

RESTORE Act Ecosystem Restoration Project Proposals
for consideration in the Gulf Coast Ecosystem Restoration Council's Comprehensive Plan
2012

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Name of Project: Lower Charlotte Harbor Flatwoods Initiative	Org and Rank: 1
Background: The Charlotte Harbor Flatwoods Initiative is a multi-phased regional hydrologic restoration effort coordinated by the South Florida Water Management District (SFWMD) and Florida Fish and Wildlife Conservation Commission (FWC). Multiple local, state and federal agencies have participated in the effort. The project area is approximately 90 square miles and includes the following sub-watersheds: 1) Yucca Pen Creek, 2) Durden Creek, 3) Greenwell Branch, 4) Longview Run and 5) Gator Slough. Runoff from these systems originates in the northeastern reaches of the Babcock-Webb Wildlife Management Area (WMA) in Charlotte County within the SFWMD and then passes through the Southwest Florida Water Management District (SWFWMD) to reach the outfall in Lee County within the SFWMD again. Thus, the need for regional coordination is clear. Project Description: Phase I <i>The Yucca Pens Hydrologic Restoration Plan</i> (Plan) was completed by SFWMD in January 2010, which is Phase I of the Charlotte Harbor Flatwoods Initiative (Initiative). The goal of the Plan is to restore historic sheet flow to the Yucca Pens area. Development and topographic changes since the 1950s have blocked, constricted, and concentrated what were formerly sheet flow areas draining in a southeasterly or southerly direction. Restoration of the historic flow will reduce the amount of water that has been redirected to Gator Slough and lessen the impact of damaging point discharges through the Gator Slough Canal to Matlacha Pass and Charlotte Harbor. This Initiative qualifies as a Surface Water Improvement and Management (SWIM) project and is part of the overall management strategy of the <i>SFWMD Lower Charlotte Harbor SWIM Plan</i> (February 2008); specifically Initiative 3 - Watershed Master Planning and Implementation. Goals of the plan are: 1. Restoration of sheet flow across the Yucca Pens unit 2. Provide outfall from Babcock-Webb WMA to the Yucca Pens unit – potential flow ways include Oil Well Road at I-75 and Harper & McNew Property at I-75 3. Investigate ways to allow water from the U.S. 41 ditch to sheet flow across Yucca Pens unit 4. Restoration of the ecological integrity of the ecosystem 5. Improvement of water retention and aquifer recharge 6. Restoration of flow severed by previous construction 7. Restoration of historic outfall to Charlotte Harbor 8. Reduction in unnatural point discharges from Gator Slough 9. Reconnect Durden Creek, Greenwell Branch and Yucca Pen Creek watersheds by removing	

hydrologic impediments, adding retention/detention system capacity and reconfiguring the conveyance structures along the Burnt Store Rd corridor to restore historic hydrology.

Phase II

Phase II of the Initiative started the implementation of the Plan with two hydrologic restoration projects in the Yucca Pens area through SFWMD partnerships with FWC and Lee County Conservation 20/20.

Phase II projects included in PS 100633 are:

The Yucca Pens Unit Hydrologic Restoration Phase I - Design & Permitting (WBS 100633-03-05-01) - the objective of this project is to prepare construction documents and secure permits for the restoration of selected All Terrain Vehicle (ATV) trails through ditch plugs in the FWC Yucca Pens unit to stop the unnatural conveyance of water off-site. The benefits will include a more natural sheet flow, decreased erosion and sediment transport through channelized water flow, restoration of historic flows and hydroperiod restoration.

SFWMD & FWC Interagency Agreement (WBS 100633-03-05-03) - this is a no cost agreement between SFWMD and FWC for completion of the Yucca Pens Unit Hydrologic Restoration project. SFWMD was responsible for the design and permitting of the project. FWC was responsible for the construction of the project provided that FWC funding was available. The construction of the project is on-hold pending availability of FWC funding.

Charlotte Harbor Preserve Hydrologic Restoration (WBS 100633-03-05-05)- The project involves the engineering, design, permitting and construction for the restoration of the Charlotte Harbor Preserve State Park's off-road vehicle trail. The objective is to stop the unnatural channeling of water along the existing trail and provide stormwater storage by restoring historic sheet flow to the area. This project is on-hold pending availability of SFWMD funding.

Phase II project included in PS 100277 - Lower Charlotte Harbor Initiative:

Yucca Pens Preserve Restoration (WBS 100277-03-05-05)-Project is Complete – SFWMD partnered with Lee County Conservation 20/20 on this project. Prior to this project, ditches and ATV trails conveyed water off site unnaturally. The project used ditch plugging to stop the unnatural conveyance of water, allowing the water to stay on site longer through sheet flow. The project was completed in March 2011.

