

Artificial Reefs, Beach Restoration and Sea Turtles Nesting Marine Spatial Planning in Martin County, Florida



CMar Consulting, LLC
Environmental & GIS Services

Alexandra Carvalho, Ph.D., GISP



Kathy Fitzpatrick, P.E.
Jessica Meinardi



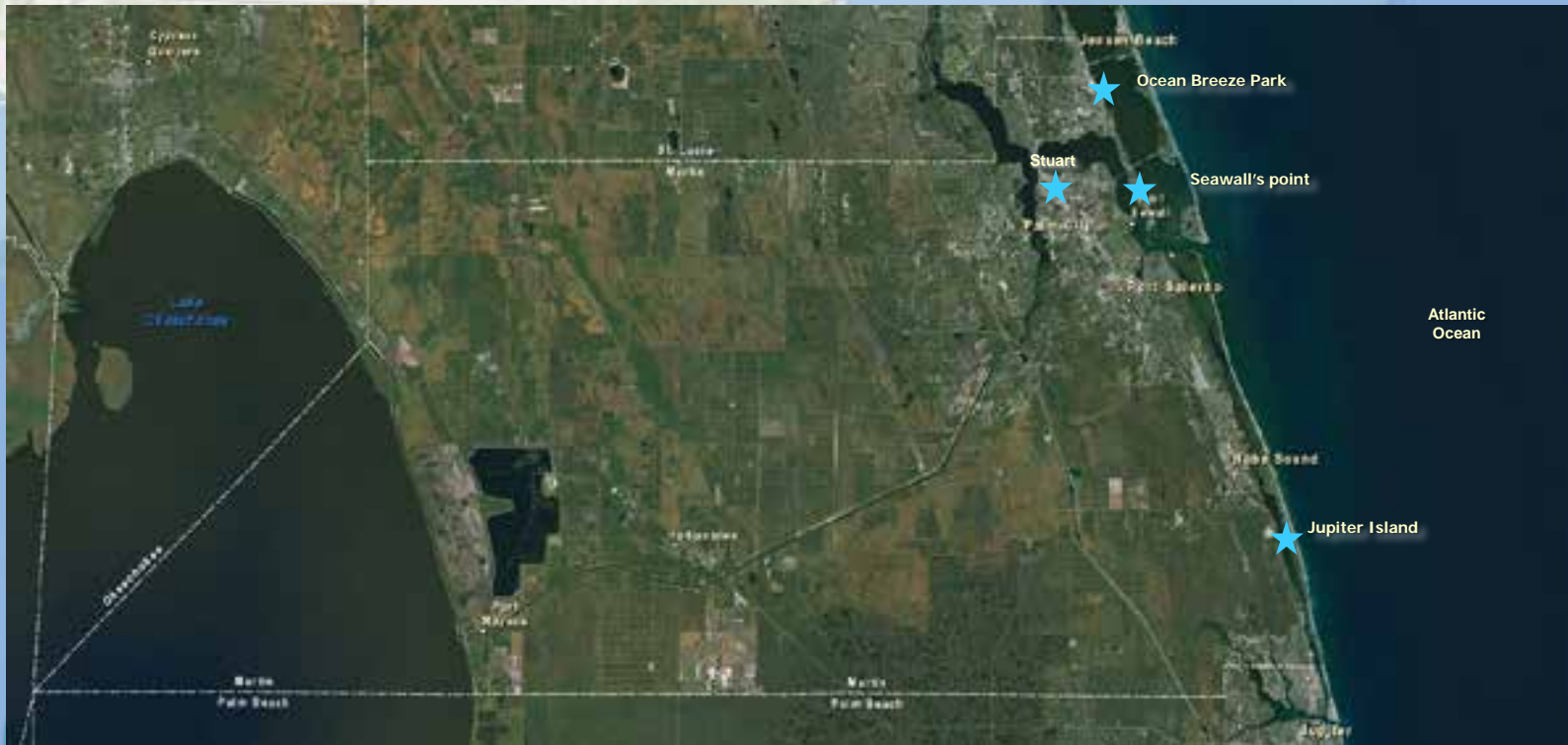
Frank Veldhuis, PSM

Outline

- Project Overview
- Case Studies
 - Artificial Reefs
 - Oyster reef restoration
 - Nearshore and Offshore artificial reefs
 - Beach Renourishment
 - Desktop application
 - Public Information during beach construction
 - Sea Turtle Monitoring
- Current status
- What is next



Coastal Engineering
Protecting Reefs,
Shoreline & Waterways



Land Area: 556 square miles
2010 Population: 146,318
Municipalities : 4

Commission District: 5
Atlantic Coastline Length: 22 miles
Active Coastal Programs: 6

Habitat Management Program



- St Lucie estuary oyster reef restoration to improve water quality
- Nearshore mitigation reefs to offset impacts from beach renourishment
- Offshore reef creation in state and federal waters for recreation
- Water Quality baseline to measure impacts in the natural reefs offshore

Beach Restoration Program



- Two long-term beach renourishment projects (1 federal one City)
- Smaller projects when needed (local and community)
- Placements from inlet and waterway dredging projects (regional and local)

Inlet Management Program



- Sediment basin dredging and sand bypass to the south beaches
- Inlet maintenance (channel, jetties, breakwaters)
- St Lucie Inlet Federal Channel Maintenance (Local Sponsor)

Waterways Management Program



- Intracoastal and Okeechobee waterways (Local sponsor managed by FIND)
- Smaller dredging projects in creeks (i.e. access channels)
- **Anchoring and Mooring Program (off the waterways program)**

How it Started...

