

# **2010 Subaqueous Soil Workshop**

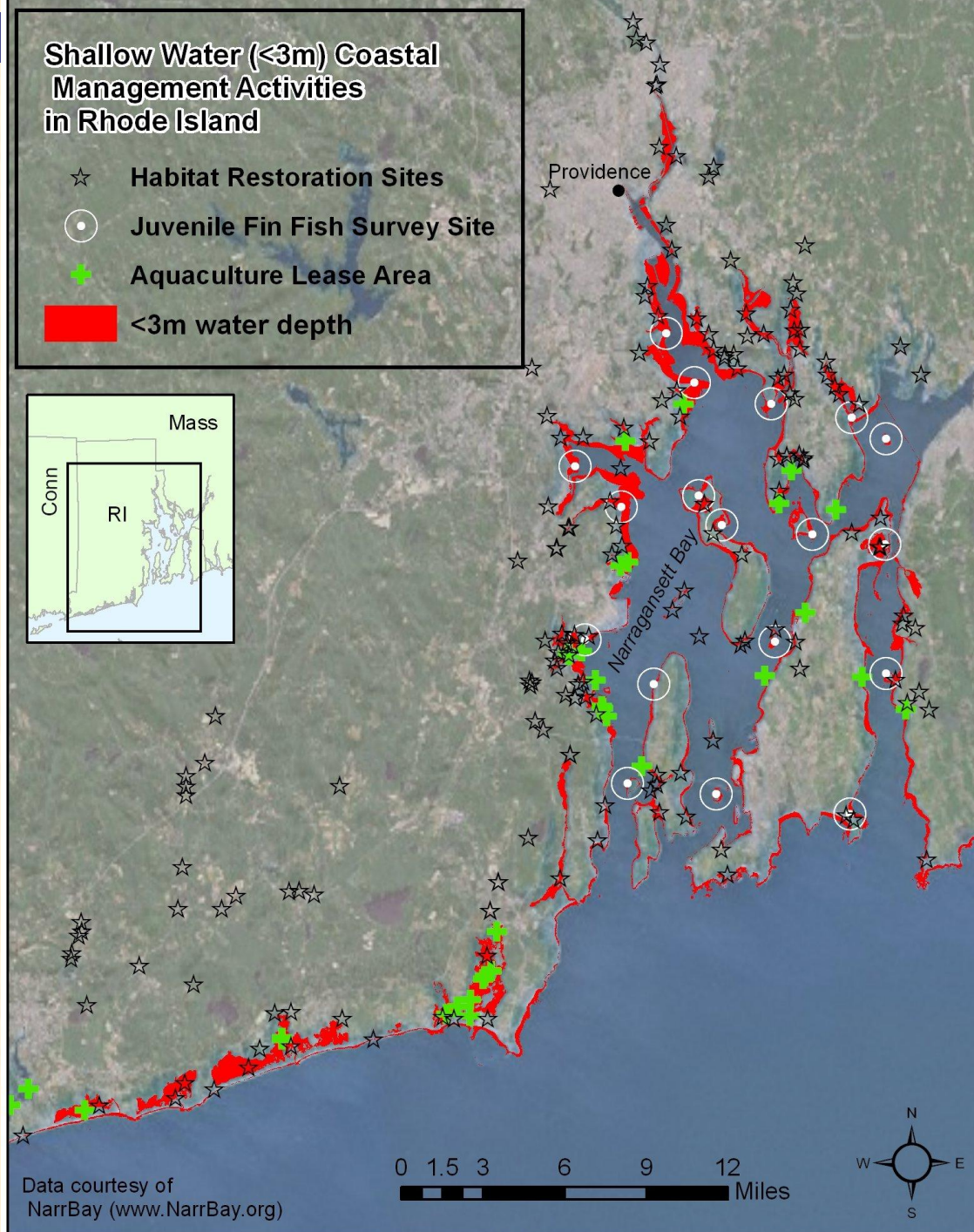
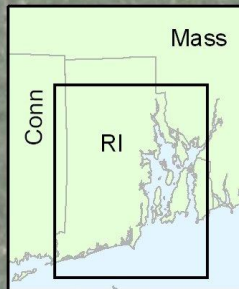
## **Bathymetric Mapping and Landscape Units in Shallow Subtidal Coastal Environments: Integrating Fathometry, GPS, and GIS**

**Mike Bradley<sup>1</sup> and Maggie Payne<sup>2</sup>**

- 1. University of Rhode Island, Department of Natural Resources Science**
- 2. USDA – Natural Resources Conservation Service**

# Shallow Water (<3m) Coastal Management Activities in Rhode Island

- ☆ Habitat Restoration Sites
- Juvenile Fin Fish Survey Site
- + Aquaculture Lease Area
- <3m water depth