Phase III – Regional Monitoring Network (WBS-100633-03-05-06)-Completed and operational currently gathering data.

Phase III of the Initiative involves area partners in the development of a Regional Monitoring and Rain Gage Network in the Babcock-Webb WMA. SFWMD developed the Statement of Work for the Regional Monitoring Network, which will consist of: 1) Two Streamflow (tidal) Monitoring Sites in Yucca Pens Creek and Durden Creek, 2) Two Surface Water Level (real time) Monitoring Sites, and 3) 16 Staff Gage & Crest Gages Sites for FY11. Three Rainfall Gage (real-time) Monitoring Sites will be installed separately by Lee County. Partners include USGS, FDOT, Lee County, FWC and FDEP. SFWMD did not have funding available for this project in FY11. USGS generated a Joint Funding Agreement with FDOT and Lee County to implement the Regional Monitoring Network in FY11.

Phase IV – Watershed Master Planning (WBS-100633-03-05-02)

Phase IV will involve developing a *Flow Evaluation Model* simulating water volumes and flows under a range of climatic conditions as well as utilizing the monitoring data from Phase III. The Model will evaluate surface water management in the project area and identify problem areas. A natural systems analysis will be conducted to identify pre-development drainage patterns, and to estimate pre-development water levels and hydroperiods. These estimates will guide the development of improvement alternatives recommended in the Plan and support the permitting of selected future hydrologic restoration designs. This phase also includes development of a MULTI-FUNCTIONAL WATER MANAGEMENT PLAN.

4.1 CONCEPTUAL PLAN FORMULATION**4.1.1 Restoration Planning Requirements**

An integrated or multi-functional restoration plan is essential to achieve the desired goal for the study area, which is to restore the sheet flow conditions over the project area to the historic level. Over the years, significant developments have taken place in portions of the project area. It is impractical to displace the existing areas of development and restore the flow to historic conditions in its entirety. Therefore, the emphasis in developing the conceptual plans is given to pragmatic concepts for restoration of the historic flow conditions within the project area. It should be noted that flood protection is considered as a potential restoration constraint such that restoration should not decrease existing flood protection in currently developed areas. Some of the high level elements of the conceptual plan may include the following requirements.

- Historic sheet flow restoration
- Restoring more natural flows to Charlotte Harbor
- Watershed Water Quality Improvement (discharging to Charlotte Harbor)
- Ground Water Recharge (to protect and enhance the fish and wildlife habitats)
- Hydroperiod Maintenance (for vegetation management and protection and enhancement of the fish and wildlife habitats)
- Land Acquisition and Management (to address operational issues)

Project Location: Lee and Charlotte Counties/Charlotte Harbor

Responsible Party: South Florida Water Management District

Partners: South Florida Water Management District, Southwest Florida Water Management, Florida Department of Environmental Protection, Lee County, Charlotte County, Charlotte Harbor National Estuary Program, Florida Department of Transportation, Florida Wildlife Commission, United States Geological Survey, Seminole Gulf Railroad, City of Cape Coral, Florida State Parks, Charlotte Harbor National Aquatic Preserve, Mote Marine Laboratory, local landowners.

