

Role of GIS in Studying the Interactions Between Sea Turtles and Hopper Dredging

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Objectives

- ❖ What is the relationship between sea turtles and dredging in the Chesapeake Bay?
- ❖ Create a visual model using GIS that can be used by conservation scientists and engineers to protect sea turtles



Where We Have Been

- ❖ Problem: Documented adverse interactions between hopper dredges and sea turtles
 - ❖ Norfolk District requested Section 7 Consultation with National Marine Fisheries Service, and prepared a Biological Assessment for the impacted projects.



Where We Have Been

- ❖ A Biological Opinion and Incidental Take Statement by the NMFS were issued to the Norfolk District.
- ❖ The Norfolk District took steps to prevent sea turtle takes by dredging activities.
 - Drag head deflectors (TED), trawling, pump operation modifications, etc



Turtle Excluder Device



Information & Data Gathering *Reports*

- ❖ Sea Turtle Observer: Stationed on dredge to examine and document any biological material found on the intake screens.
- ❖ Relocation Trawler: Trawling
- ❖ Dredge: Silent Inspector
- ❖ Created web based sea turtle take database with data gathered



Intake Screens



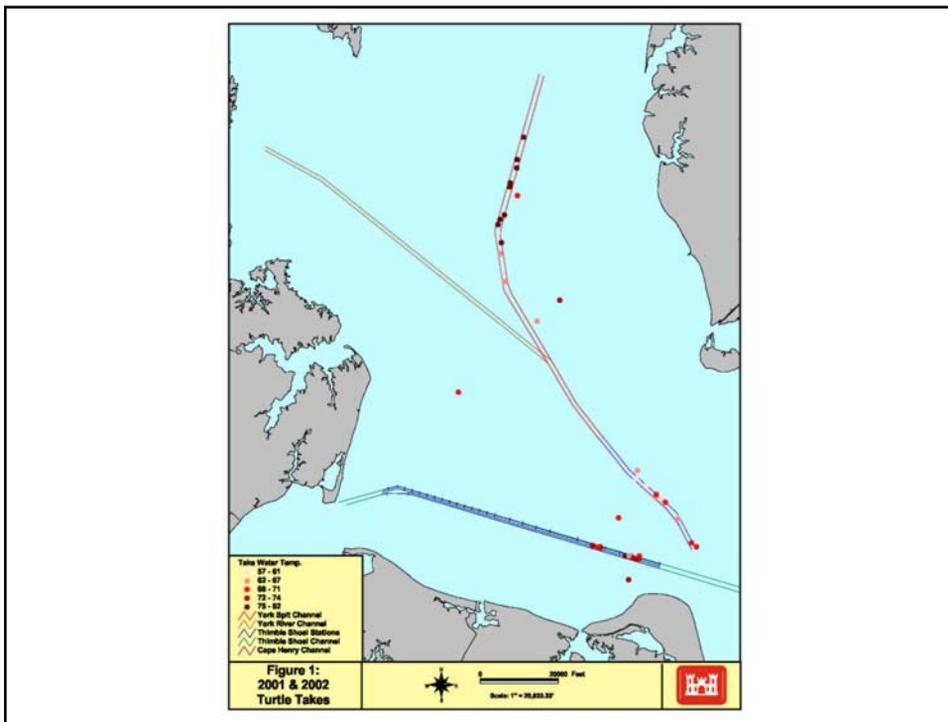
Turtle Take Database