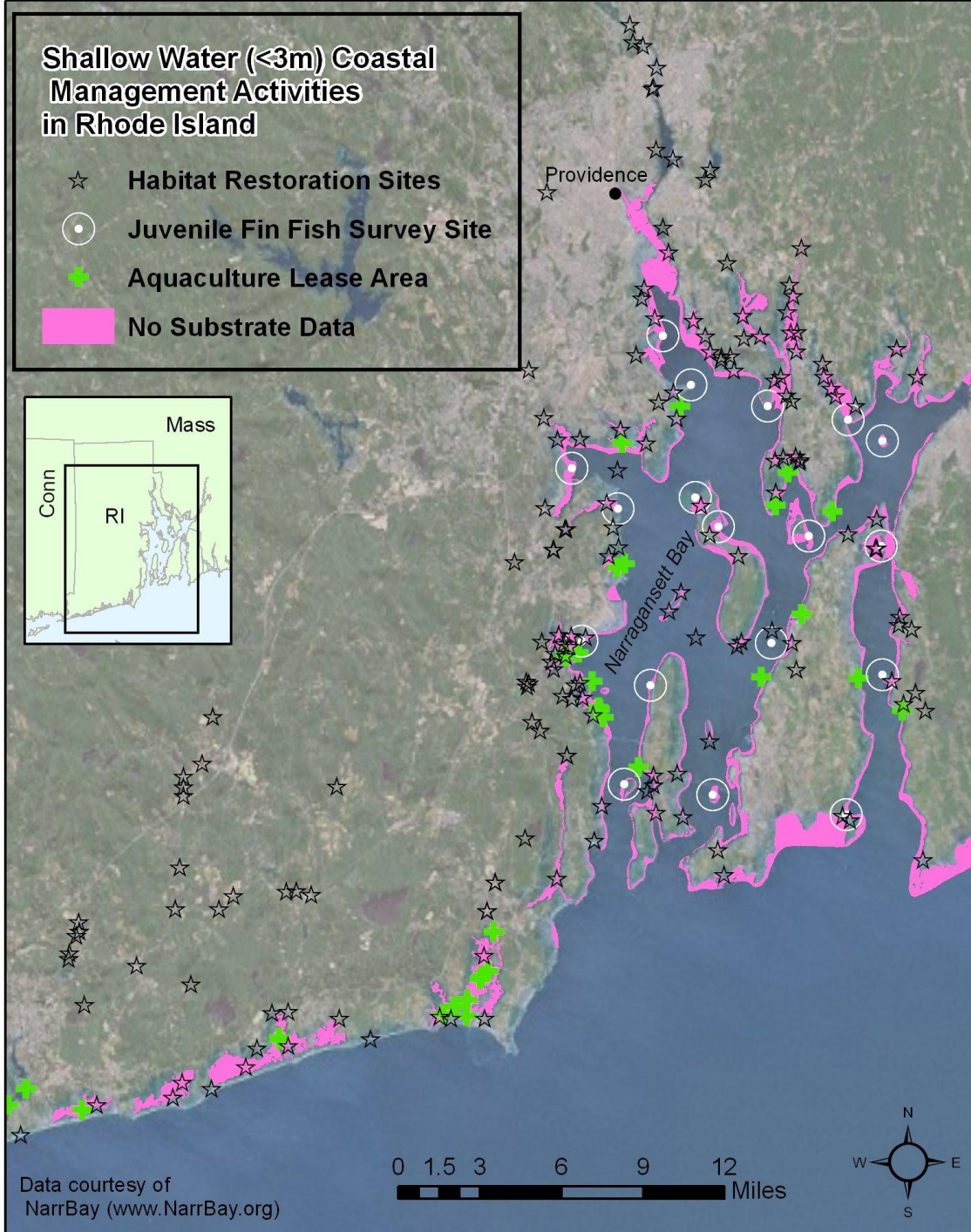
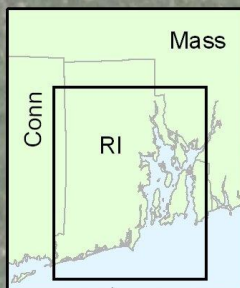


Data courtesy of  
NarrBay ([www.NarrBay.org](http://www.NarrBay.org))



## Shallow Water (<3m) Coastal Management Activities in Rhode Island

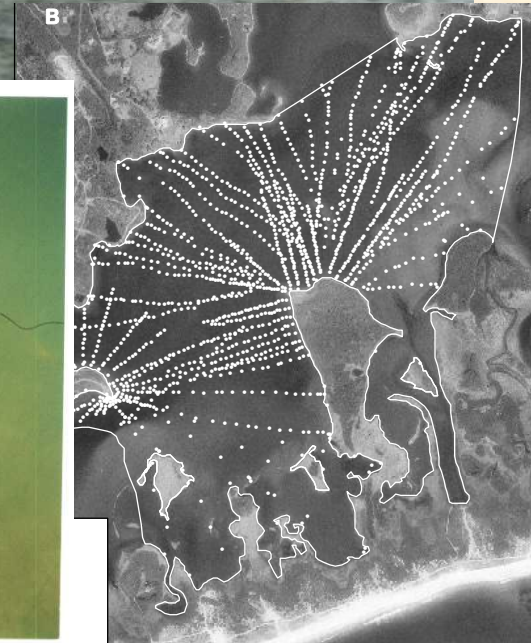
- ☆ Habitat Restoration Sites
- Juvenile Fin Fish Survey Site
- + Aquaculture Lease Area
- No Substrate Data

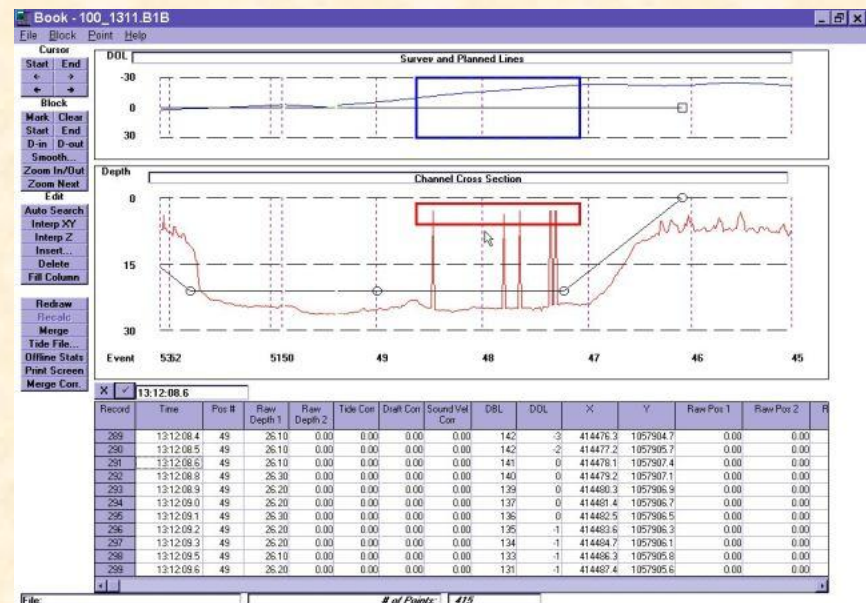


Data courtesy of  
NarrBay ([www.NarrBay.org](http://www.NarrBay.org))