NEP: CHNEP

Project Benefits and Costs:
The benefits and the cost estimates for the

Total Dollars Needed:
\$15,000,000

	various concepts presented in this report are given below. It should be noted that the cost estimates are not accurate since the actual scope of the conceptual designs are not materialized. The actual cost estimates, based on comprehensive engineering analysis, may significantly differ from the values presented below. • Flow Diversions in GSE1 - o Benefits: Reduce flow to Gator Slough Canal, redistribute stormwater runoff outfalls, enhance hydroperiods, support fish, wildlife and vegetation, improve water quality - o Approximate Total Cost: \$9,500,000 ☐ Construction - \$ 800,00 ☐ Land Acquisition - \$ 8,350,000 ☐ Construction Management - \$ 100,000 ☐ Feasibility Study, Design and Permitting - \$250,000 • Flow Diversions in GSE2 - o Benefits: Reduce flow to Gator Slough Canal, redistribute stormwater runoff outfalls, enhance hydroperiods, support fish, wildlife and vegetation, improve water quality - o Approximate Total Cost: \$10,200,000 ☐ Construction - \$ 1,100,000 ☐ Land Acquisition - \$ 8,750,000 ☐ Construction Management - \$ 100,000 ☐ Feasibility Study, Design and Permitting - \$250,000 • Flow Distribution and Treatment Enhancement in DCEBS/YPEBS - o Benefits: Ensure restoration of historic flow ways, enhance hydroperiods, support fish, wildlife and vegetation, improve water quality - o Approximate Total Cost: \$4,500,000 ☐ Construction - \$ 3,300,000 ☐ Land Acquisition - \$ 300,000 ☐ Construction Management - \$ 400,000 ☐ Feasibility Study, Design and Permitting - \$500,000 • Protect and Perpetuate Flow Ways in YPEBS, GBEBS, and DCEBS	
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	- o Benefits: Enhance restoration of historic flow ways, enhance hydroperiods, support fish, wildlife and vegetation, improve water quality - o Approximate Total Cost: \$400,000 ☐ Construction - \$ 250,000 ☐ Land Acquisition - \$ 0 ☐ Construction Management - \$ 50,000 ☐ Feasibility Study, Design and Permitting - \$100,000 • Restore Historic Flow across Burnt Store Road - o Benefits: Reduce flow to Gator Slough Canal, redistribute stormwater runoff outfalls, enhance hydroperiods, support fish, wildlife and vegetation, improve water quality - o Approximate Total Cost: \$1,700,000 ☐ Construction - \$ 1,000,000 ☐ Land Acquisition - \$ 400,000 ☐ Construction Management - \$ 100,000 ☐ Feasibility Study, Design and Permitting - \$200,000 • Improved Monitoring System for Performance Measures - o Benefits: Source of information for design of restoration plans, performance measures for implemented restoration plans, assist evaluate hydroperiods and water quality improvement. - o Approximate Total Cost: \$350,000 ☐ Construction - \$ 200,000 ☐ Land Acquisition - \$ 0 ☐ Construction Management - \$ 0 ☐ Feasibility Study, Design and Permitting - \$150,000						
Start: 2012		Completion: 2016					
Status of Project Design and Permitting: Many of the overall project components are designed and permitted and ready for construction.							
What Date or Year could Construction Feasibly Begin: 2012							
Your Proposed Timing of Funding (given permits, phasing, staging, etc.)							
FY	12/13	13/14	14/15	15/16	16/17	17/18	Total
\$1,000,000 spent to date by	\$970,000	\$5,000,000	\$4,500,000	\$4,000,000			\$15,000,000

stakeholders						
Quantify Environmental Results and How to Measure Them: <u>Identification of Problem and Impacts</u> ▪ The patterns of freshwater flow into the Charlotte Harbor estuary have been altered from their natural state ○ Increased impervious surfaces in watersheds have caused increased runoff ○ Ditches, berms, and canals have disrupted natural sheet flow and altered direction and amount of freshwater flows ○ Aquifer levels have declined because of development, causing freshwater springs to cease flowing ○ In general, freshwater flows that once entered the Charlotte Harbor estuary via many tidal creeks and sheet flow now enter the estuary via fewer creeks or canals that carry higher volumes of water ▪ Alterations of freshwater flows cause significant ecological changes in estuarine habitats, including species composition and abundance ○ Research in Charlotte Harbor creeks show that there are fewer species and lower abundance of fishes in creeks with highly altered watersheds than creeks with less impacted watersheds ▪ Fragmentation of habitats also causes significant ecological changes similar to freshwater flow alterations ○ Disconnection of tidal creeks and upland streams reduces available habitat for estuarine species and species that depend upon these creeks ○ Species abundance and species composition changes ▪ Altered upland aquatic habitats appear to enhance the invasion of non-native species into estuarine habitats ○ This was documented for Mayan cichlid (<i>Cichlasoma urophthalmus</i>) ▪ These changes are also reflected in diets of predatory fishes, including snook, which may cause reduced growth, condition, and survival ○ The diet of juvenile snook in mangrove creeks of Charlotte Harbor were half as diverse and had a higher incidence of empty stomachs in creeks with highly altered watersheds ▪ Freshwater flow alterations include changes to ○ Timing – this can occur on multiple scales (ranging from daily to seasonally to annually) ○ Location (e.g., change from multiple sources (creeks) to single sources (canals)) ○ Quantity (e.g., attenuated flow over time vs high-volume pulses) ○ Quality (salinity, nutrients, contaminants) ▪ Although increases in nutrients are of concern, rapid and/or long-term changes in salinity probably have the greatest effect on estuarine fishes and invertebrates ○ However, recent apparent increases in nutrient levels have caused notable increases in filamentous green algae in mangrove creeks and adjacent sand flats. ▪ In addition to the many fish species that are residents in tidal creeks, the juvenile life stages of economically important recreational fishes rely upon mangrove creeks ○ Juvenile snook rely upon mangrove creeks for their first year ○ Juvenile tarpon use tidal creeks and associated wetlands for at least their first year						