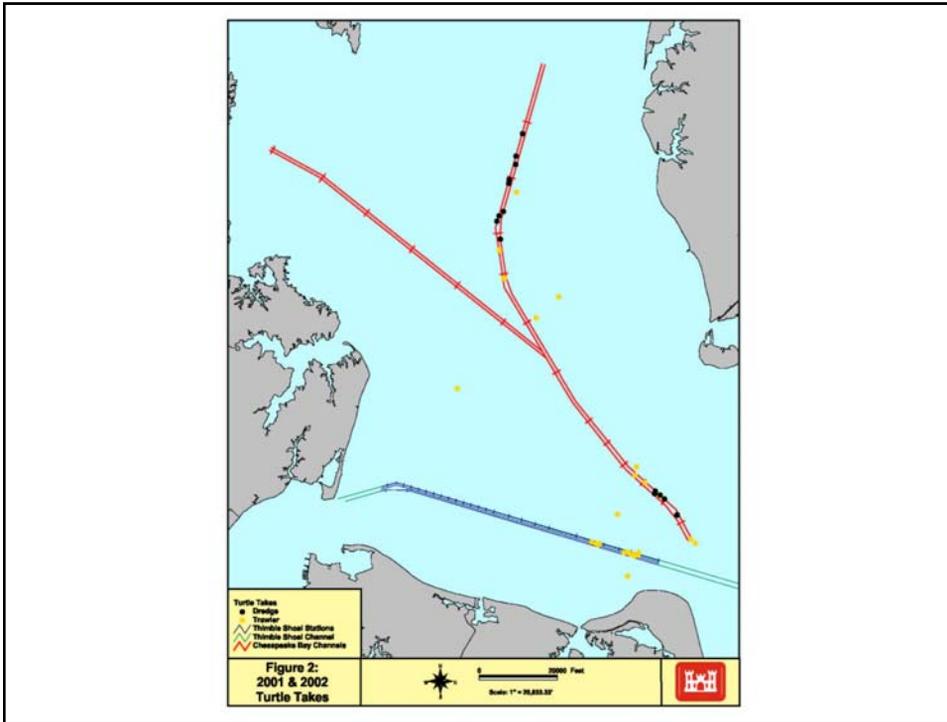
- ❖ Web based system that allows users to update without having knowledge in MS Access.
- ❖ Can be downloaded for use in a GIS or spreadsheet.
- ❖ Viewable as an online document in a spreadsheet format.
- ❖ Fields for coordinates, date, time, water & air temp., trawler or dredge, tide, etc.



Where We Are Now

- ❖ Maintaining and updating turtle take database as needed.
- ❖ 2D layouts portraying locations of turtle takes (both by dredge and trawler) in the Bay channels.
- ❖ Coordinating with VIMS to gather necessary information about sea turtle habits.





Ongoing Studies: *VIMS*

- ❖ Virginia Institute of Marine Science: Kate Mansfield, graduate student, studies sea turtle migrations and behaviors
 - ❖ Uses radio and satellite tracking devices
 - ❖ Surfacing behaviors, location in water column, and migration patterns recorded and analyzed



“Coral Kate”

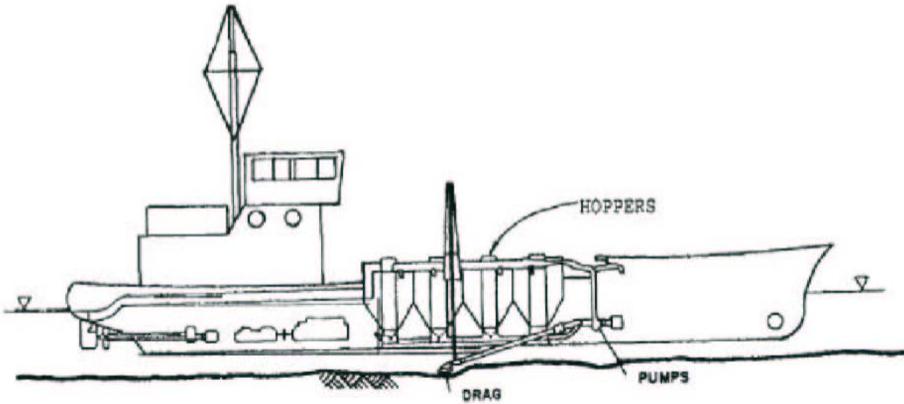


Hopper Dredging *Norfolk District*

- ❖ Acts as a vacuum on the bottom, sucking up sand and sediments
 - ❖ Draghead with turtle deflector on front that acts as plow
 - ❖ System of pumps designed to bring in sediments and water into a holding area on board the vessel
- ❖ Continually looking at new ways to prevent turtle takes through modification of hopper dredging operations.



