

Title	Quantify Env Results
Alligator Creek Ecosystem Restoration Project Phase III in Punta Gorda	Filling of mosquito control ditches and re-contouring of existing upland cut canals will reduce the effects of sea-level rise and improve resilience of the park.
Babcock Ranch State Preserve Hydrologic Restoration – Tidal Caloosahatchee	Restoration of hydro-period & base flow to the tidal Caloosahatchee measured by flow and water quality data being collected by Lee County and private sources with a target of documenting ground water table rise to surficial providing an addition month wetland success and piezometer data loggers on base flow changes with significant increases of more than one month on average increases. These changes are significant to fish and wildlife as well as stabilizing the surficial aquifer and reducing exceptional rapid high water runoff and extended dry season periods. These factors will be significant in reducing salt water intrusion as sea level rise continues to native natural systems historic seasonal water levels proposed in this project cannot be fully attained due to existing downstream developments but similar project created in the Babcock Ranch Community development have demonstrate a very significant lift using UMAM flora and fauna criteria as indicators of performance success.
Bob Janes Preserve wetland restoration	Much of the drainage in the area has been redirected into alternate watersheds via manmade ditches and canals like the Lightered Canal. This project will restore sheet flow across former agricultural fields, providing for more natural sheet flow and reducing flows that are too high for the tributaries accepting water from the Lightered Canal. Natural communities will rebound in the former agricultural fields, providing for better wildlife habitat.
Buckingham FGCU Watershed Restoration	Improve habitat by restoring freshwater flows to the wetland system in Hickory Creek and the Orange River that ultimately discharges to the Caloosahatchee Estuary. This could be measured by water quality and oyster bed monitoring.
C-43 West Basin Storage Reservoir	Water quality improvement by nutrient load reduction. Can be evaluated through the BMAP water quality monitoring program.
Caloosahatchee Creeks Preserve creek and wetland restoration	Re-hydrated wetlands, linear feet of berm removal and linear feet and area of newly cut stream bed. The actual acres of restoration and linear feet of stream bed and berm cuts will be determined during the permitting process and is not yet available.
Charlotte Harbor Flatwoods Initiative/NW Lee County Surface Water Management Plan	Identification of Problem and Impacts ♣ The patterns of freshwater flow into the Charlotte Harbor estuary have been altered from their natural state - o Increased impervious surfaces in watersheds have caused increased runoff - o Ditches, berms, and canals have disrupted natural sheet flow and altered direction and amount of freshwater flows - o Aquifer levels have declined because of development, causing freshwater springs to cease flowing - o In general, freshwater flows that once entered the Charlotte Harbor estuary via many tidal creeks and

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	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 - o 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 - o Disconnection of tidal creeks and upland streams reduces available habitat for estuarine species and species that depend upon these creeks - o Species abundance and species composition changes ♣ Altered upland aquatic habitats appear to enhance the invasion of non-native species into estuarine habitats - o 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 - o 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 - o Timing – this can occur on multiple scales (ranging from daily to seasonally to annually) - o Location (e.g., change from multiple sources (creeks) to single sources (canals)) - o Quantity (e.g., attenuated flow over time vs high-volume pulses) - o 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 - o 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 - o Juvenile snook rely upon mangrove creeks for their first year - o Juvenile tarpon use tidal creeks and associated wetlands for at least their first year - o 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 - o This long residence time magnifies the effects of freshwater flow alteration, and these impacts extend

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	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. - o The recreational fisheries of Florida have an annual economic impact of approximately \$8 billion - o 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) - o 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 - o 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 - o 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) - o 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) - o 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

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	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
Coral Creek Ecosystem Restoration on the Cape Haze Peninsula, Florida	Filling of mosquito control ditches and re-contouring of existing upland cut canals will reduce the effects of sea-level rise and improve resilience of Cape Haze.
Dona Bay Environmental Restoration	Environmental results will be quantified by reduction of flows to the estuary measured by stage heights and discharge curves. Phases of the project are estimated to reduce excess flows by 15% to 80%.
Fichter's Creek Restoration	Improve habitat by restoring freshwater flows to the Caloosahatchee Estuary. This could be measured by water quality and oyster bed monitoring.
Four Corners/Florida Citrus Land Acquisition	Complete landscape plan in support of the Caloosahatchee River Watershed Protection Plan, the Southwest Florida Comprehensive Watershed Plan (formerly Southwest Florida Feasibility Study) and provide habitat concurrent with Lee County's comprehensive conservation master planning efforts.
Henderson Creek Diversion Pump Station	Results will be measured by volume of freshwater diverted from Golden Gate Main Canal to the Henderson Creek Canal.
Manatee River Minimum Flow	Improvement of low salinity habitat area and persistence integral to developmental stages of many marine organisms. Monitoring stations will be added to those previously established.
Moving Water South	This project will improve the habitat of 630 acres of drained wetlands that will increase the number of birds that utilize these wetlands. The bird population is estimated to increase by over 1,100 birds. The project will also reduce the volume of freshwater inflows to the Caloosahatchee River estuary by 2,500 acre feet per year, and the pollutant load reduction will be 218 and 2,240 Kg/yr Total Phosphorus and Total Nitrogen.
North Belle Meade Spreader Swale	Environmental benefits will be measured in freshwater discharge reduction to Naples Bay and improvements to the hydroperiods of wetlands in North and South Belle Meade.
North Fort Myers Surface Water Master Plan	Water quality improvement by nutrient load reduction. Can be evaluated through the BMAP water quality monitoring program.
North Golden Gate Estates (NGGE) Flowway Restoration Project	Results will be measured in improved hydrology to wetlands in the NGGE Flowway and increased Floodplain Levels of Services.
Poinsetta Stormwater Pump Station Improvements	The upgraded stormwater pump station will provide a significant savings to the City through more efficient operation of the pumps, especially with remote monitoring and control systems.
Removal of Agricultural Dam from Phillippi Creek	This project will restored tidal habitat including wetlands, mangroves and natural shorelines. It may remove accumulated sediment. It will also provide a measurable amount of nutrient removal to improve the health of Phillippi Creek and Sarasota Bay.
Six Mile Cypress Slough Preserve	The flow will no longer be directed into a manmade borrow pit, but will instead flow south in a natural

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hydrological restoration	pattern. The Slough has a series of wells that monitor water levels. Once the ditch is blocked the change could possibly be noted.
South I-75 Canal Spreader Swale	Results will be measured in increased freshwater discharge into Rookery Bay.
South Lee County Surface Water Plan	Meet target flows developed for the South Lee County Watershed Plan and the Southwest Florida Feasibility Study (Project Group 34).
Southwest Lehigh Weirs Project	This project will reduce peak flows during the wet season to the Orange River and Caloosahatchee River estuary, and the overall volume of freshwater to the estuary will be reduced.
Stumper Jumper Ranch Land Acquisition	Complete landscape plan in support of the Caloosahatchee River Watershed Protection Plan, the Southwest Florida Comprehensive Watershed Plan (formerly Southwest Florida Feasibility Study) and provide habitat concurrent with Lee County's comprehensive conservation master planning efforts.
Sweetwater Creek Improvement Project	The proposed four acres of dredge area will be verified for the post-construction as-built certification process. Water quality sampling will be conducted pre-during-post construction within the project limits as well as upstream and downstream of the dredging area.
Telegraph Creek Drainage Repairs	Sediments are being washed into the creek from fire lines within the dry and wet prairie and flatwoods.