2003



- Staff from the Martin County Engineering Division (Kathy Fitzpatrick) struggling with high volumes of unorganized information resulting from permitting and management of 5 coastal program (6 as of 2013)

Spatial Data Created by Environmental Permitting

- Typical permitting project data collection efforts
 - Baseline / Permit Application
 - Pre-Construction
 - Construction
 - 1-3 Years Post-Construction Monitoring
 - 📅 Entire project life ranges from 1 to 6 years
 - 📅 30 to 60 datasets per project
 - 📅 Some projects occur every 3 to 6 years

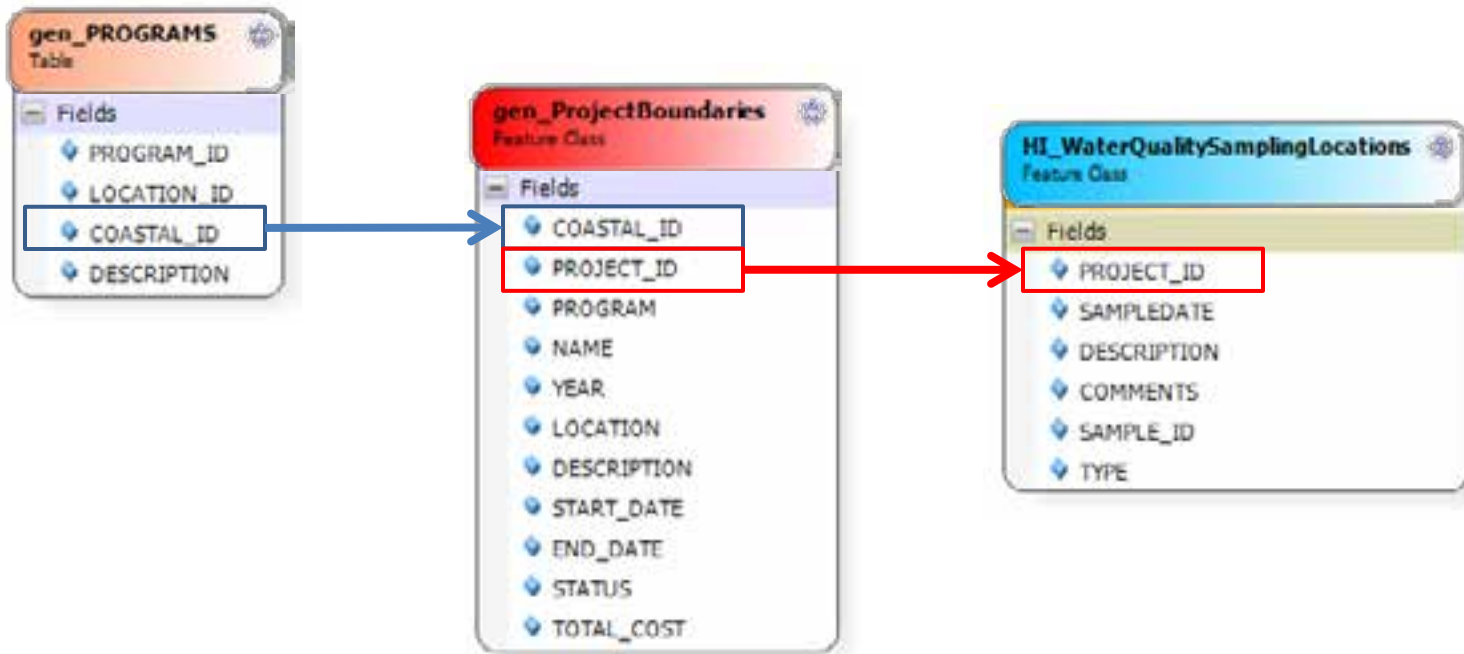
Coastal Geodatabase Organization

- Frequent Asked Questions
 - What type of information the County needed for its day to day project management
- Bathymetry
 - Most survey XYZ and some LIDAR
- Unique ID
 - Link the project location with the project data