Hopper Dredge



GIS Modeling *Cape Henry Channel*

- ❖ This channel marks the entrance to the Bay where sea turtles frequent during migration periods in fall and spring.
- ❖ Recently dredged in the Fall of 2002
- ❖ Threshold on sea turtle mortalities was reached, and relocation trawling was necessary



Methodology

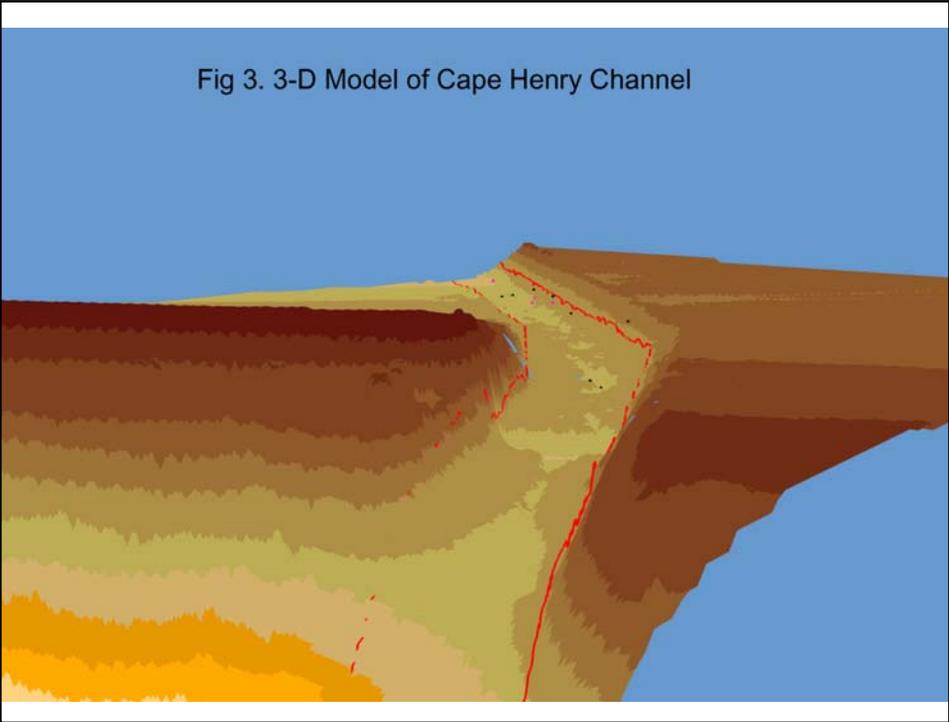
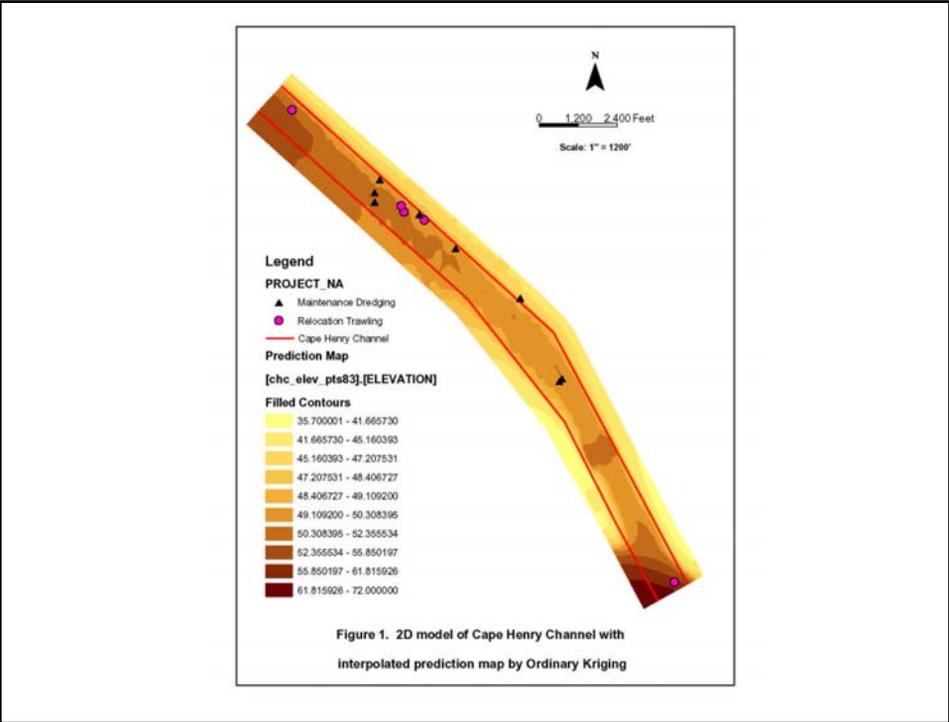
- ❖ Elevation data brought into GIS from CAD files of recent channel surveys
 - ❖ Soundings, in a text .dwg file, were converted to a point shapefile
- ❖ Converted new elevation shapefile to State Plane NAD83 to overlay turtle take and Cape Henry channel shapefiles
 - ❖ Used Define Projection tool in ArcToolbox



Methodology cont.

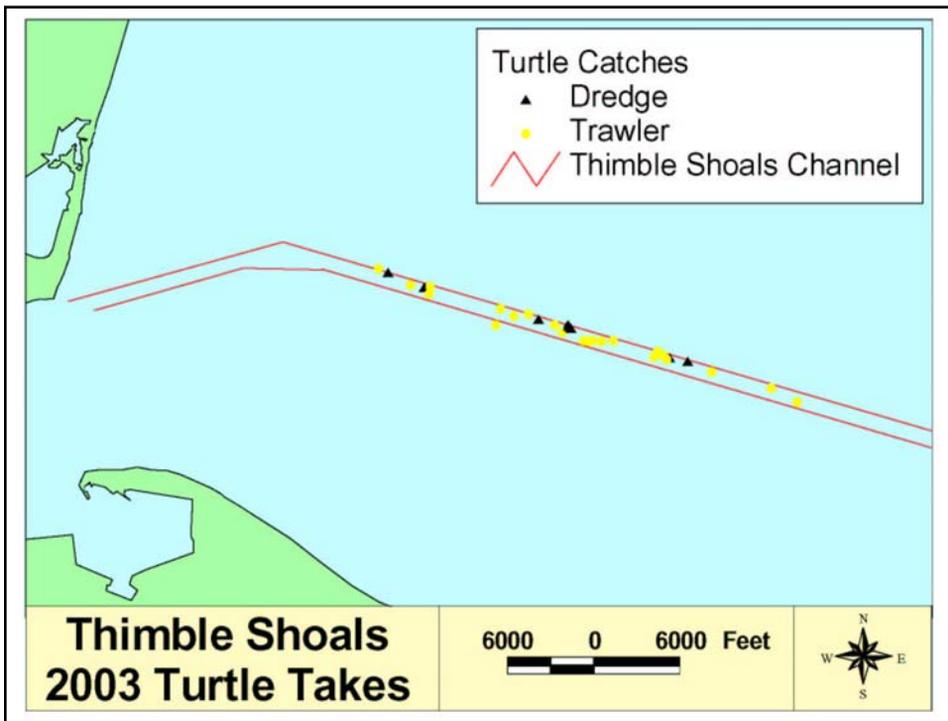
- ❖ Created Prediction maps to interpolate the surface of the channel
 - ❖ Performed Universal and Ordinary Kriging, and Inverse Distance Weighting
- ❖ Converted elevation features to a raster-based grid to create a 3D model of the channel
 - ❖ Created 3D model and recorded a fly-thru of channel in ArcScene





Where We Plan to Go

- ❖ Build on the 2D & 3D models in order to discover trends in:
 - ❖ Bathymetry and sea turtle habitats
 - ❖ Sea turtle food preferred habitats
- ❖ Continued monitoring of sea turtle behavior and dredging activities
- ❖ Model the Thimble Shoals Channel with 2003 dredge and trawler catches overlaid



Thanks! Any Questions?