# Bathymetry : the Grad student way





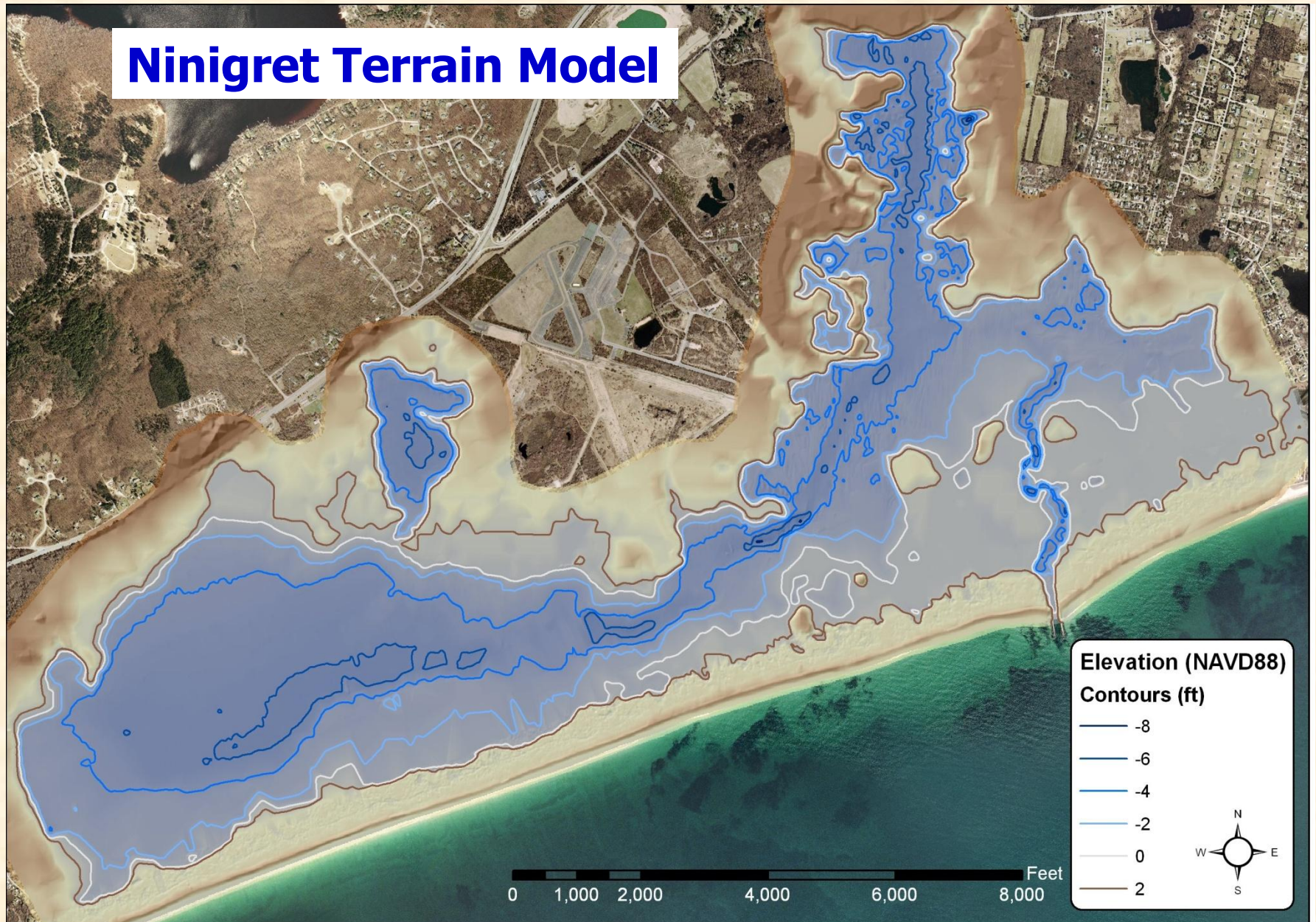




## **Goals for Talk:**

- **Discuss data requirements for delineation of landscape units**
- **Discuss how to acquire or produce data sets**
- **Provide GIS reference guide for getting started**

# Ninigret Terrain Model



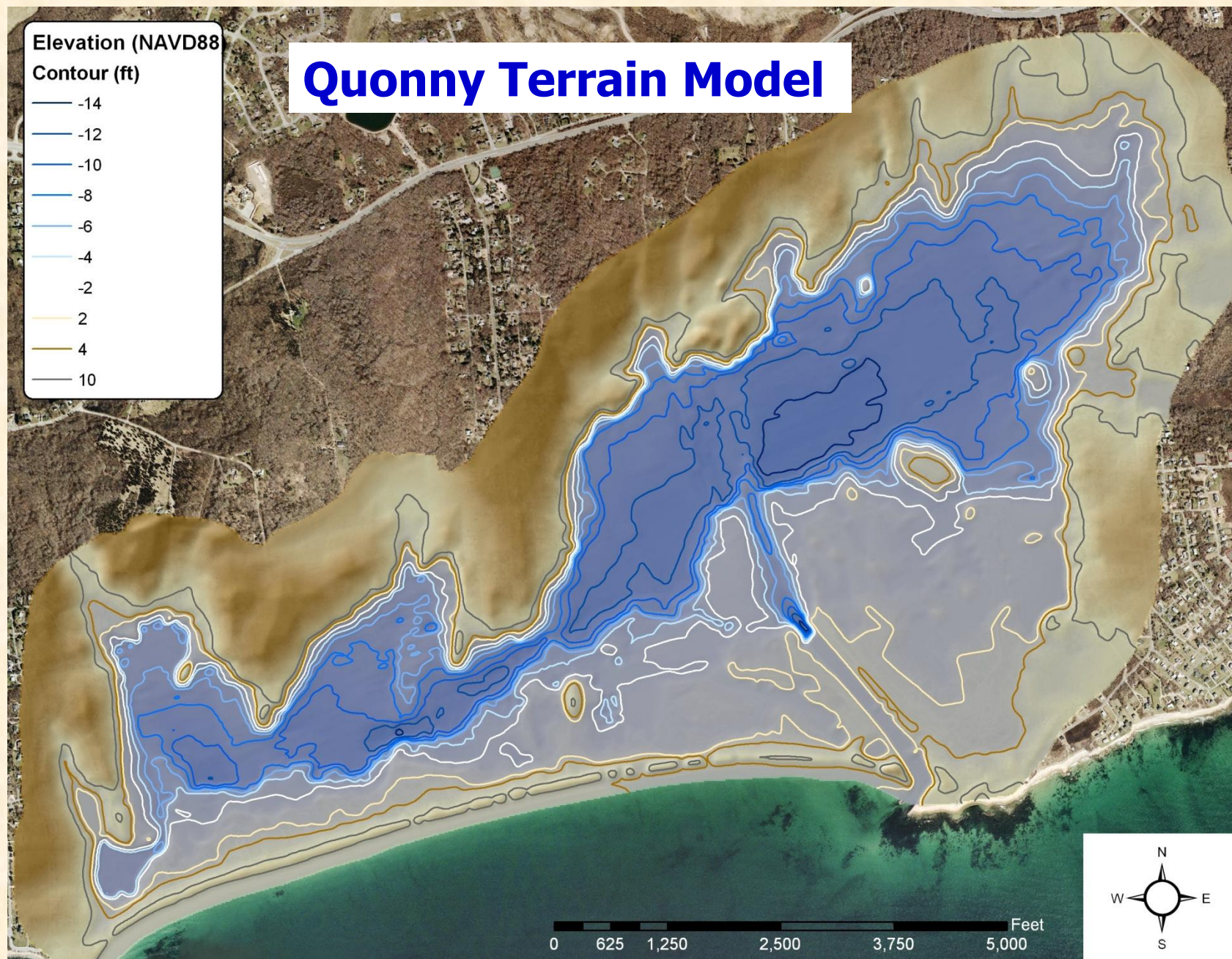


# Quonny Terrain Model

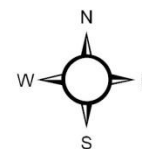
Elevation (NAVD88)

Contour (ft)

— -14  
— -12  
— -10  
— -8  
— -6  
— -4  
— -2  
— 2  
— 4  
— 10



0 625 1,250 2,500 3,750 5,000 Feet





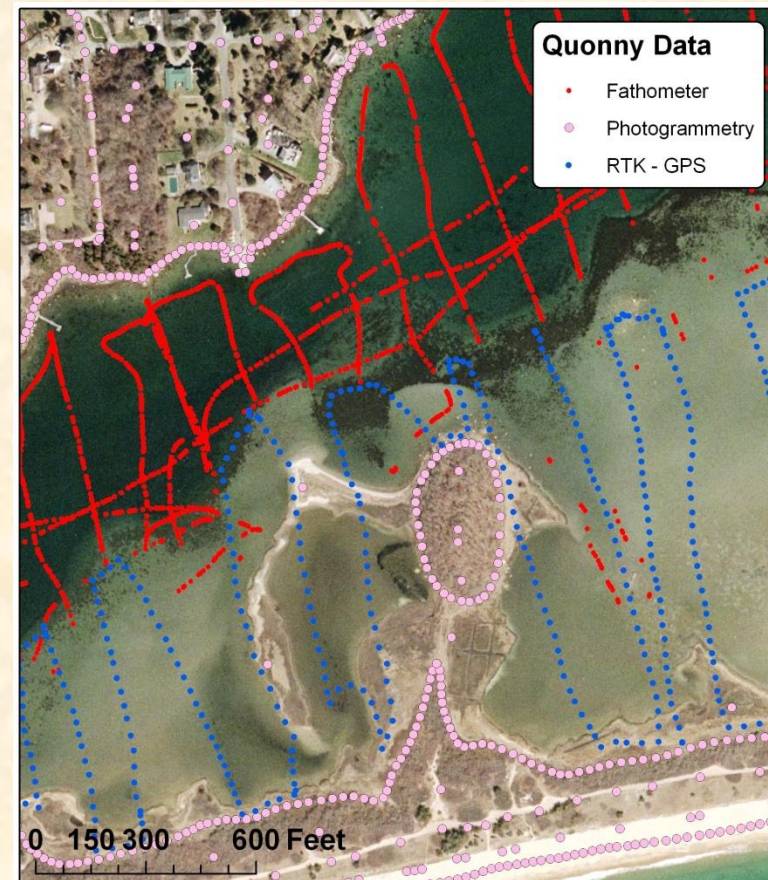
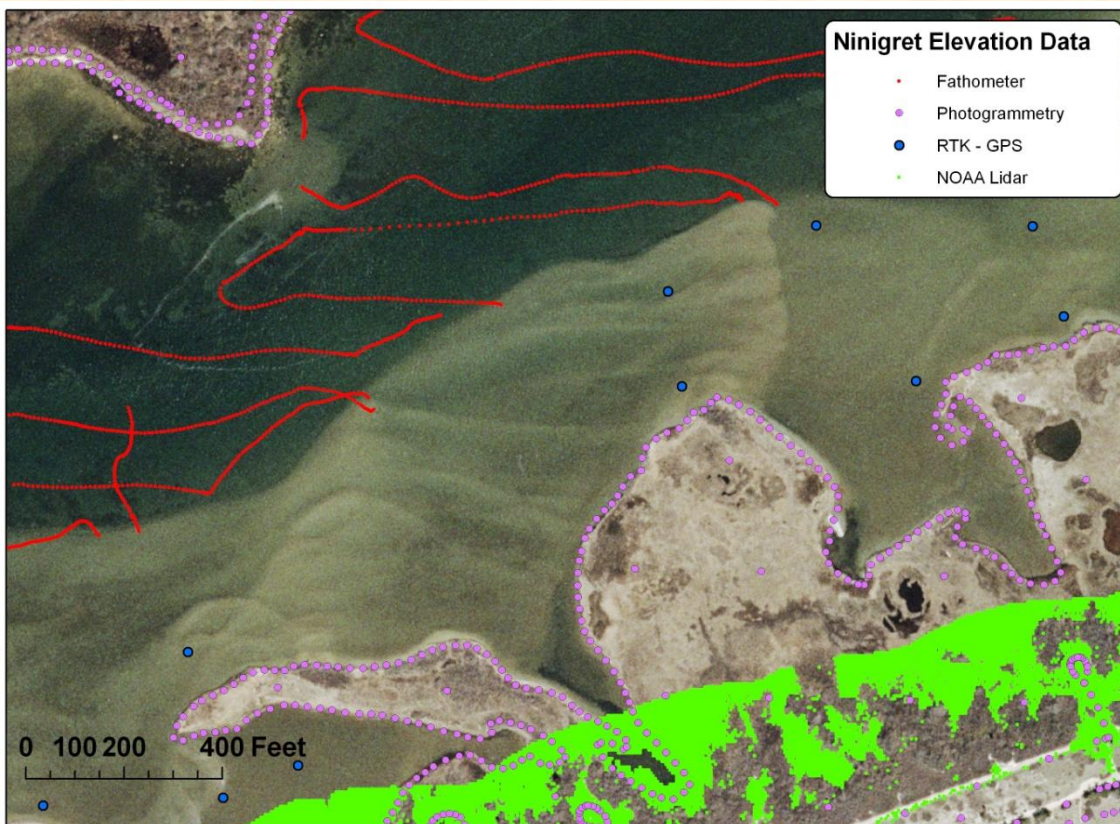


## **MapCoast Steps for Seamless Topo-bathy**

- **Bathymetric soundings taken from fathometer by boat**
- **Shallow water elevation taken by RTK GPS**
- **Tide stage monitored during fieldwork**
- **Digital data integration (LiDAR, photogrammetric points e.g.)**
- **QA**
- **Build terrain model**
- **QA**
- **Create derivate products from terrain model**

# Terrain Model Inputs

- Photogrammetry points (from 1:5,000 orthophotography)
- Deep water bathy points
- Shallow water RTK points
- LiDAR (when available)







## **Data needs and requirements for landscape delineation:**

- **Recent Imagery (free)**

**<http://resources.esri.com/arctonline services>**

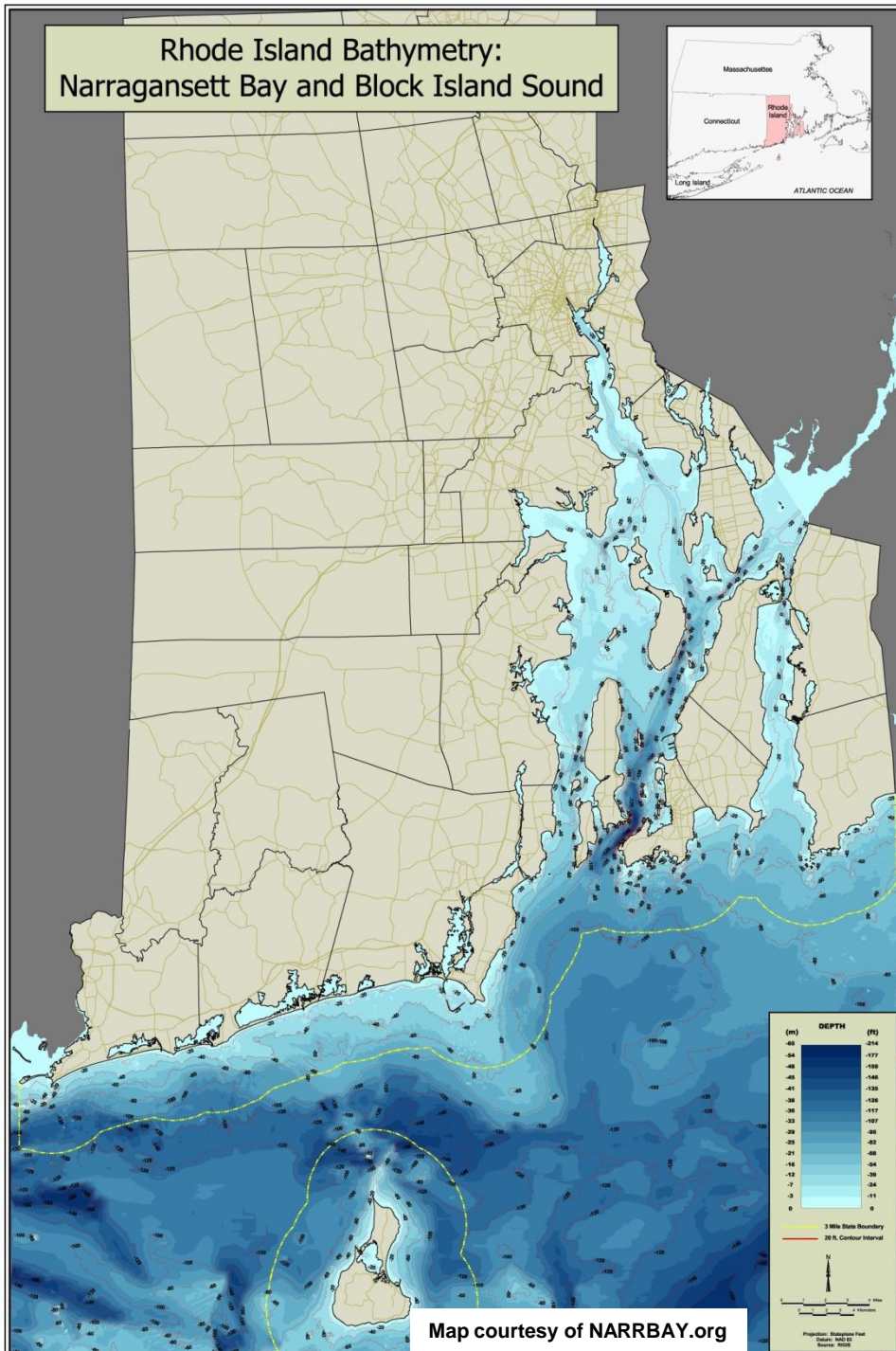
- **Bathy (free)**

**<http://www.ngdc.noaa.gov/mgg/bathymetry/hydro.html>**

- **Understanding of coastal geology**

- **Consult State repositories of GIS data (ArcGIS Server demo)**

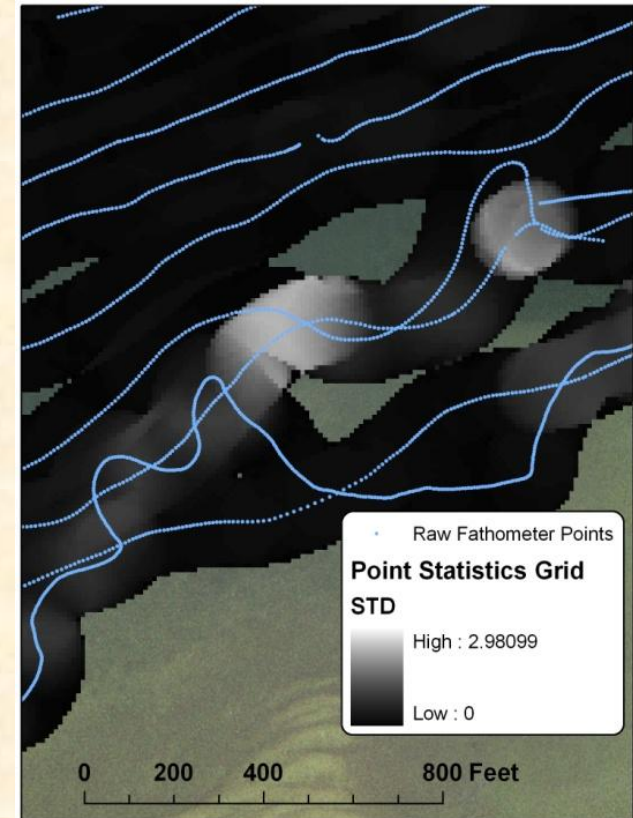
# Rhode Island Bathymetry: Narragansett Bay and Block Island Sound



Map courtesy of NARRBAY.org



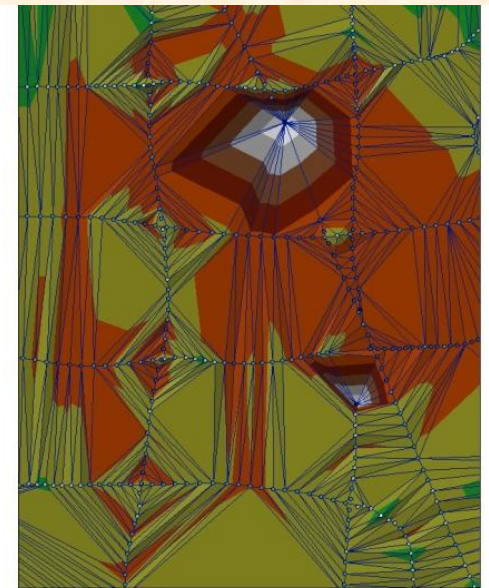
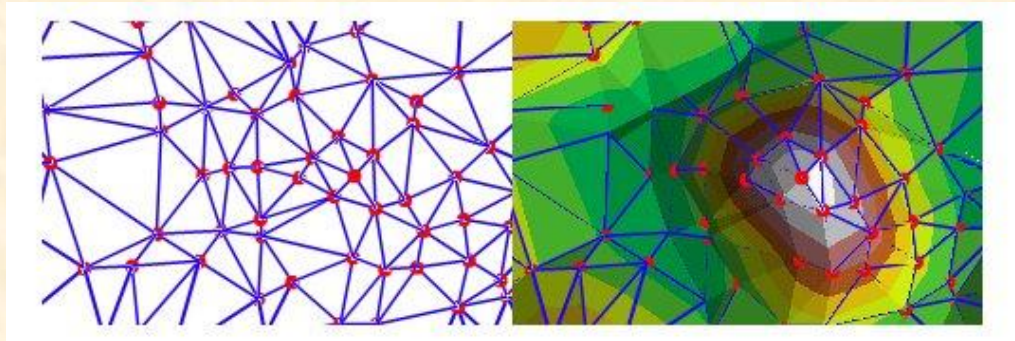
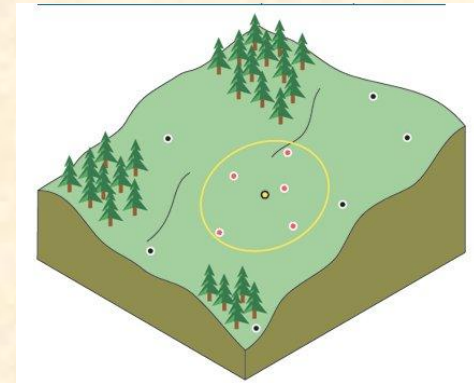
# Ok Ive got my points – Now what?





# Interpolation Models

- **Inverse Distance Weighted (IDW) (Spatial Analyst)**
- **Spline (Spatial Analyst)**
- **Triangular Irregular Network (TIN) (3-D Analyst)**



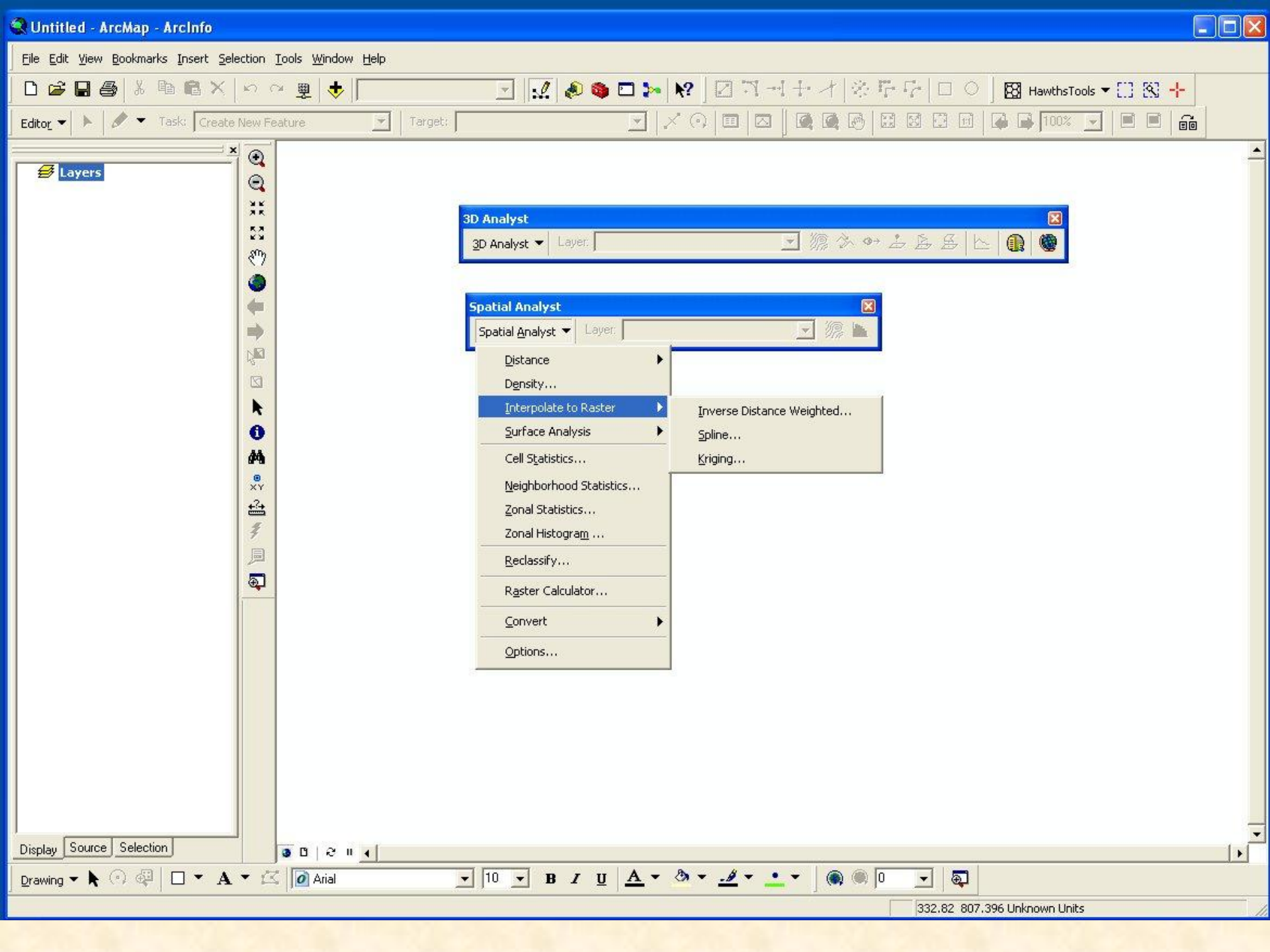