FAQs

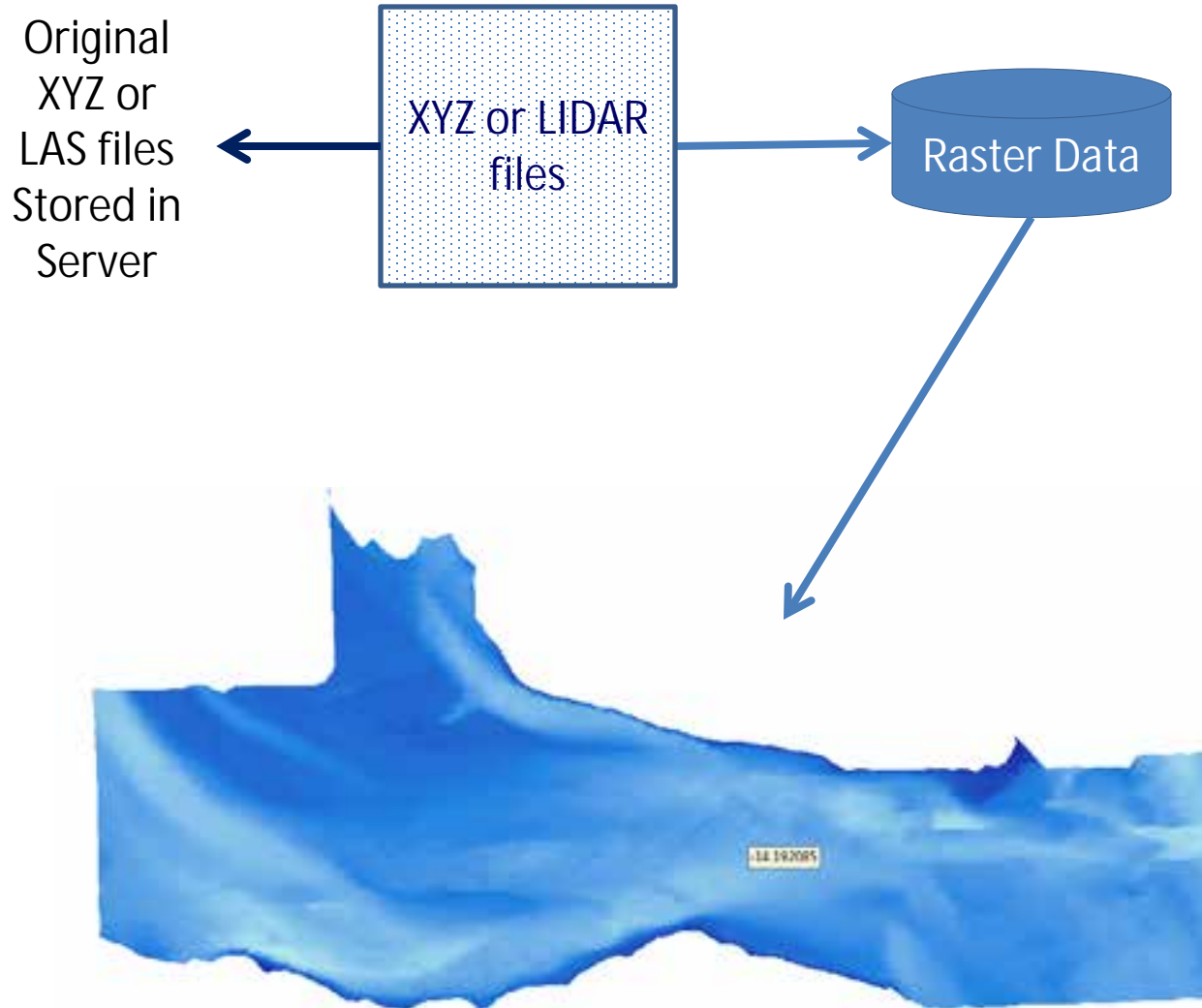
- What information do I need organized by project
 - Engineering data
 - Water and sediment quality
 - Regulatory (County)
- What information do I need organized by data type
 - Natural Resources
 - Surveys
 - Regulatory (created by others)