- Juvenile redfish use tidal creeks
- In addition to these juvenile life stages, adult snook and redfish also use tidal creeks and adjacent habitats
- These habitats are also used by commercially important species, including blue crab and striped mullet
- Due to the topography and tidal range of Charlotte Harbor, the residence time of water is long, especially in tidal mangrove creeks and adjacent mangrove and seagrass habitats
 - This long residence time magnifies the effects of freshwater flow alteration, and these impacts extend outward from the creeks into adjacent habitats, and impact the entire estuary

Restoration Needs

- Given that the amount of developed land in the Charlotte Harbor watershed will increase, it is important to address the issue of freshwater flow alterations now.
- Restoration of freshwater flows will help sustain the economically important fisheries of Charlotte Harbor – both recreational and commercial.
 - The recreational fisheries of Florida have an annual economic impact of approximately \$8 billion
 - In Charlotte Harbor, a study of the recreational fishery for tarpon found an annual economic impact of \$110 million for resident anglers (tourism and guides not included)
 - These fisheries depend upon healthy habitats. There is no cost associated with maintaining these important fisheries – they will continue to have high economic impact in perpetuity as long as habitats are healthy
 - Therefore, restoration of natural freshwater flows into Charlotte Harbor can be considered an investment in these fisheries, as well as tourism in general (boating, sightseeing, birding)
- NOAA and USFWS offer funds for ‘community based restoration’ and other restoration programs that focus on (recreational) fish habitat restoration. The Charlotte Harbor restoration program should qualify for some of these funds.
- It will be essential to develop a monitoring program for tidal creek habitats to measure the effects of the restoration and to evaluate different restoration methods
 - Develop metrics for measuring restoration effectiveness for tidal creeks using comparative data from previous work in habitats of differing qualities (e.g., impacted vs natural)
 - Number of fish species
 - Fish species composition
 - Fish abundance
 - Fish diet
 - Number of invertebrate species
 - Invertebrate species composition
 - Invertebrate abundance
- Design a comprehensive approach to measure restoration effectiveness for all variables (abiotic and biotic)
 - Comparative: Sample multiple locations along a ‘gradient of habitat degradation’ or in restored vs natural vs impacted areas (i.e., use higher spatial coverage of

sampling to make up for a lack of historical data) ○ Event sampling: Frequency of sampling abiotic variables may not be sufficient to detect freshwater flow changes that occur on a shorter time scale but have longer term biological implications. In addition to sampling at regular intervals, it may be worthwhile to also conduct event sampling (e.g., high rain event) to obtain data on the effects of these events.
Economic Benefits (including ecosystem services):
Estimated number of Jobs Created or Preserved: 1,500
How much Habitat will be restored and conserved?: Project area is 90 square miles
Quantify pollutant reductions: The largest water quality problem within the project area is point discharge of freshwater into Charlotte Harbor. However, best management practices installed during project(s) construction will have a direct impact on nutrients within the watershed. The total TP loads from the watersheds within the drainage basin were estimated at 28,906 lbs/yr without BMPs and 28,561 lbs/yr with BMP treatments. The total TKN loads from the watersheds within the drainage basin were estimated at 197,944 lbs/yr without BMPs and 197,119 lbs/yr with BMP treatments. The wet detention ponds accounted for the majority of the BMP treatments in this drainage basin.
What living coastal/marine resources will be improved and by how much?: Matlacha Pass Aquatic Preserve and National Wildlife Refuge, 12,500 acres of sovereign submerged lands and habitat restoration on approximately 90 square miles of land.
How will community resilience be enhanced? Improved flood control in the current landscape will prolong the period of habitability in the residential corridors of the Matlacha Pass tributaries as climate change and sea level rise occur. Habitat improvements due to restored historical flows will also mitigate the current effects of degradation on fisheries and improve the period of time these fisheries can be sustained during the onset of sea level rise.
Additional Justification: The Charlotte Harbor Flatwoods Initiative is a regional hydrologic restoration project that will improve water quality, enhance wetlands, provide aquifer recharge, mitigate historic flooding, improve wildlife and fish habit, provide much needed storage, restore low groundwater levels, while having a major economic impact on the region. The hydrologic reconnection of historic flow ways will benefit an Estuary of National Significance as well as the Matlacha Pass Aquatic Preserve and National Wildlife Refuge.

Add any photos or maps that explain project:

