Coastal Inlets Research Program

US Army Corps of Engineers
Engineering Research and Development Center


Site of Moriches Inlet
Nov. 1951

Julie Dean Rosati
and
Nicholas C. Kraus,
CIRP Program Manager

Shinnecock Inlet
3 days after formation, Sep 1938


Moriches Inlet, NY


Shinnecock Inlet, NY

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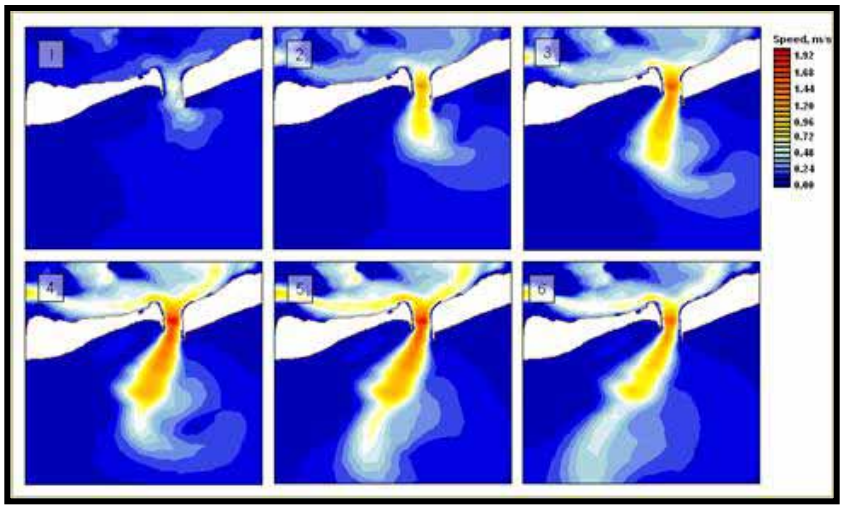
Objectives

- Develop desk-top tools and models
  - Inlets and adjacent beaches
  - Engineering actions, natural conditions, and storms.
- Reduce Operation and Maintenance (O&M) costs at inlets.
- Transfer knowledge, tools, and models to the public.

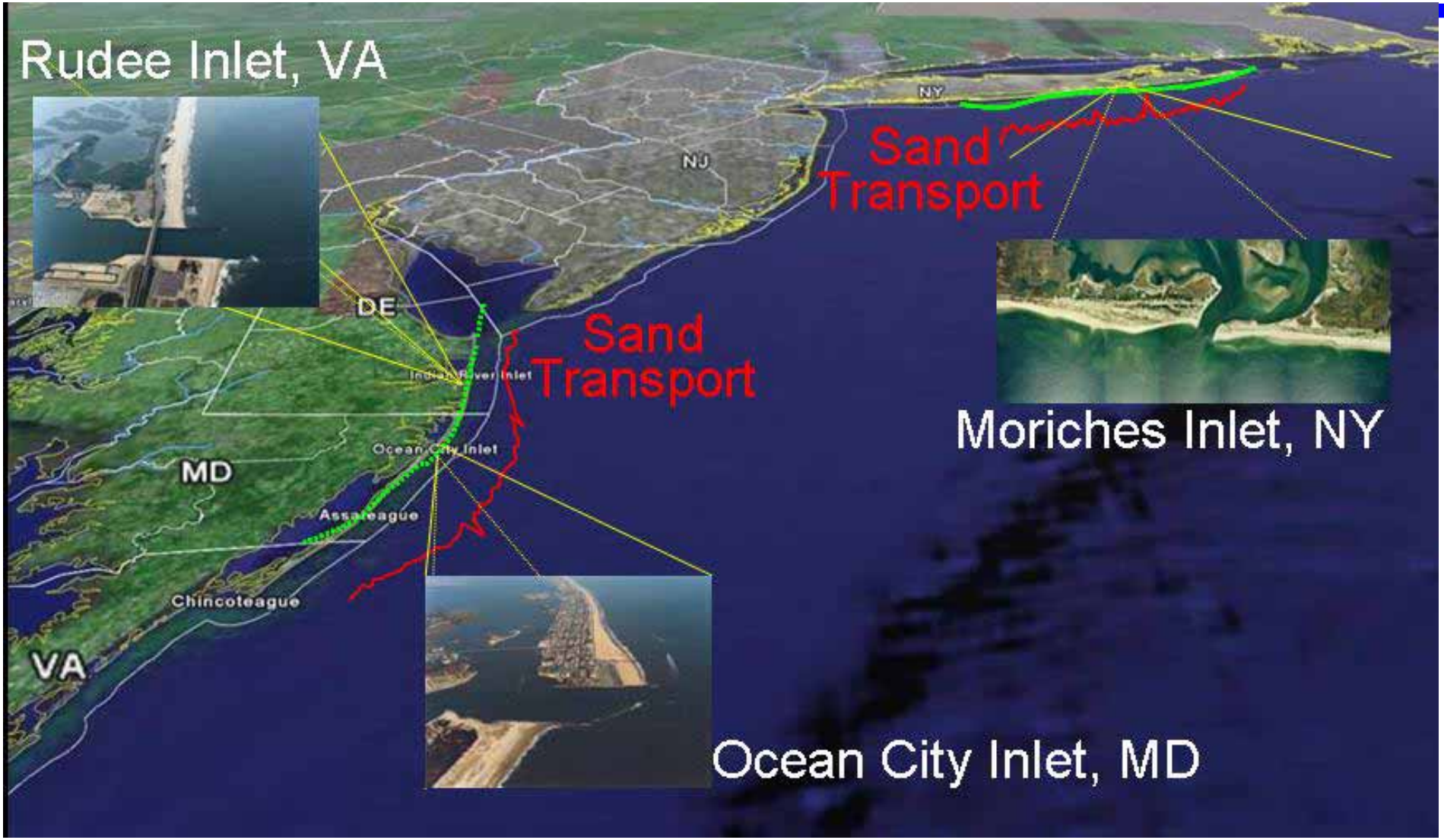


Ebb jet advection and channel migration, Shinnecock Inlet, NY

Cascade

Regional Coastal Response Model

System-wide Water Resources Program



Connection to Research Programs CIRP & SWWRP

Plovers need unvegetated sand →
need to predict new inlet formation (breaching) & overwash

Coastal Inlets Research Program
Inlet breaching models

System-wide Water Resources Program
Cascade integrates large-scale shoreline processes, including overwash & breaching

Coastal Inlets Research Program
Presentation Overview

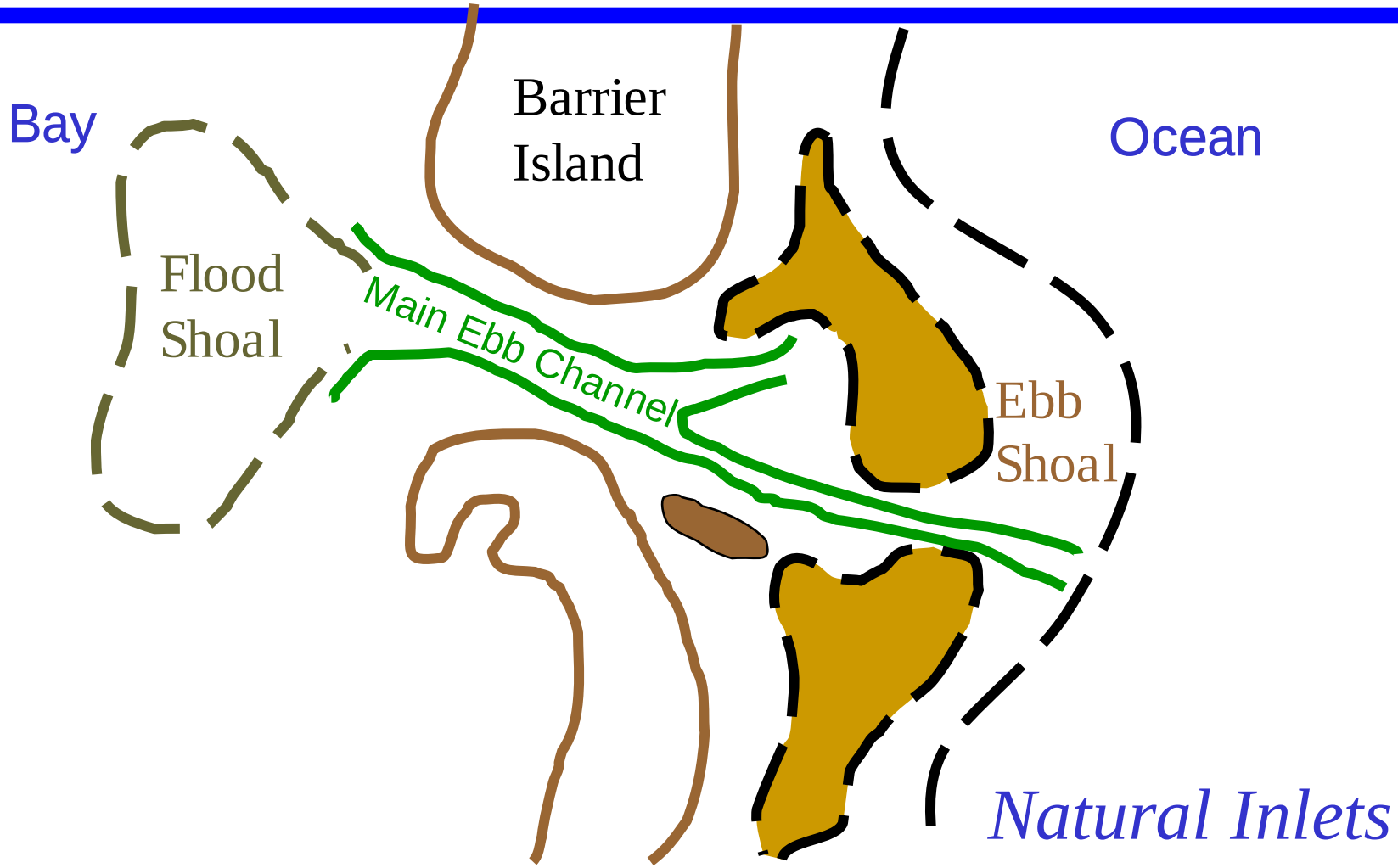
- Overview of inlet and adjacent beach systems
- CIRP tools and models
- SWWRP – Cascade and future plover population module
- Sources of downloads and more information

I. Inlets and Adjacent Beach Systems

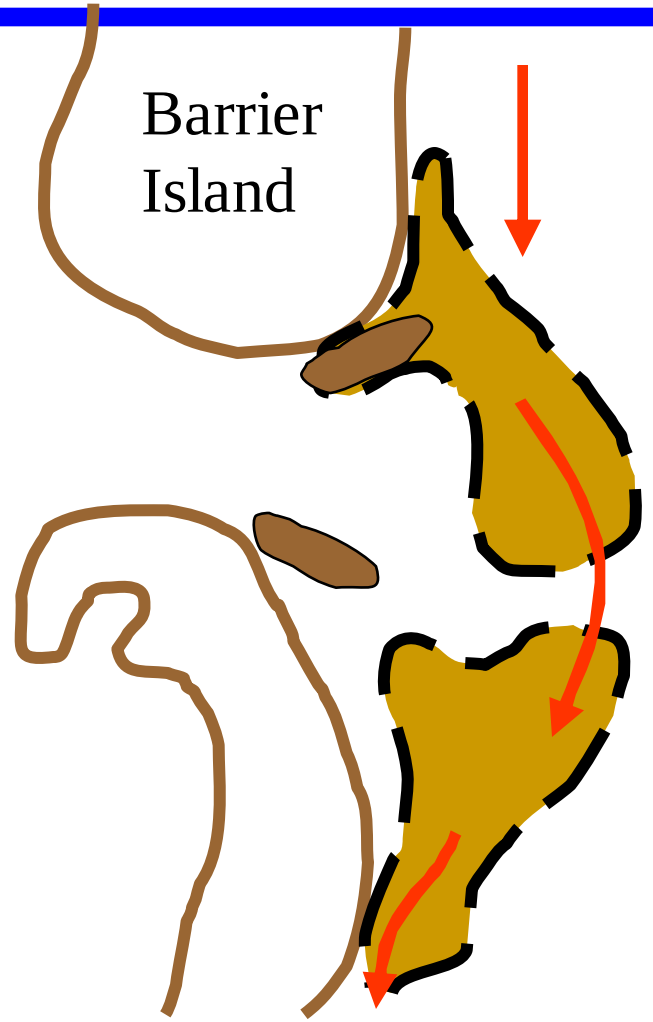
- *How do inlets function?*
- *How does sediment move around inlets?*
- *How do dredging and placement activities seek to replicate natural systems?*

Packery Channel, Corpus Christi, Texas, 7 Mar 05
A new inlet designed in part with CIRP technology

Inlets and Adjacent Beaches
Definitions



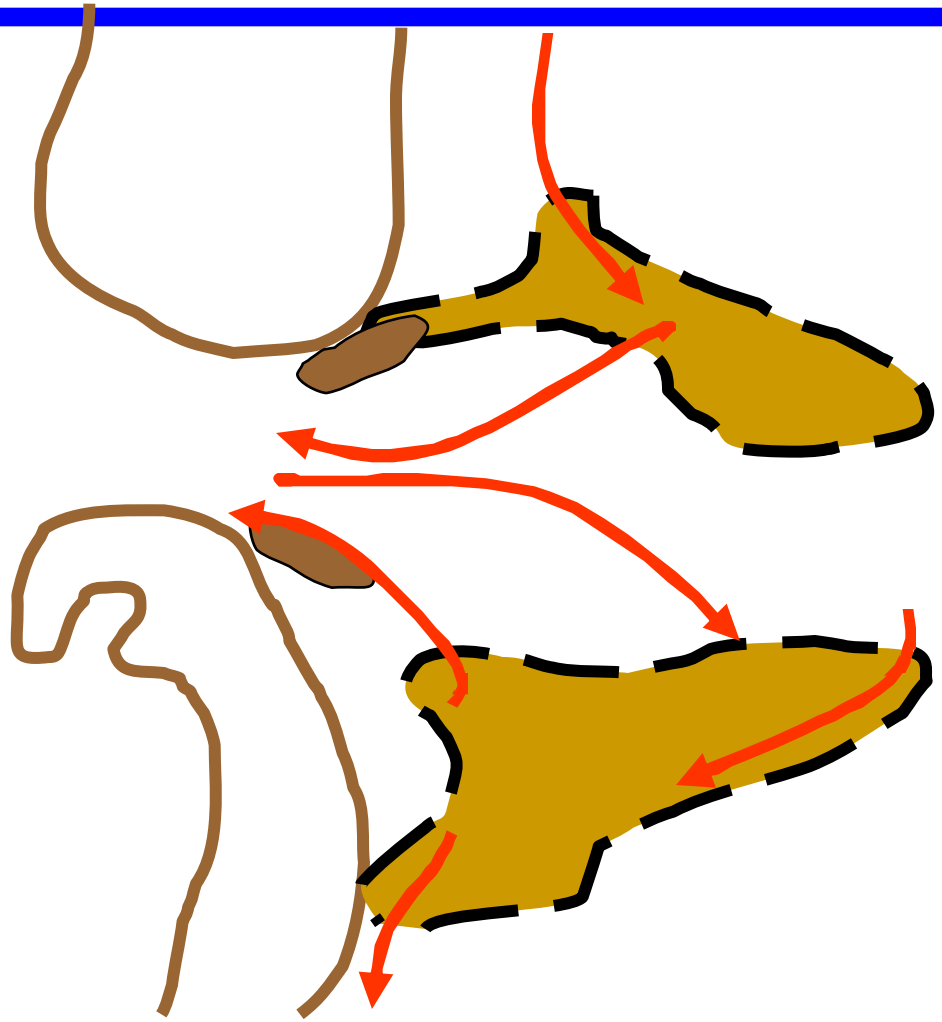
Inlets and Adjacent Beaches
Bypassing Sand (1 of 3)



1. Wave-Induced along Ebb Shoal

Natural Inlets

Inlets and Adjacent Beaches
Bypassing Sand *(2 of 3)*



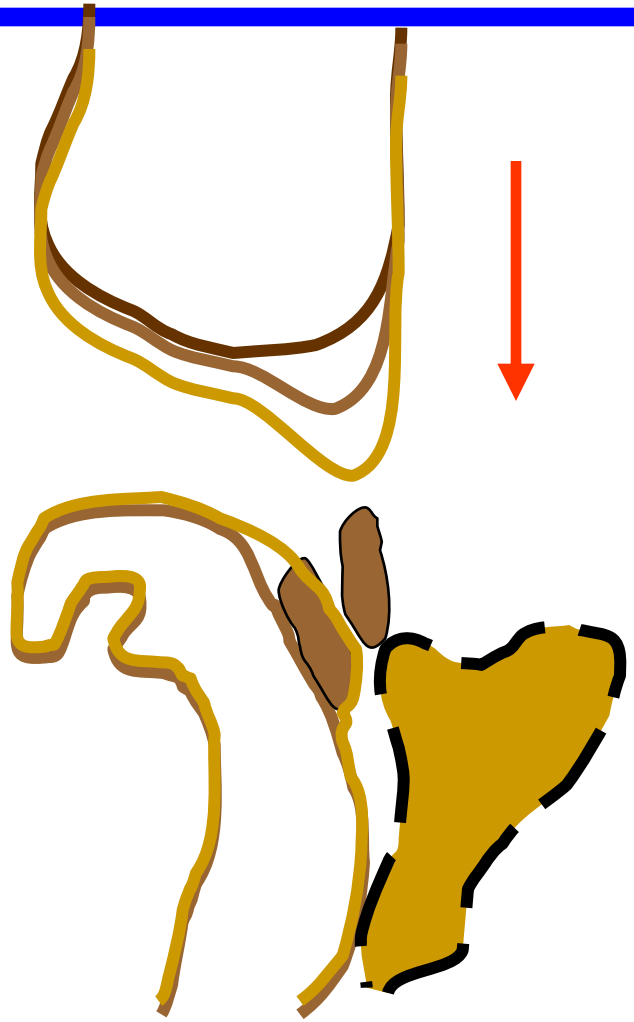
2. Transport into and out of inlet by tidal currents

Natural Inlets

Inlets and Adjacent Beaches
Bypassing Sand (3 of 3)

Bay

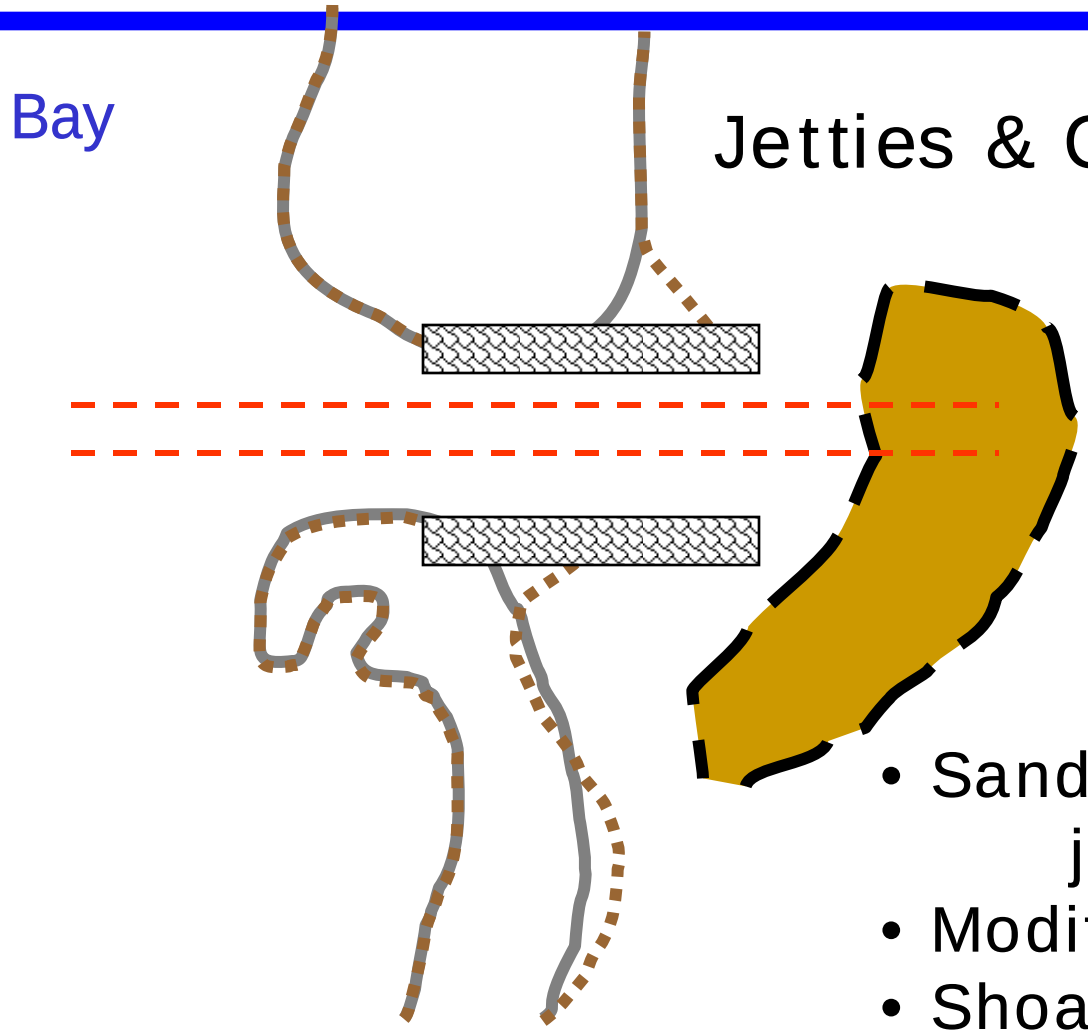
Ocean



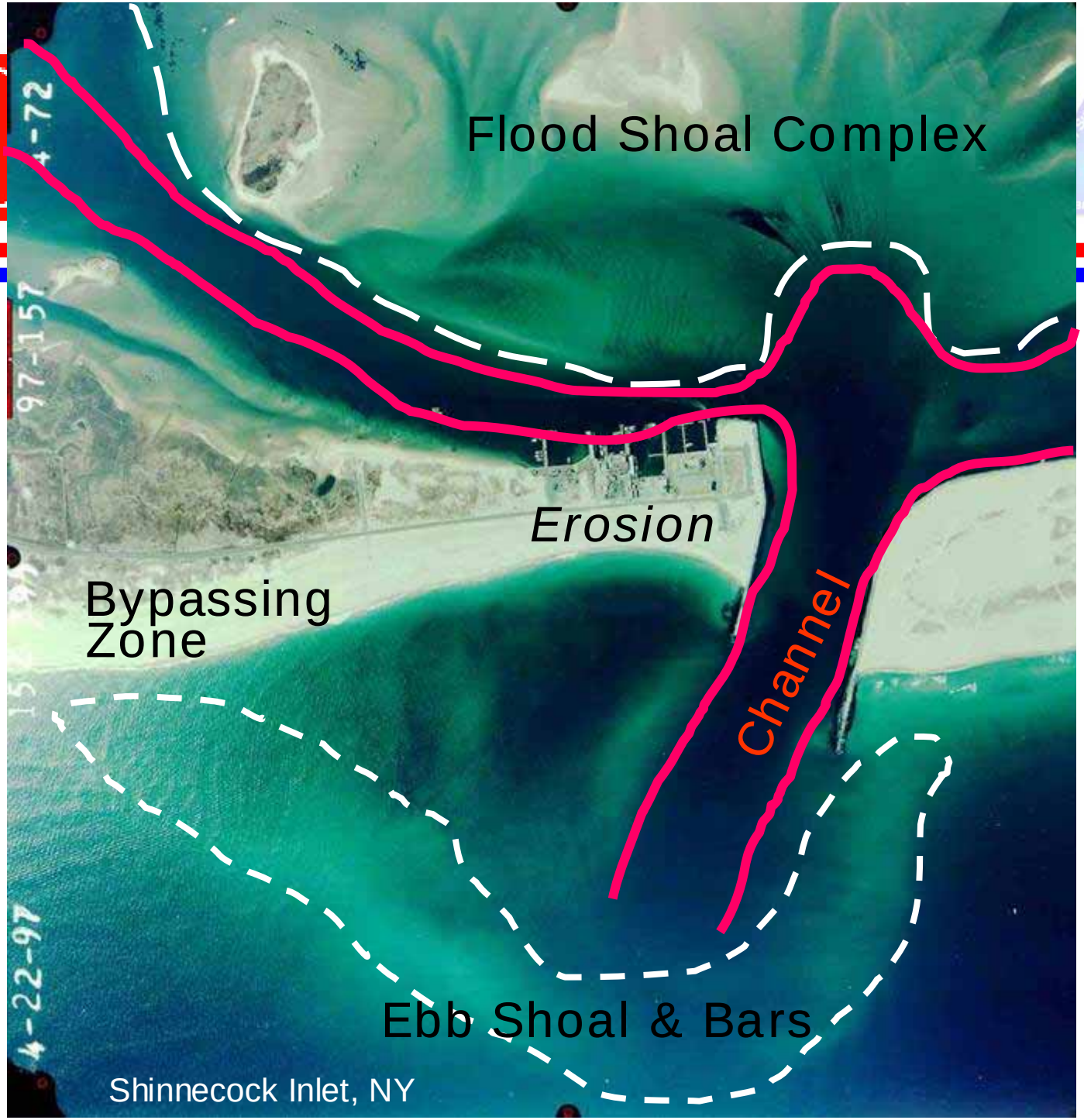
3. Migration of channels and bars

Natural Inlets

Inlets and Adjacent Beaches
Inlet Stabilization



- Sand impoundment at jetties
- Modified bypassing
- Shoaling in channel


Flood Shoal Complex
Erosion
Bypassing
Zone
Channel
Ebb Shoal & Bars
Shinnecock Inlet, NY
4-22-97
97-157
4-72

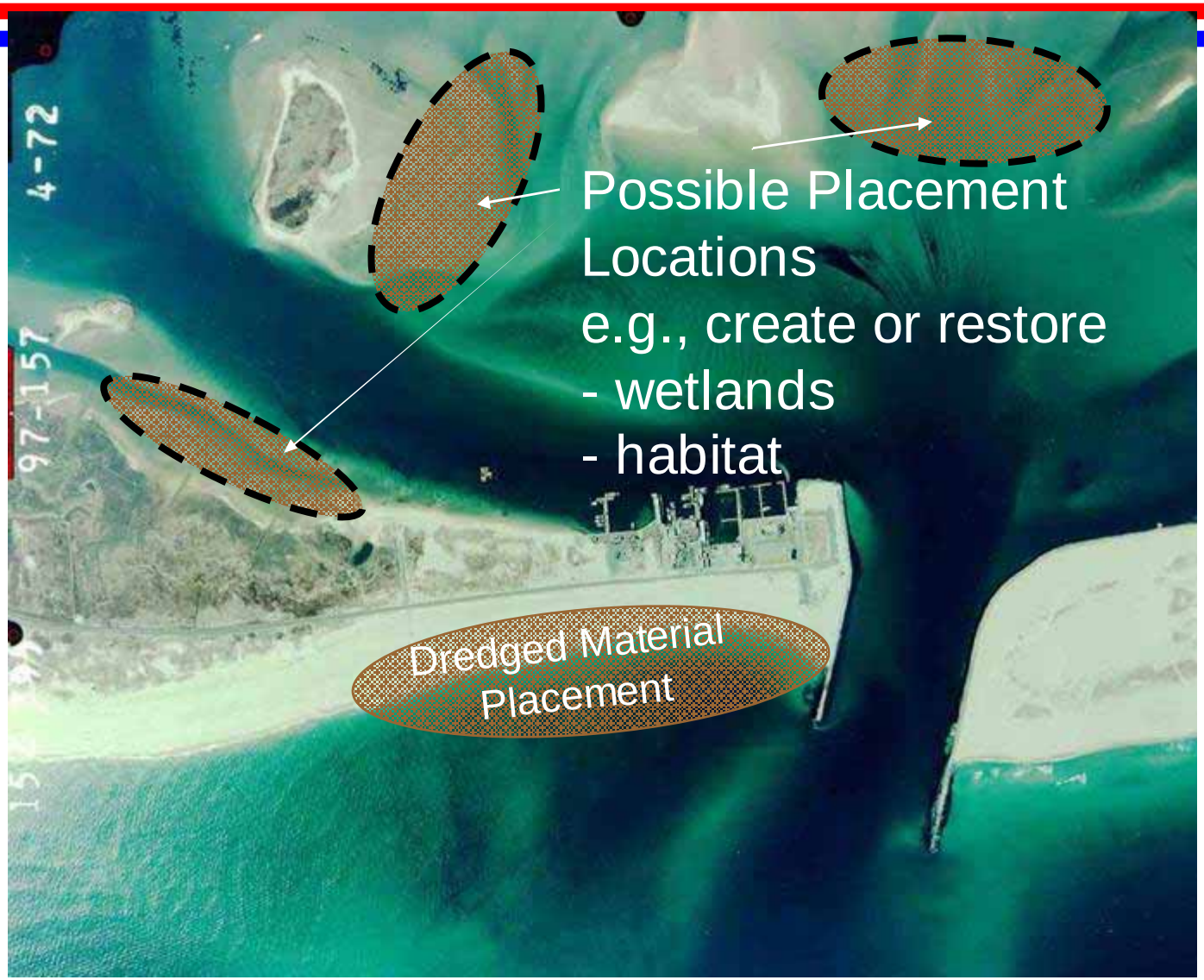

4-72
97-157
4-22-97

Inlet Navigation Channel Operation and Maintenance (O&M)

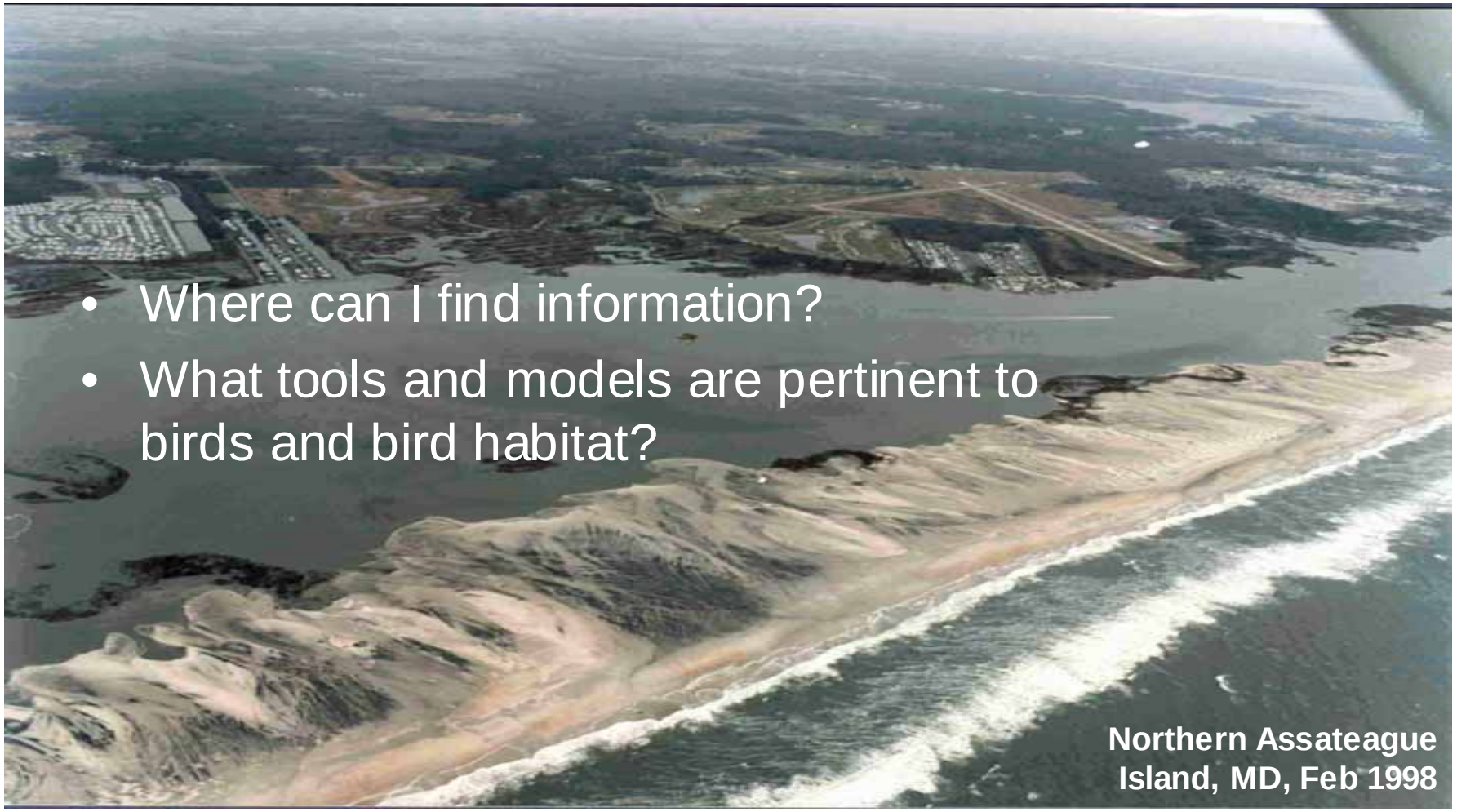
The Corps moves
250-350 Million cu yd of sediment annually

Costing > $700 Million per year

Inlets and Adjacent Beaches
Dredging and Placement for Beneficial Use



II. CIRP Tools and Models



- Where can I find information?
- What tools and models are pertinent to birds and bird habitat?

CIRP Tools and Models
All available via CIRP Website

http://cirp.wes.army.mil/cirp/cirp.html

- Inlets Online
- Inlets Database
- Download Tools & Reports
- Workshop Presentations

Inlets Online

Inlets Online

Illustrating Inlet & Beach Processes

- Inlet and Beach Processes
- Inlet and Beach Morphology
- Engineering Activities

Tutorial

Illustrate processes

History

Inlets Online
Glossary of Terms

Please click on the letters to view the index:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

You can also perform a full content search by keywords. Separate multiple words by spaces:

Any of the words All words Search

Gabion
Gale
Generating Area
Geographical Information System (GIS)
Geometric Grade Scale
Geometric Mean
Geometric Mean Diameter
Geometric Shadow
Geomorphology
Geophysics
Geotextile
Glacier
Glacio-Eustasy
Glacio-Isostacy
Global Positioning System (GPS)
Gorge
Gradation
Graded
Graded Bedding
Graded Shoreline
Grade Scale
Gradient
Grading
Gravel
Gravity Wave
Groin
Groin Bay
Groin System
Gulf
Gulf Coast Low Water Datum
Gut

GRADIENT (gra'-di-ent)

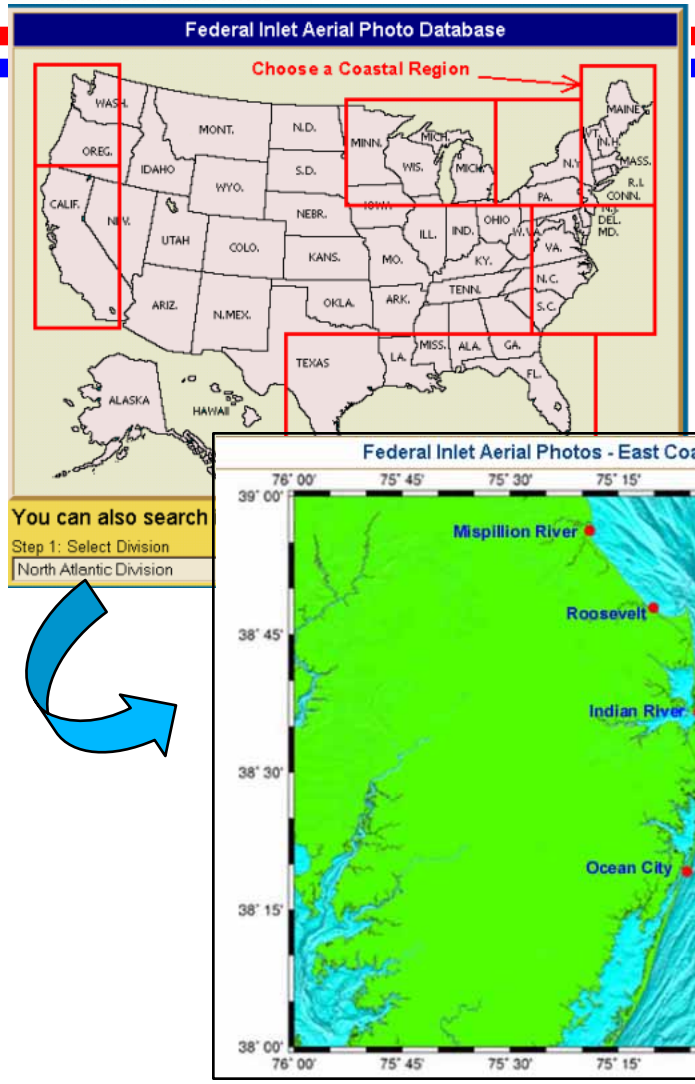
(1) A degree of inclination, or a rate of ascent or descent, of an inclined part of the Earth's surface with respect to the horizontal; the steepness of a slope. It is expressed as a ratio (vertical to horizontal), a fraction (such as m/km or ft/mi), a percentage (of horizontal distance), or an angle (in degrees). The synonymous term grade is used in engineering. (2) More general, a change of a value per unit of distance (e.g., the gradient in longshore transport causes erosion or accretion). (3) With reference to winds or currents, the rate of increase or decrease in speed, usually in the vertical; or the curve that represents this rate.

PDF files for printing and downloading:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

INTERNET

Inlets Online
Download photographs



Ocean City Inlet, Maryland

Topographic Site Map | Construction and Rehabilitation History
Corps Project Report | Link to Baltimore District Web Site

Date yyyy-mm-dd	Image	High Resolution Download	Details
1933-09-18	View Image	zip file (1.2 MB)	Details
1933-10-00	View Image	zip file (0.8 MB)	Details
1934-10-09	View Image	zip file (0.6 MB)	Details
1935-11-05	View Image	zip file (1.7 MB)	Details
1935-12-06	View Image	zip file (0.6 MB)	Details

Technical Notes…
Aerial photograph interpretation

Aerial photo interpretation: vegetation line and dune line

Features Off

Primary Dune/ Vegetation Line

Foredune Line

The primary dune (stable dune) line/vegetation line and foredune line are identified on the above aerial photograph. Recognizing these features is helpful for analyzing beach mobility, long-term storm impacts, and the sediment budget. Well vegetated dune areas indicate stable dune systems. Some areas, such as the west side of the jetty in the image, are unvegetated. The dune line in these areas is nonexistent due to the dynamic nature of the beach and established infrastructure.

placement
channel centerline
wave-current interaction
vegetation line
dune line
spit
bluff line
washover deposition and
Back to Feature List

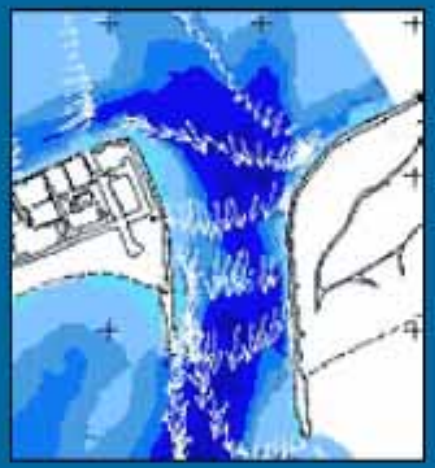
Inlets Online
Analytical Toolbox

Analytical Toolbox

- HyPAS
- SBAS
- Flow Constriction Jet
  - Flow Net Calculator
- Nozzle-Type Constriction Jet
  - Flow Net Calculator
- Inlet Channel Equilibrium Scour Depth Calculator
- Tide Prediction Web Server (XTide)
- Corpscon

Tools useful for coastal analysis

Please Choose a Tool on the Left

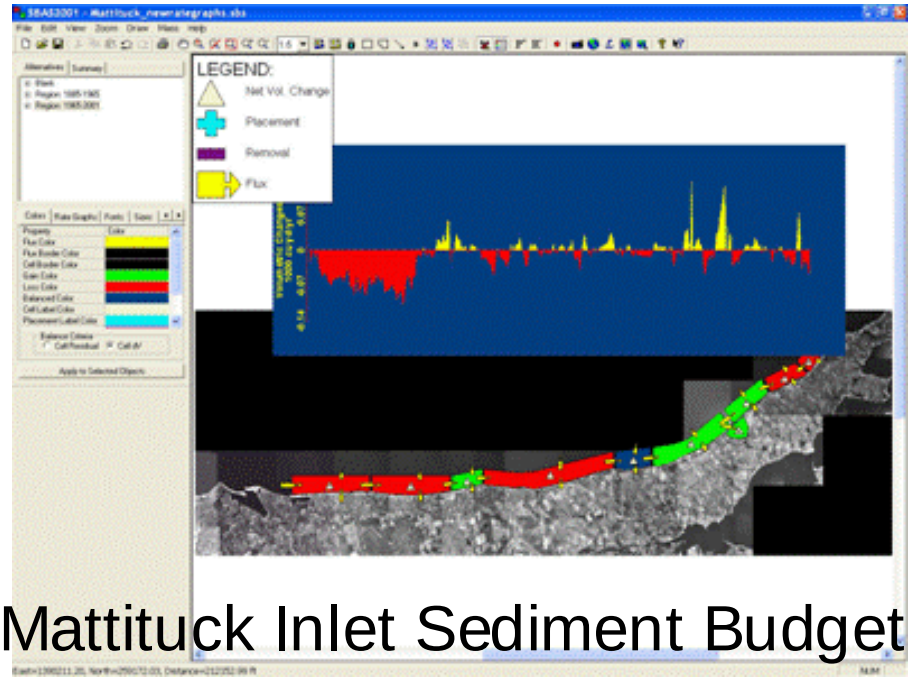


SBAS and SBAS-A
Sediment Budget Analysis System

A sediment budget is a tally of sediment gains and losses, within a specified area over time.

Stand-alone Windows version and Arc 8.x/9.x compatible extension

ArcMap



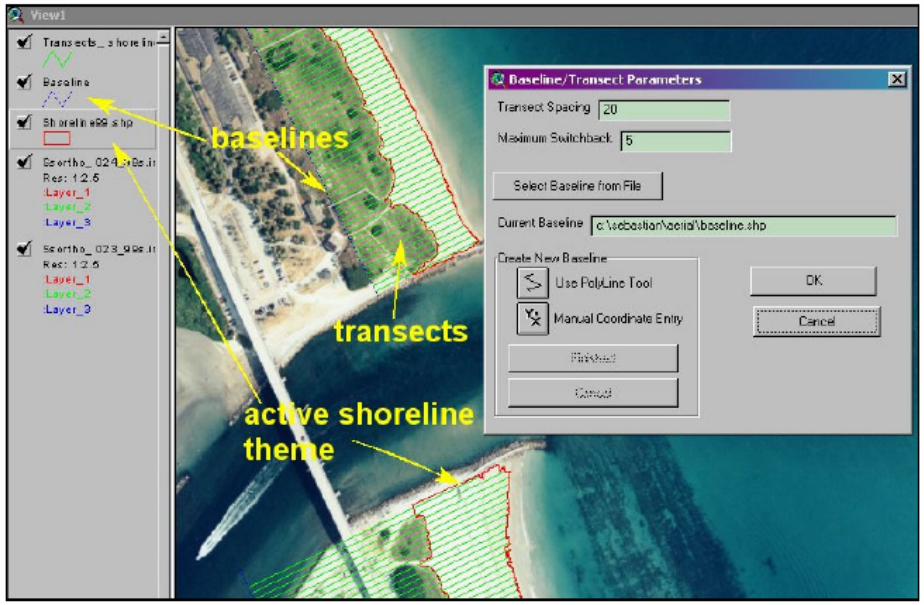
Mattituck Inlet Sediment Budget

BeachTools

ArcView 3.2© Extension (upgrade in the works)

BeachTools: **Identify position of shorelines and other coastal features from aerial imagery**

- **mosaic imagery**
- **image histogram stretching**
- **delineation of coastal features**
- **baseline and transect generation tools**

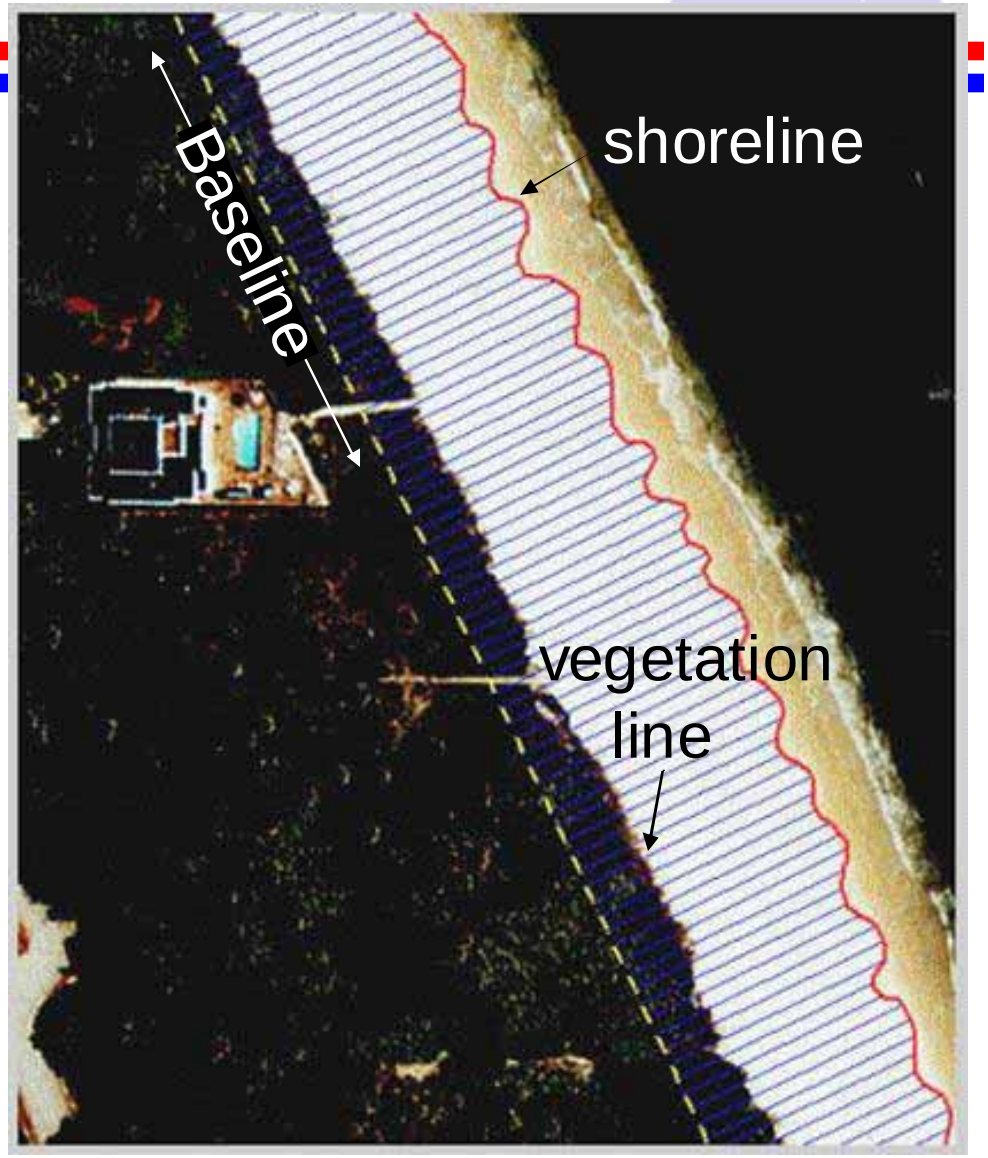


BeachTools
ArcView Extension

User selects pixels that represent shoreline and vegetation line

BeachTools automatically generates continuous shoreline and vegetation line

Can generate transects and distances from a baseline

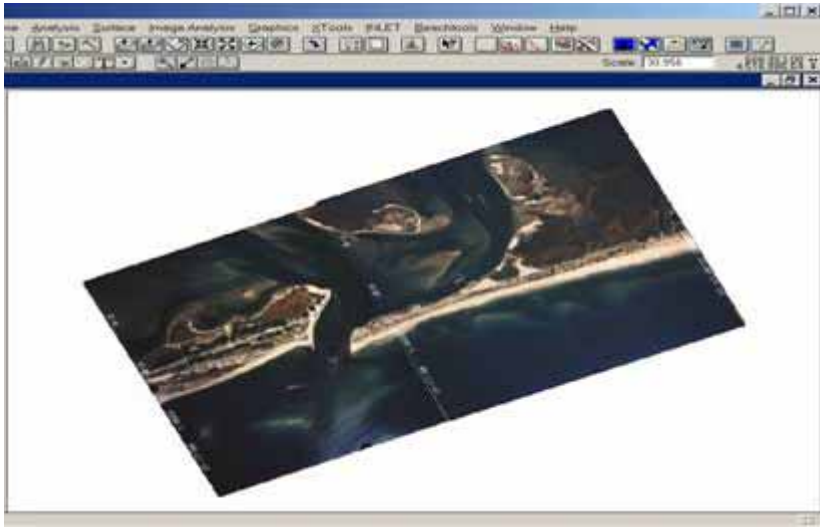


INLET-GIS

Inlet, Nearshore, and Littoral Enhancement Tool for Geographic Information Systems

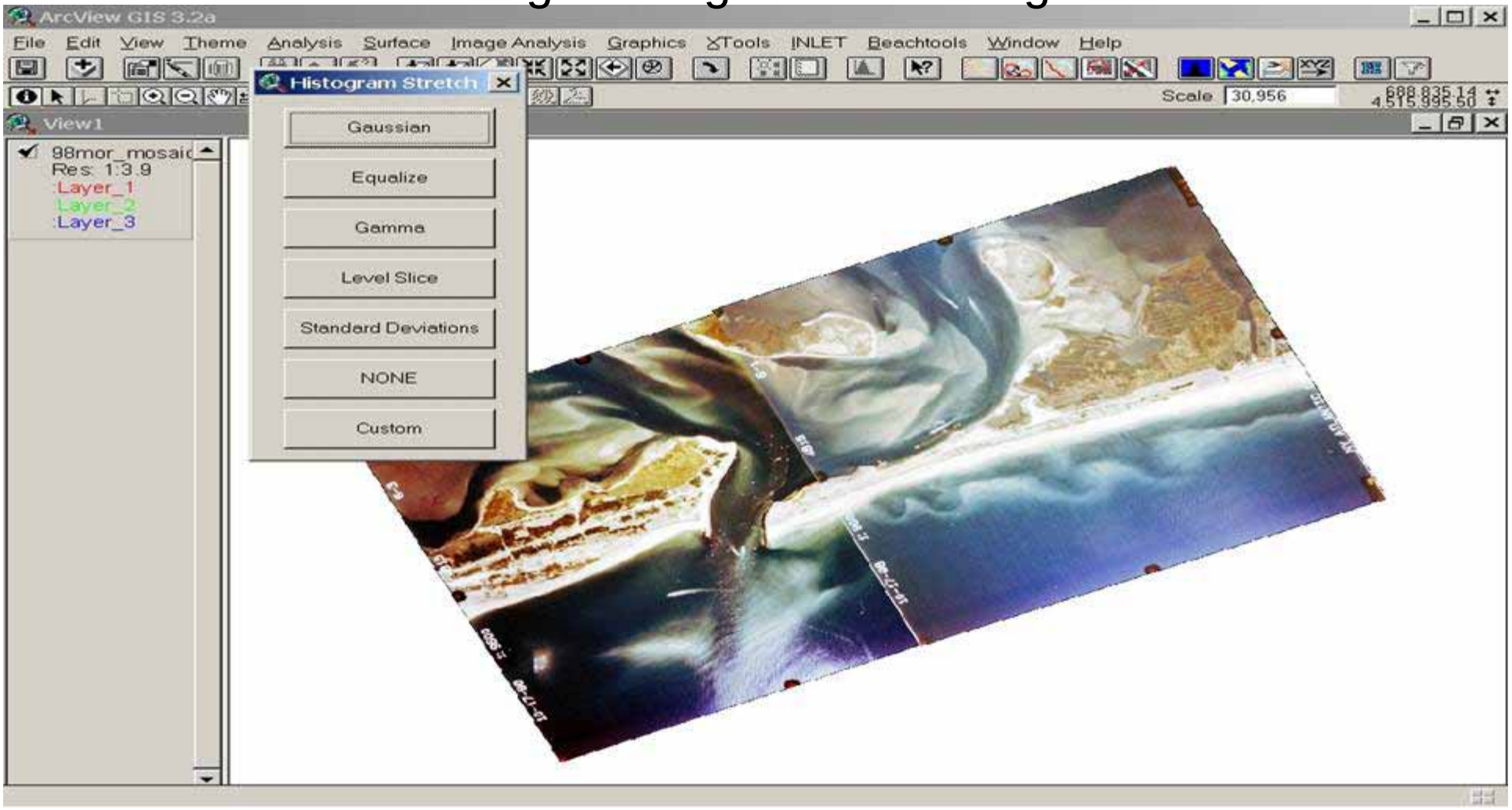
- ArcView© 3.x extension (upgrade underway)
- Thematically classifies digital aerial photography
- Identify inlet shoals, channels, and other features
- Import bathymetry and merge with aerial analysis

- stretch image histograms
- classify themes
- clip shorelines
- import bathymetric and topographic data



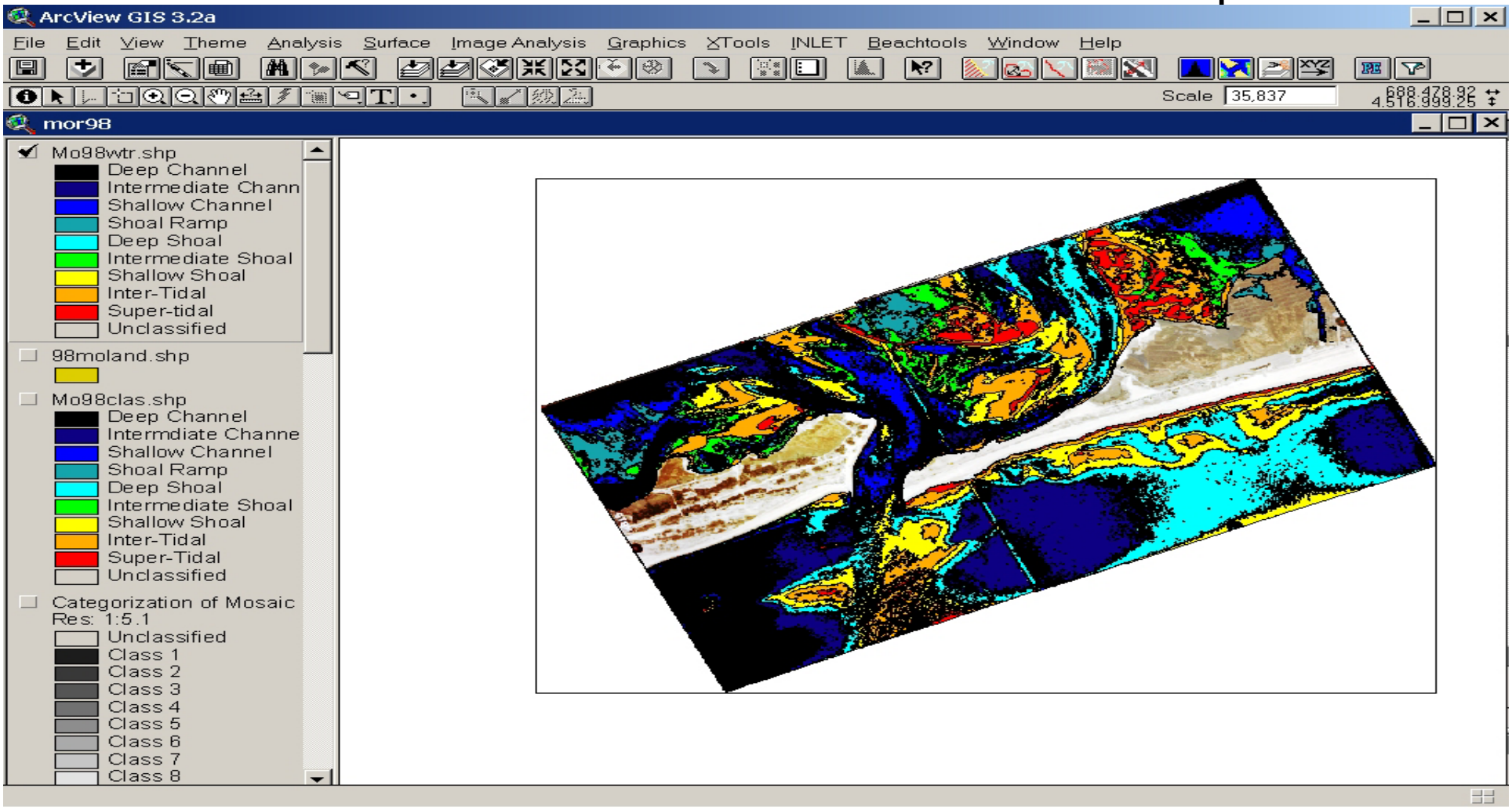
INLET-GIS – steps to go through in mapping

Image histogram stretching



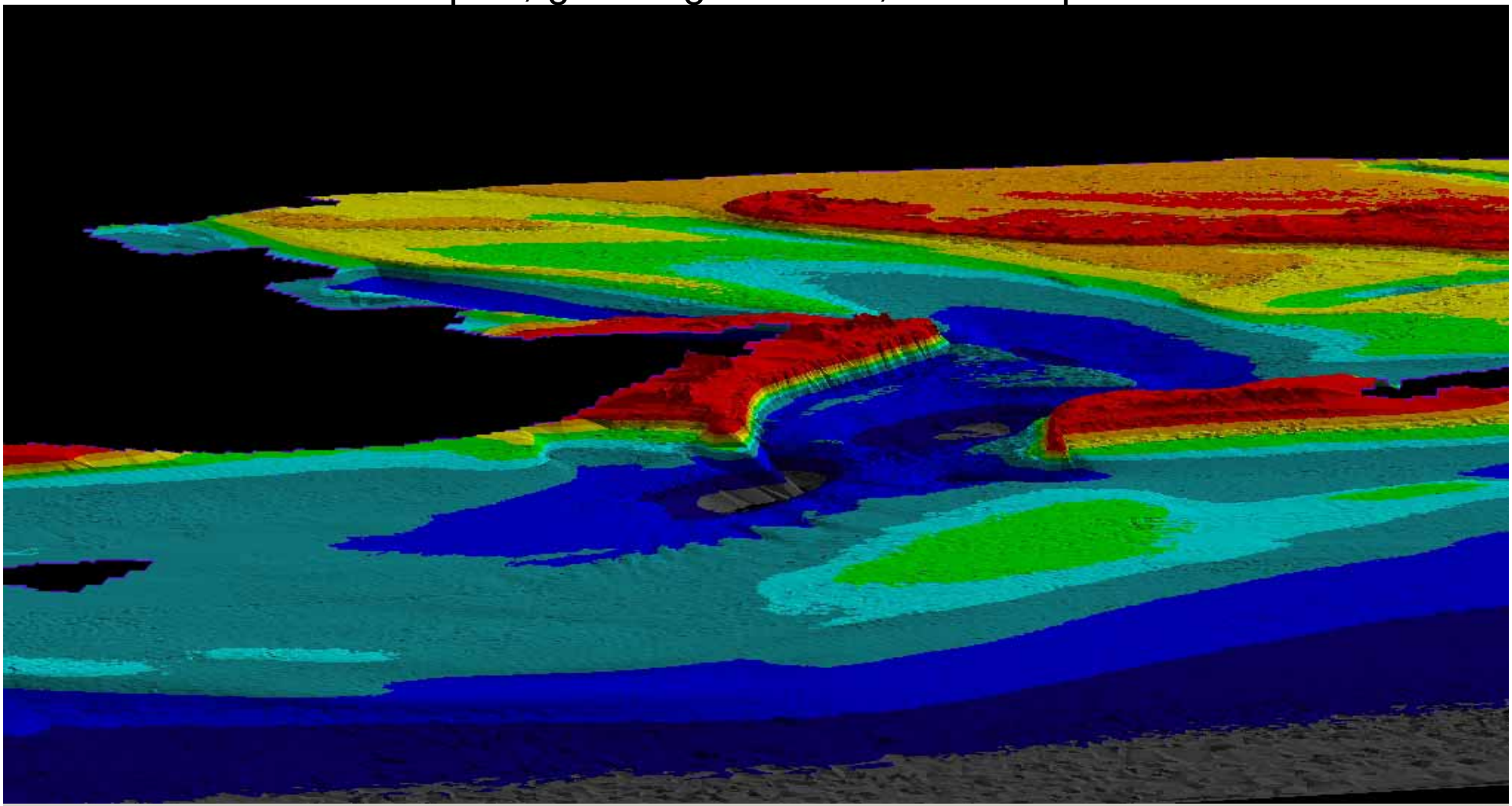
INLET-GIS

Thematic classification and land feature clip



INLET-GIS

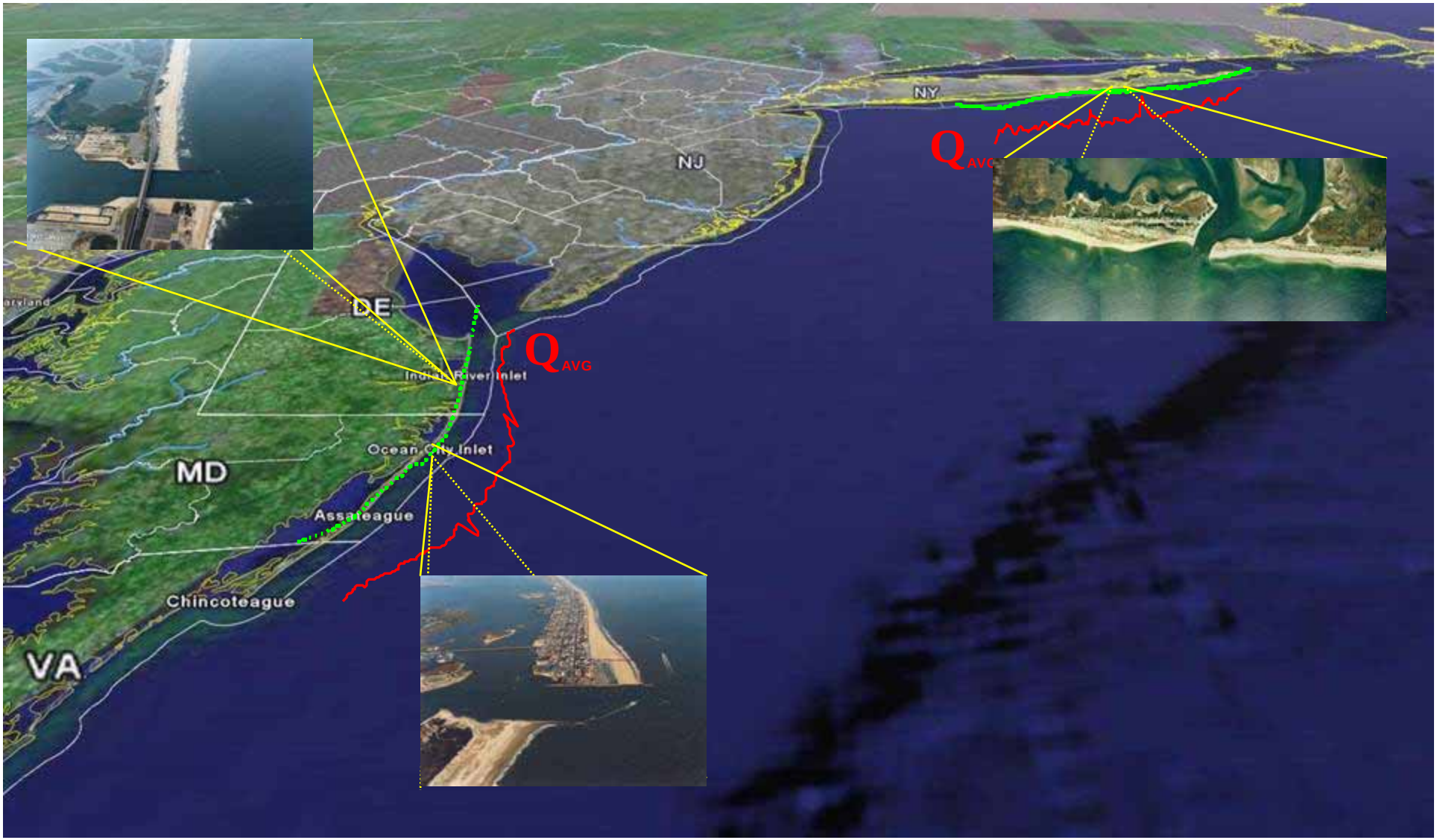
Data import, grid/tin generation, and comparison



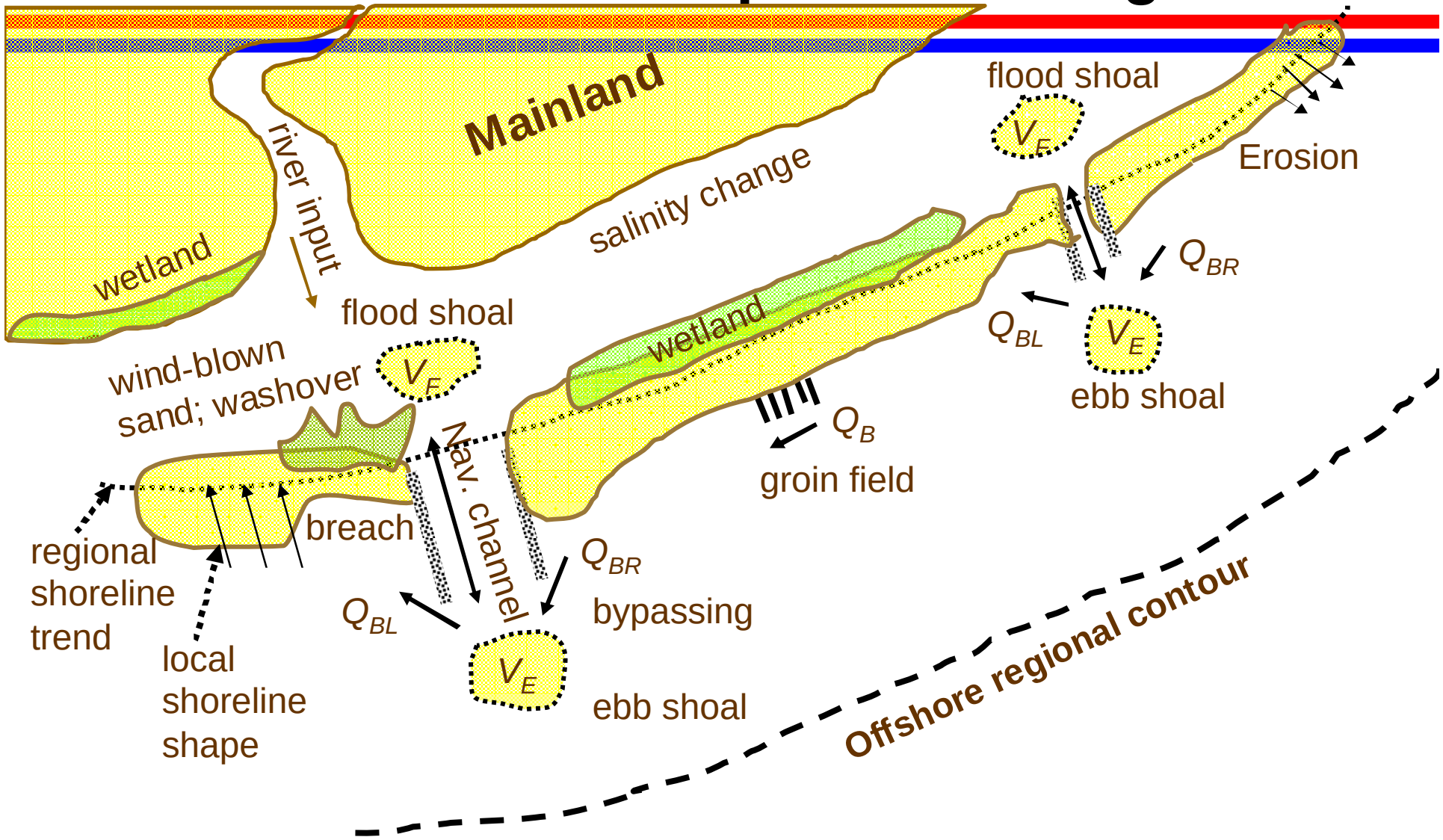
III. Other Pertinent Research

- System-wide Water Resources Program (SWWRP)
- Cascade and plovers…

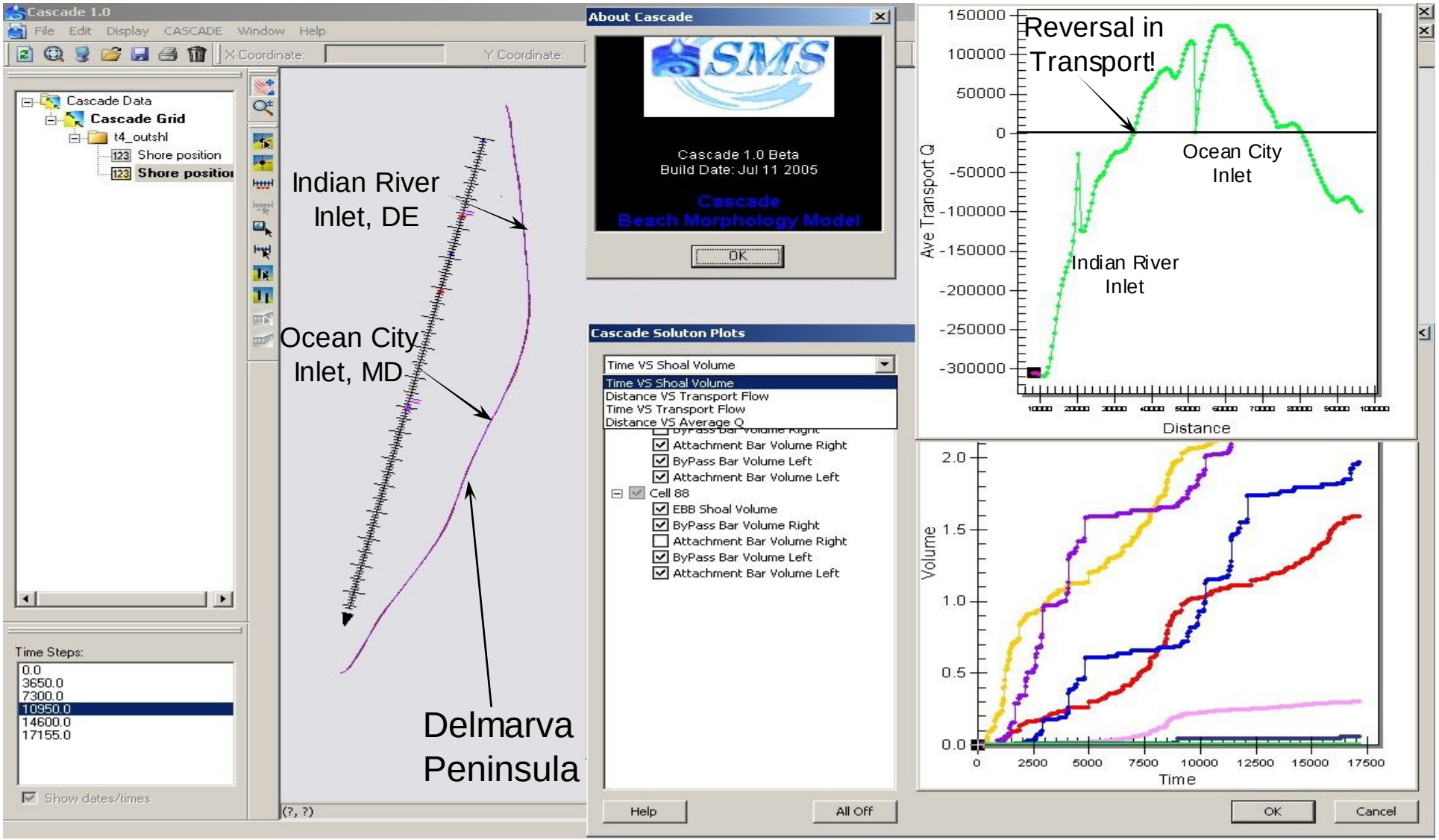
Cascade


NY
NJ
DE
MD
VA
Chincoteague
Assateague
Ocean City Inlet
Indian River Inlet
Q_{AVG}
Q_{AVG}

Cascade Conceptual Coverage



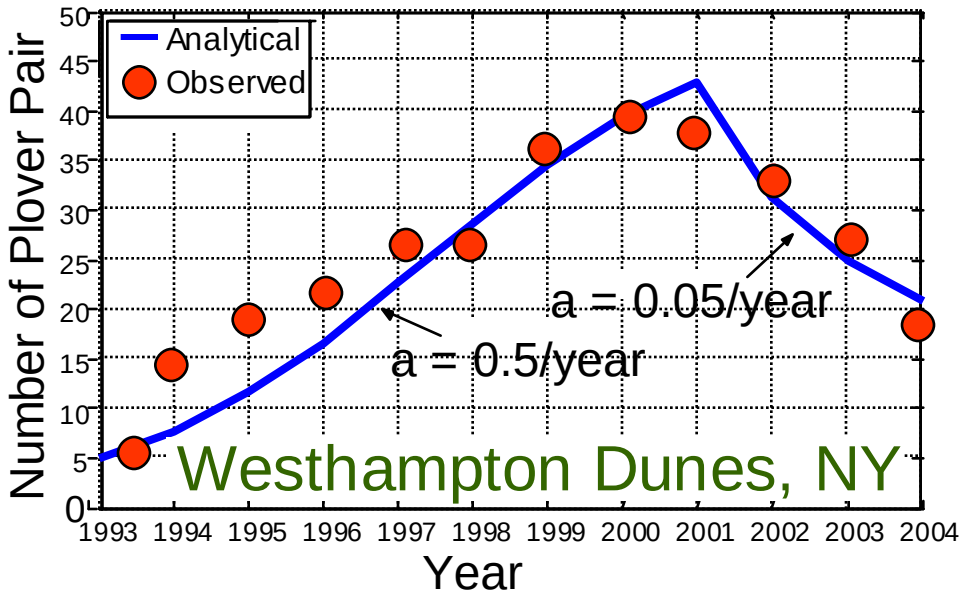
Cascade Interface

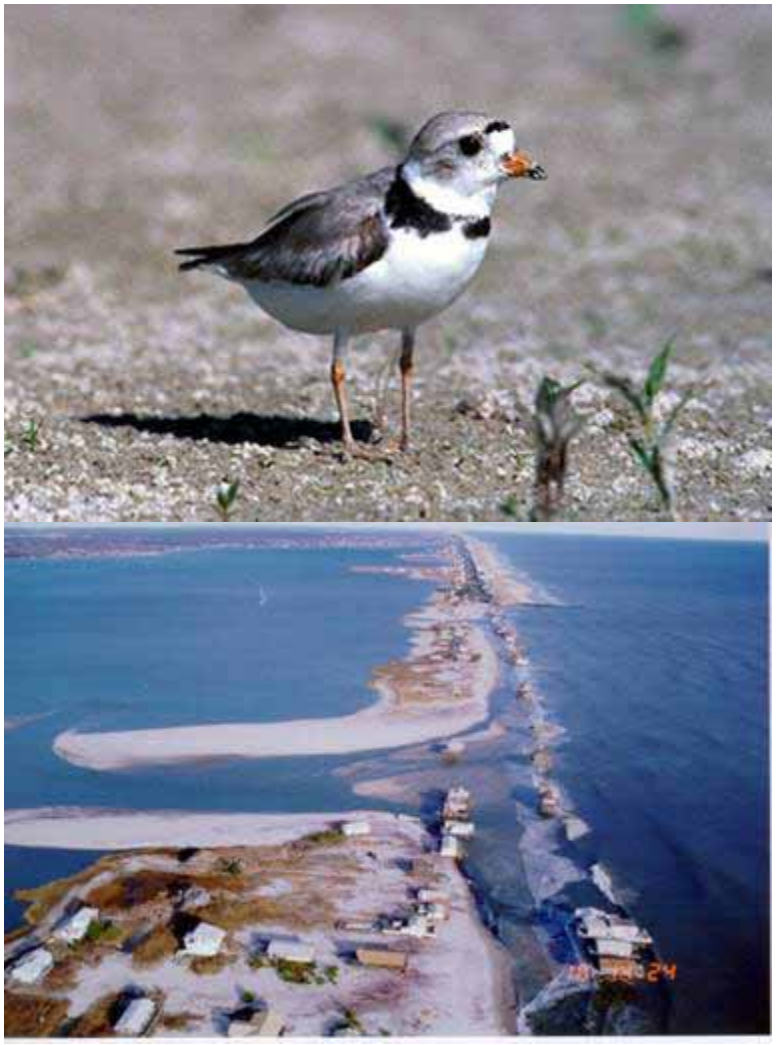


Cascade Ecological Sub-Module

Piping Plover Habitat & Population Dynamics

- Plover require unvegetated sand.
- Cascade will calculate overwash and breaching.
- Plover population model will link to Cascade.





Cascade -- Ecological Enhancements?

Relate area of plover habitat to time-dependent population

Benefits of predator trapping programs

Determine area of foraging habitat available through time

Determine potential benefits from dredging and placement

More Information & Collaboration

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http://cirp.wes.army.mil/cirp/