COASTAL_ID

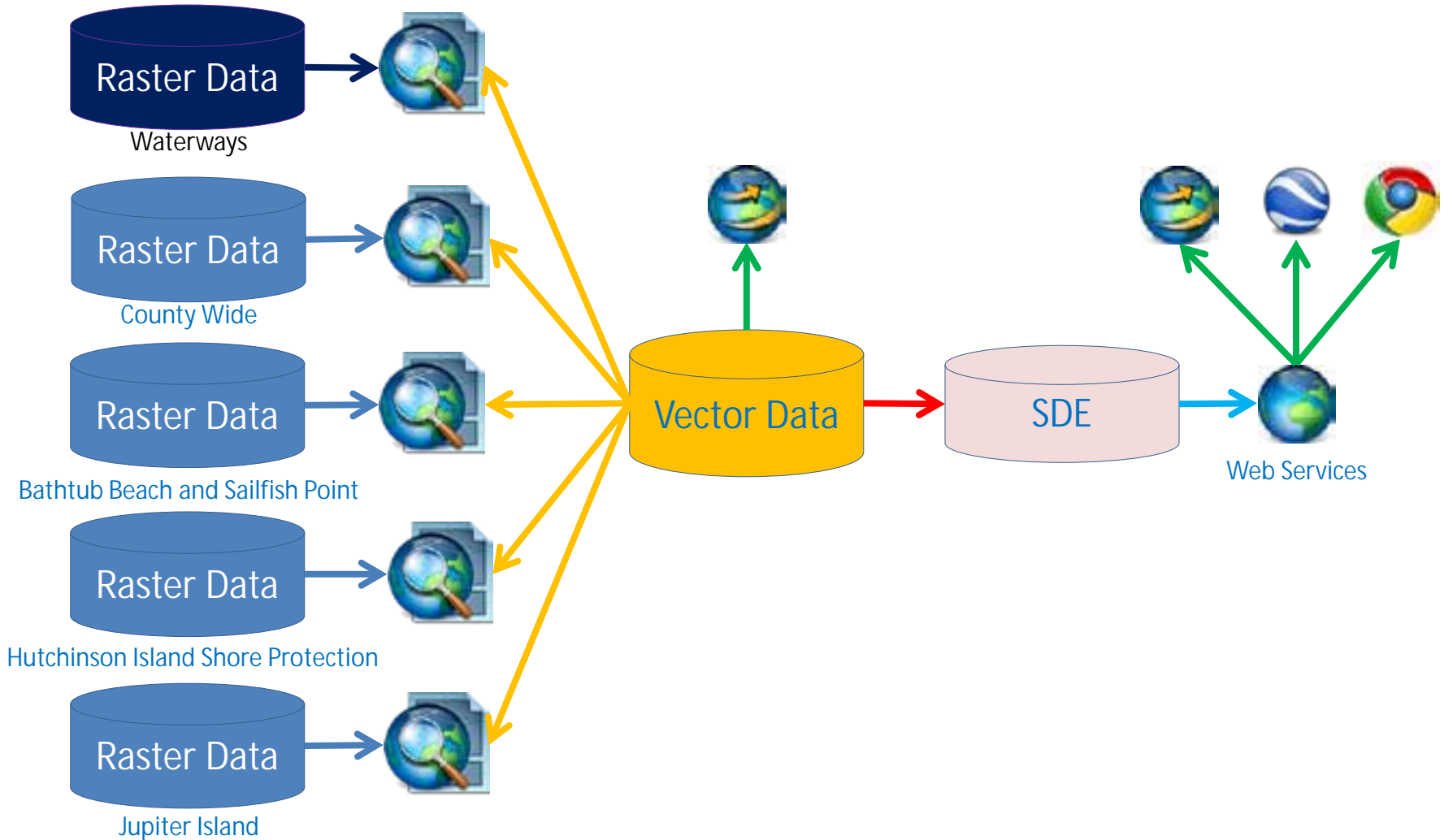


Project Locations	Program_ID	Location_ID	Coastal_ID
Beach Restoration Program	002	000	002000
Hutchinson Island Shore Protection		001	002001
Bathtub Beach Park		002	002002
Sailfish Point Beach		003	002003
St. Lucie Inlet State Park		004	002004
Hobe Sound Wildlife Refuge		005	002005
Town of Jupiter Island		006	002006

Geodatabases with RASTERS



Current Structure



Coastal Geodatabase

- [-] [Folder] Martin County Coastal Data
 - [Folder] Bath tub Beach and Sailfish Point Rasters.gdb
 - [Folder] CoastalGeodatabase.gdb
 - [Folder] County Wide Rasters.gdb
 - [Folder] Hutchinson Island Rasters.gdb
 - [Folder] Inlet Management.gdb
 - [Folder] Jupiter Island.gdb
 - [Folder] Waterways Rasters.gdb
 - [File] Artificial Reefs v1.5.mxd
 - [File] Basemaps v1.5.mxd
 - [File] Bath tub Beach and Sailfish Point Beach Renourishment Project v1.5.mxd
 - [File] Hutchinson Island Beach Renourishment Project v1.5.mxd
 - [File] Inlet Projects v1.5.mxd
 - [File] Turtle Demo v1.3.mxd
 - [File] Waterways Channel Limits and Right of Ways v1.3 .mxd
 - [File] Waterways v1.3.mxd

[Folder] BaseLayers	File Geodatabase Feature Dataset
[Folder] BCH_BathtubBeachParkandSailfishPoint	File Geodatabase Feature Dataset
[Folder] BCH_BeachRestoration	File Geodatabase Feature Dataset
[Folder] BCH_HutchinsonIslandSPP	File Geodatabase Feature Dataset
[Folder] BCH_JupiterIsland	File Geodatabase Feature Dataset
[Folder] BCH_WWW_InletSandbyPassPlacement_HSNWR	File Geodatabase Feature Dataset
[Folder] CMP_CoastalMonitoring	File Geodatabase Feature Dataset
[Folder] FDEP_Storm	File Geodatabase Feature Dataset
[Folder] GEN_NaturalResources	File Geodatabase Feature Dataset
[Folder] GEN_Surveys	File Geodatabase Feature Dataset
[Folder] HAB_InshoreReefs	File Geodatabase Feature Dataset
[Folder] HAB_NearshoreOffshoreReefs	File Geodatabase Feature Dataset
[Folder] REG_Regulatory	File Geodatabase Feature Dataset
[Folder] WWW_WaterwaysManagement	File Geodatabase Feature Dataset
[Table] cmp_WAVEGAGEDATA	File Geodatabase Table
[Table] gen_DOCUMENTS	File Geodatabase Table
[Table] gen_FUNDING	File Geodatabase Table
[Table] gen_GRANT	File Geodatabase Table
[Table] gen_ORGANIZATION	File Geodatabase Table
[Table] gen_PROGRAMS	File Geodatabase Table
[Table] gen_ProjectBoundaries	File Geodatabase Feature Class
[Table] grant_documents	File Geodatabase Relationship Class
[Table] permit_documents	File Geodatabase Relationship Class
[Table] permitcondition_documents	File Geodatabase Relationship Class
[Table] permitTBL_permitcondTBL	File Geodatabase Relationship Class
[Table] reg_PERMIT	File Geodatabase Table
[Table] reg_PERMIT_CONDITIONS	File Geodatabase Table

Case Studies

Habitat Management Program

Habitat Management Program

This year's planning of new sites used the information on the map template. Looking for areas within the permitted sites where depth/relief conditions were optimal for placement of the new materials.

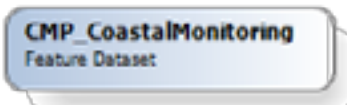
- Oyster Reef Restoration



- Nearshore and Offshore Reef Habitat Creation



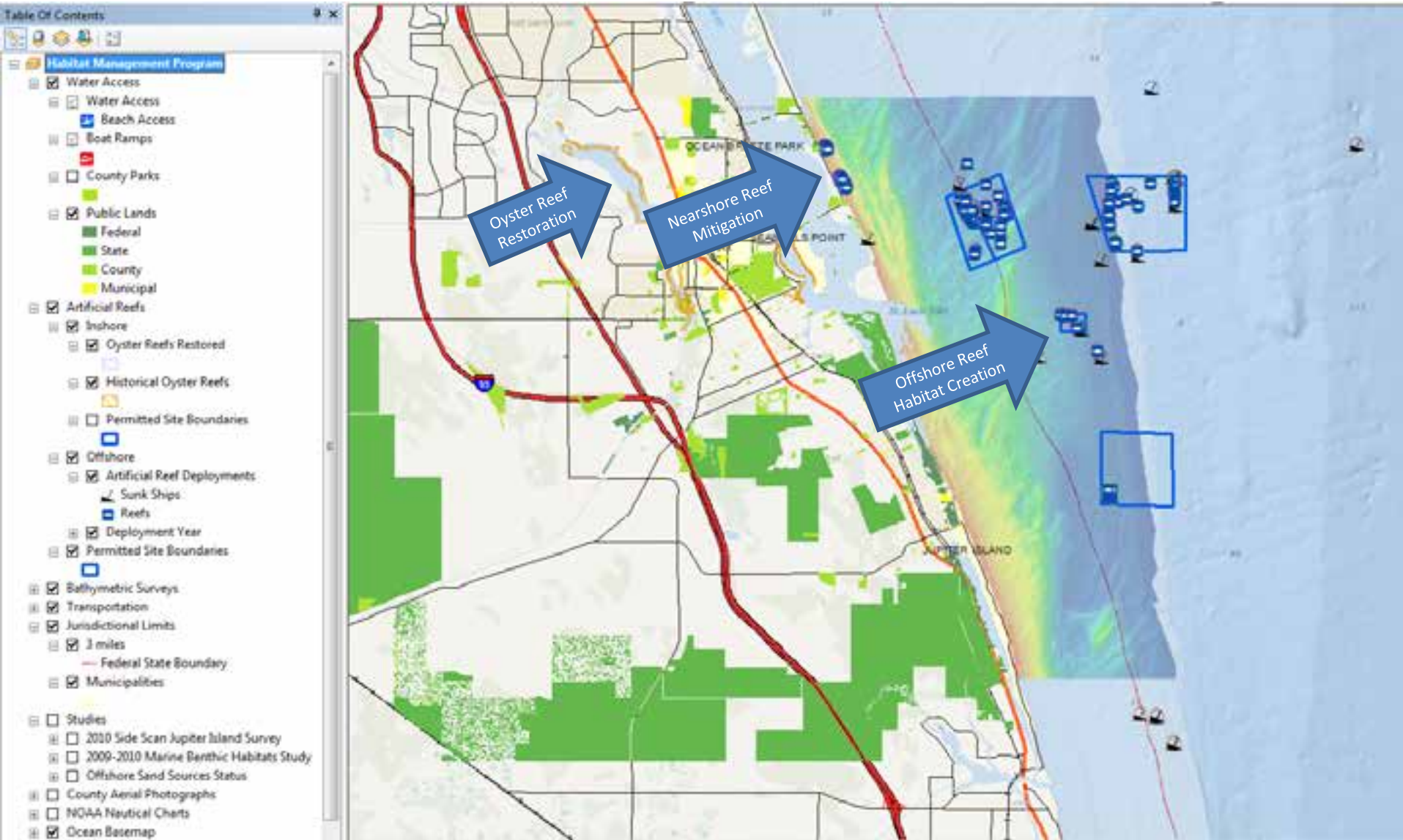
- County Wide Monitoring



- Studies by Others



Habitat Management Program



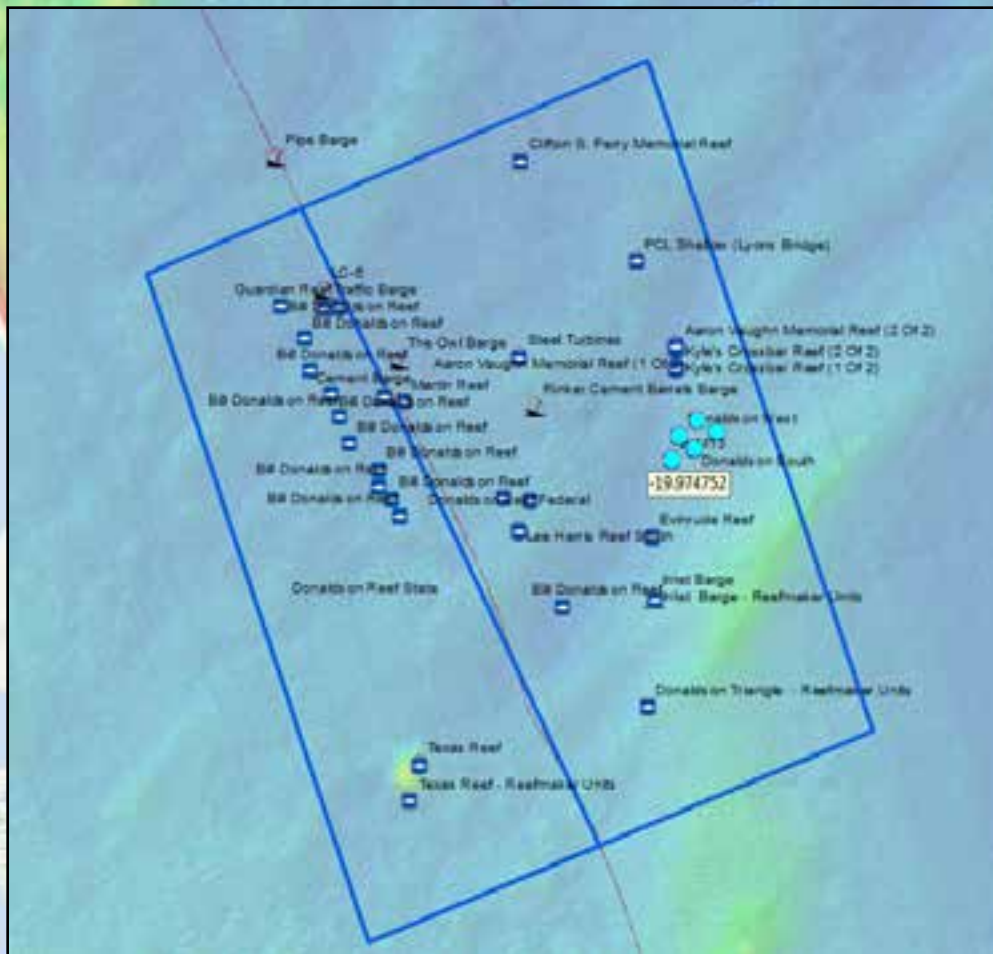
St. Lucie Estuary Oyster Reef Restoration



- Artificial Reefs
- Inshore
- Oyster Reefs Restored
- Permitted Site Boundaries
- Historical Oyster Reefs

Offshore Artificial Reefs

Habitat Creation



- Artificial Reefs
- Offshore
- Artificial Reef Deployments
- Sunk Ships
- Reefs
- Deployment Year
- Permitted Site Boundaries

Case Studies

Beach Renourishment

Hutchinson Island Shore Protection Project

Desktop Application

Beach Restoration Program



Beach Restoration Information

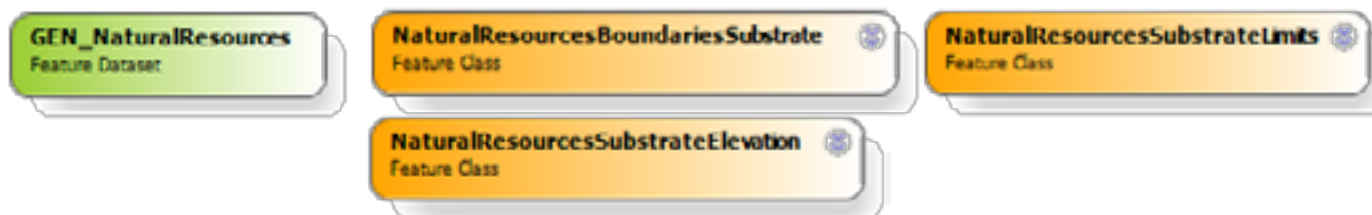
- Regulatory Data



- Permitting Data

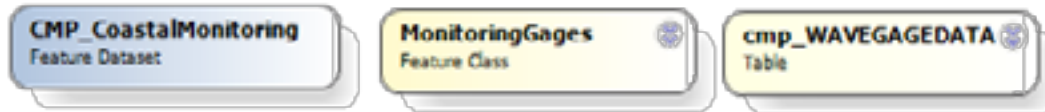


- Habitat and Natural Resources



Beach Restoration Monitoring

- Gages

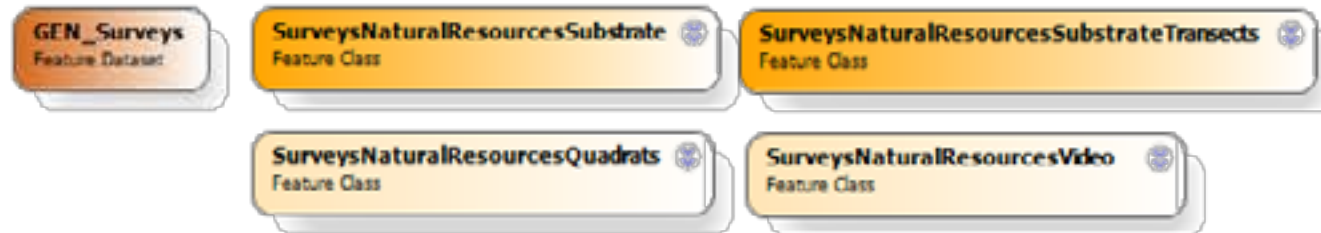


- Construction



- Pre and Post Construction

- Natural Resources



- Topography and Bathymetry Monitoring



Hutchinson Island SPP



Case Studies

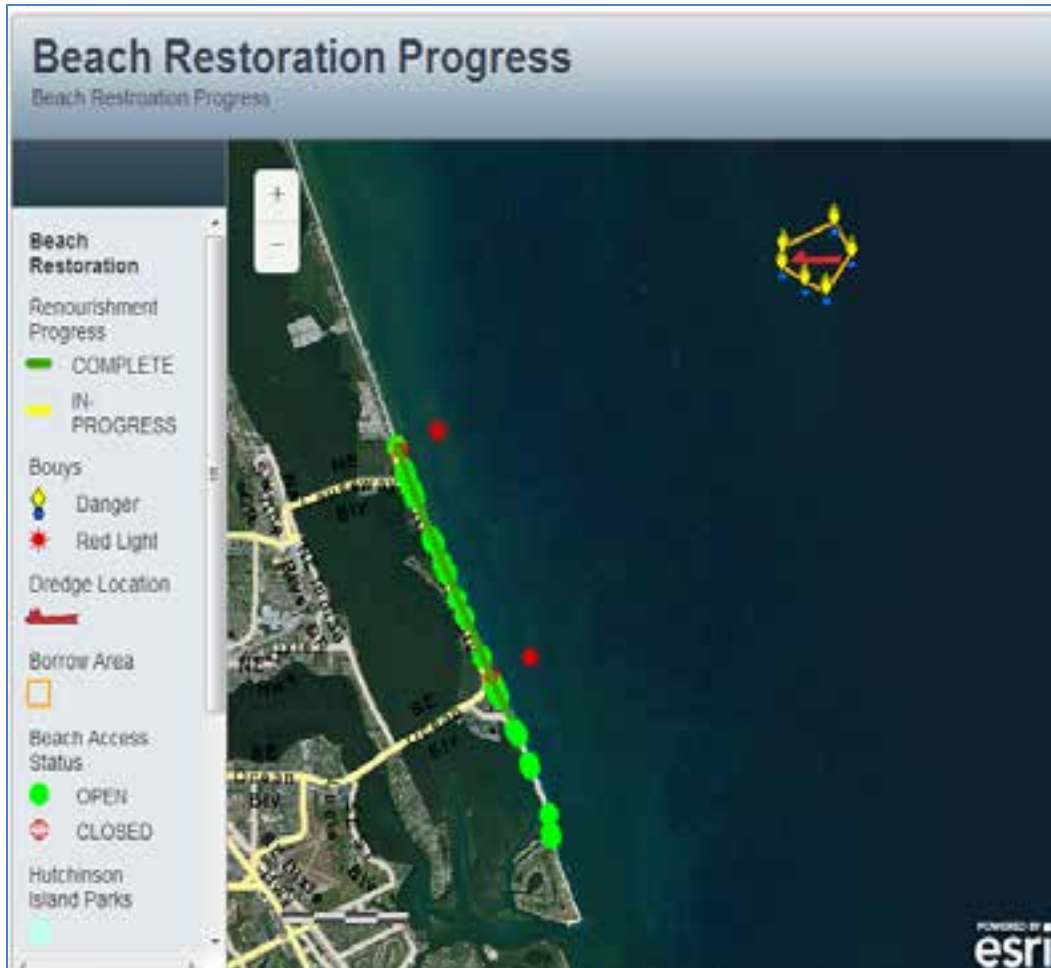
Beach Renourishment

Hutchinson Island Shore Protection Project

Public Information Application

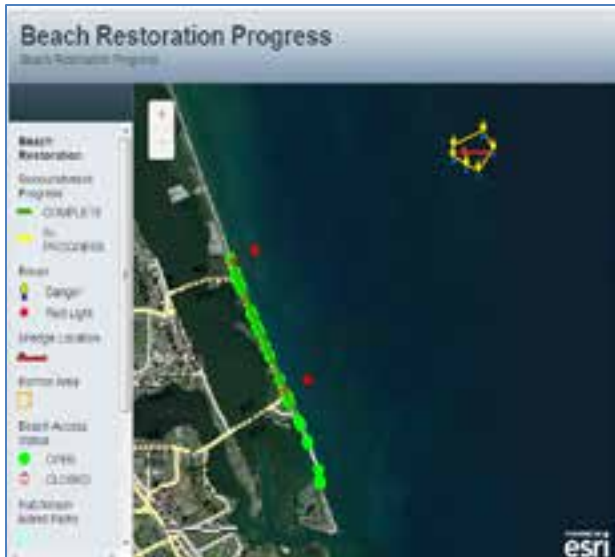
ArcGIS Online

Public Information



- Location of equipment
- Progress of the beach construction
- Infrastructure and beach access closures.

Public Information



Data stored in the geodatabase:

- Beach access points
- Permitted beach and borrow area dredge template
- Location of temporary navigation aids and markers
- Pipeline corridors

Data from the project's construction daily progress monitoring

- Sand placement progress along the shore
- Beach access and infrastructure closures
- County built an ArcGIS Online map application and added it to the project website.



Hutchinson Island Shoreline Protection

Project Update

The beaches sustained considerable damage from the passage of Hurricane Sandy in October 2012. Martin County has requested supplemental federal funding to recover from the excess erosion caused by this storm. If awarded, this funding could place additional sand on the beach at no cost to County residents. The US Army Corps of Engineers awarded a contract for the construction of the Hutchinson Island Shore Protection Project to Great Lakes Dredge and Dock on December 17, 2012. This project placed approximately 600,000 cubic yards of sand on the northern 3.75 miles of Martin County's coast from an offshore borrow site.

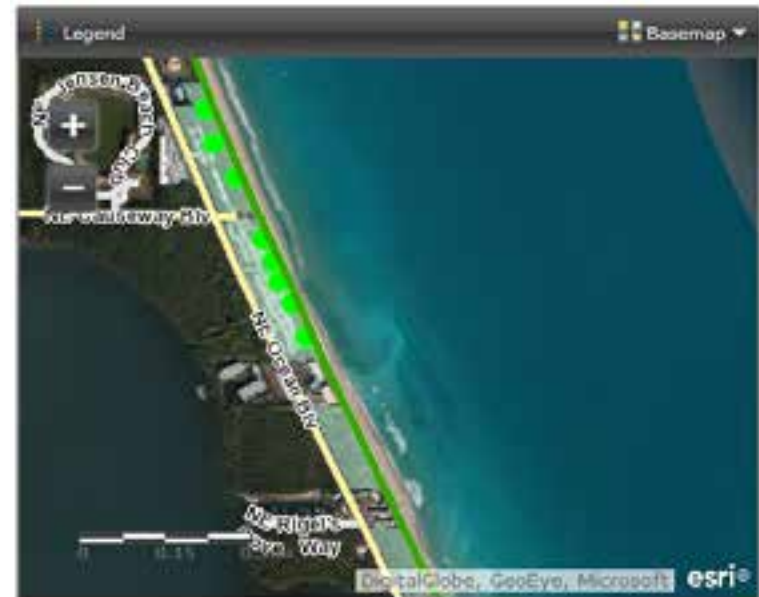
A new ecosystem based design template will be compared with traditionally constructed sections in this project. ([Click Here for Information](#)) The project will be divided into approximately 1/2 mile sections where construction will alternate between traditional and the new design. In-depth analysis has been funded by a grant from the National Fish and Wildlife Foundation and will determine benefits to nesting sea turtles, shore birds and other beach inhabitants. Work completed toward this goal includes geotechnical studies to ensure the suitability of the sand, biological studies to better understand the ecological role of the offshore borrow site and bathymetric and archaeological surveys have been finalized. This project will be completed by June, 2014.

In March, 2013, construction began starting at the North end of the project and was completed on April 30, 2013. The Army Corps of Engineers issued the Notification of Completion of June 27th 2013. ([Click here for a copy](#))



[Click here for a full page map.](#)

- Application was ready before the project started and public (press release)
- Emails and web traffic information indicated the application was used during beach construction



Case Studies

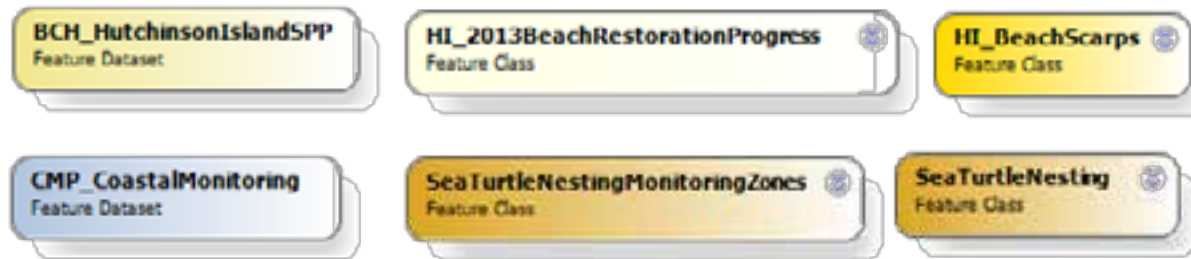
Beach Renourishment

Hutchinson Island Shore Protection Project

Marine Turtle Nesting

Marine Turtle Nesting

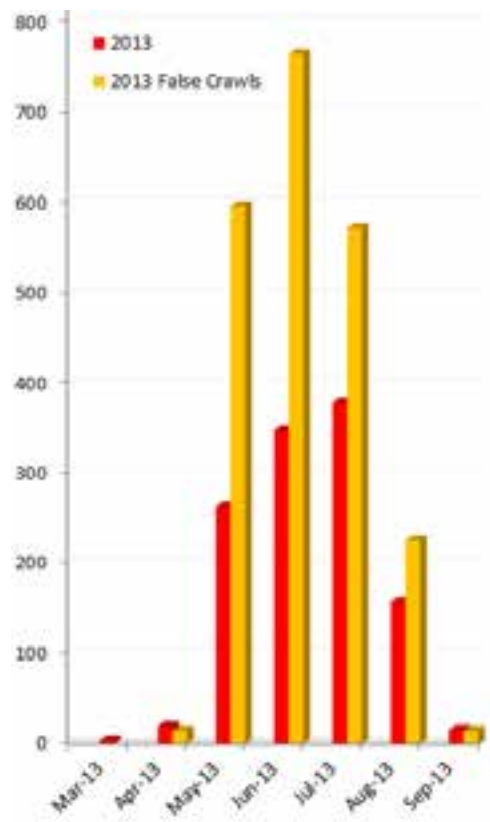
- Marine Turtle Nesting



- 📌 As the placement of sand on the beach progressed and sea turtle nesting activity was recorded the data was added to the geodatabase.
- 📌 Following the completion of the project a time enabled desktop map application provided a quick way to review the effects of the project in the sea turtle nesting activity on the beach.
- 📌 As post construction monitoring continues the data is being added to the geodatabase and analyzed on a regular basis more maps and applications will be built to help the County manage, analyze and share project information.

Time: 3/19/2013 12:00:00 AM

- Hutchinson Island Beach Renourishment
- 2013 Beach Renourishment
- 2013 Turtle Nests
- Nests
- Monitoring
- Beach Scarps
- Renourishment Progress
- Beach Access
- Beach Template



Current Status

- County has a approximately 20 years of its coastal data in GIS (70%)
- County has a framework for each type of projects, so currently new data is uploaded twice a year as it becomes available
- Management of information and planning of new projects for each program
- Request of information

Future Plans

- Data organized for beginner level GIS users
- Data Analysis platform for its programs
- Continue to enter historical and current data
- Enterprise / SDE
- Web – Arc GIS online or server

Thank you



CMar Consulting, LLC
Environmental & GIS Services

alexandra@cmarconsulting.com



kfitzpat@martin.fl.us