matheson, Jr., R.H. McMichael, Jr., T.C. MacDonald. 2007. Community structure of shoreline nekton in the estuarine portion of the Alafia River, Florida: differences along a salinity gradient and inflow-related changes. Estuarine, Coastal, and Shelf Science 74: 223-238.

FWC's fisheries monitoring was expanded into the Alafia River in Tampa Bay to determine how fish communities respond to freshwater inflow-related changes. This paper and several others illustrate the program's ability to detect change associated with changing hydrology.

Stevens, P.W., C.L. Montague, and K.J. Sulak. 2006a. Fate of fish production in a seasonally flooded saltmarsh. Marine Ecology Progress Series 327: 267-277.

A component of this study compares fish production in coastal wetland habitat to that of other systems. Coastal wetlands and their associated tributaries are among the most productive habitats for small fishes that form the base of the food web. This production is then consumed by larger fish that use the system as a nursery and eventually leave. This "tropic relay" moves large quantities of wetland production from marshes to the open estuary and into oceans like the Gulf of Mexico. Tidal tributaries are an important conveyer of this production.

Stevens, P.W., D.A. Blewett, and J.P. Casey. 2006b. Short term effects of a low dissolved oxygen event on estuarine fish assemblages following the passage of Hurricane Charley. Estuaries and Coasts 29: 997-1003.

This paper, and five other papers, described what happened to fish communities after Hurricane Charley passed over Charlotte County. Such studies illustrate the FWC's fisheries monitoring program's ability to detect change after disturbances.

Idelberger, C.F., and M.F.D.Greenwood. 2005. Seasonal variation in fish assemblages within the estuarine portions of the Myakka and Peace rivers, southwest Florida. Gulf of Mexico Science 23:224-240.

This paper summarizes the story of how fish use tributaries, specifically the mouths of the Peace and Myakka Rivers. It includes many classic examples of Gulf-spawning species recruiting to tributaries during their early life history, growing, and eventually leaving for the Gulf of Mexico as adults.

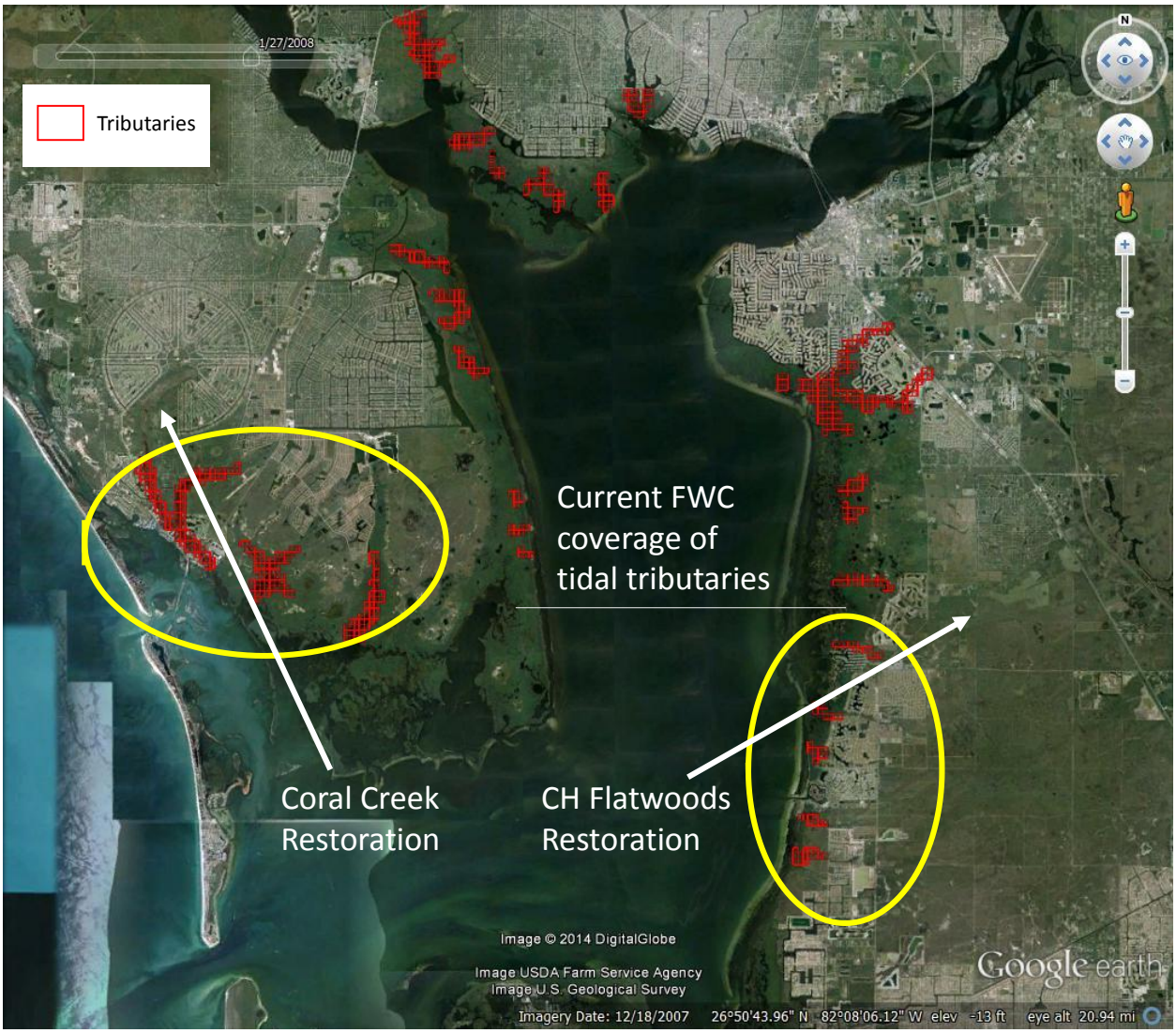

Figure 1. Map of tidal tributaries in the Charlotte Harbor estuary that are currently sampled by the Florida Fish and Wildlife Conservation Commission (red grids in upper Charlotte Harbor) and the tributaries for which fish sampling is proposed in this study. The proposed sampling includes the tidal tributaries downstream of Coral Creek Restoration and Charlotte Harbor Flatwoods Restoration (red grids within yellow circles).