- **Kriging (Spatial Analyst)**



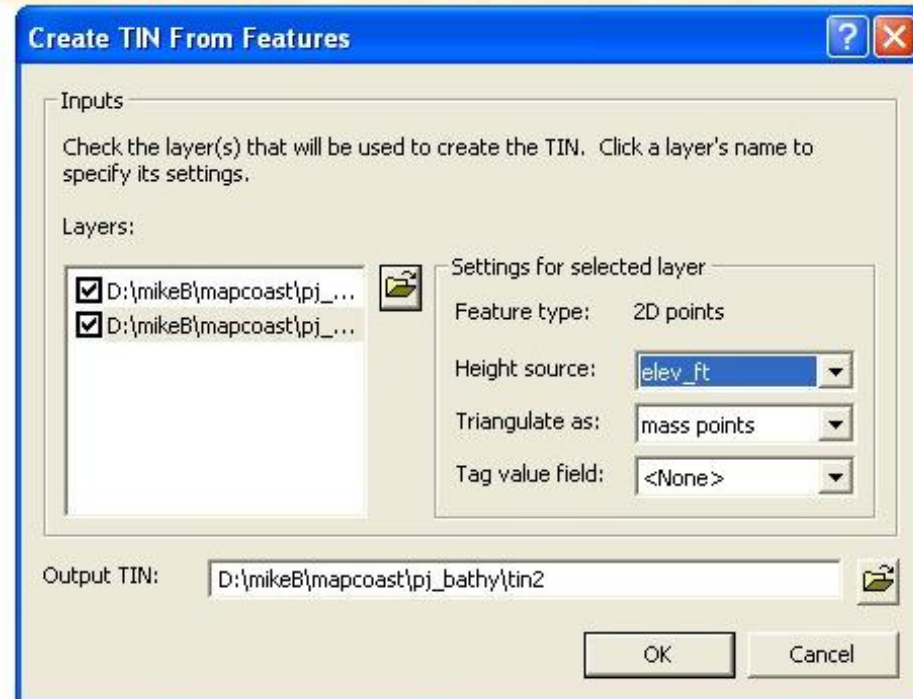
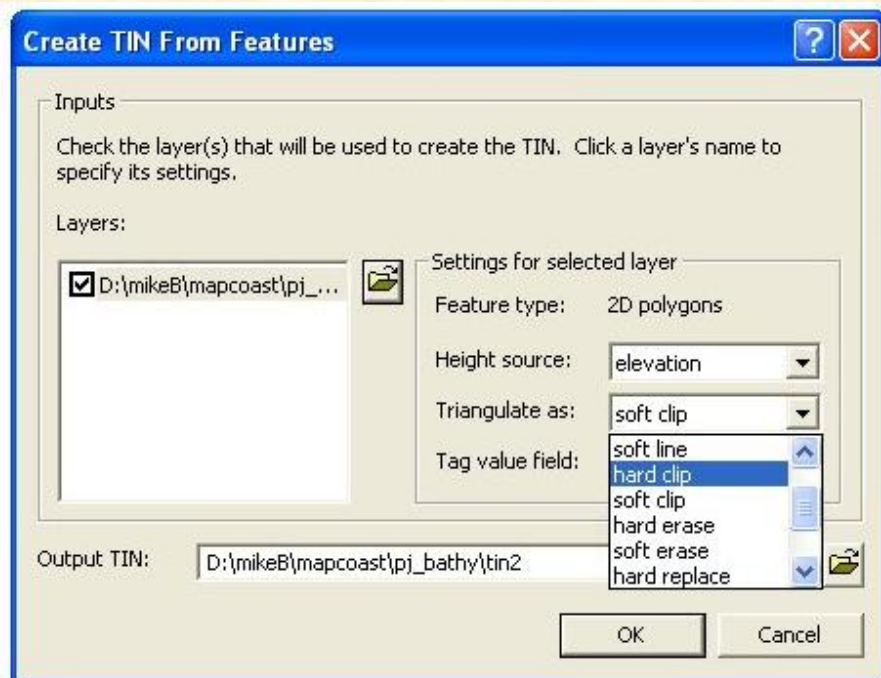
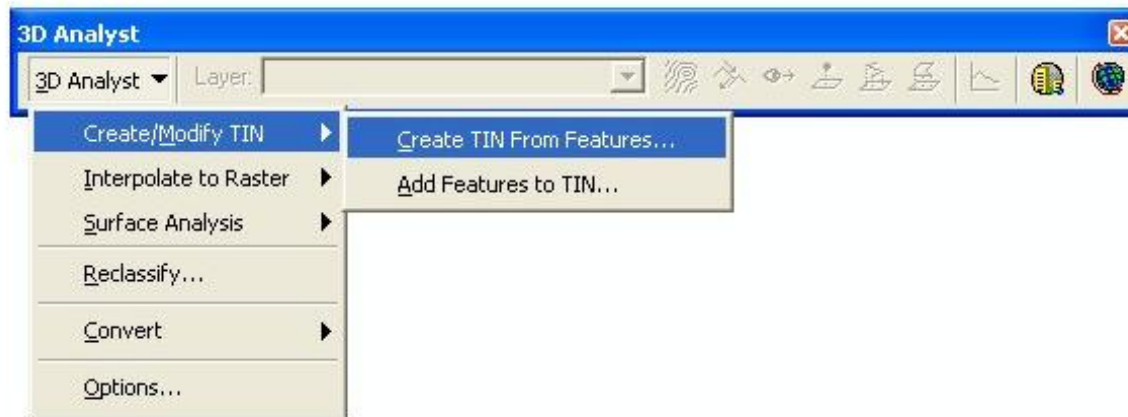


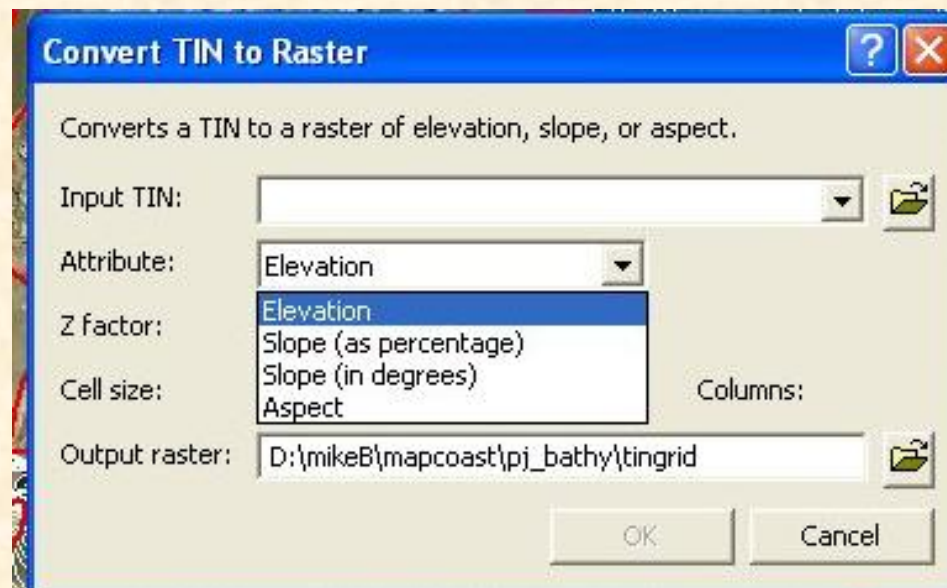
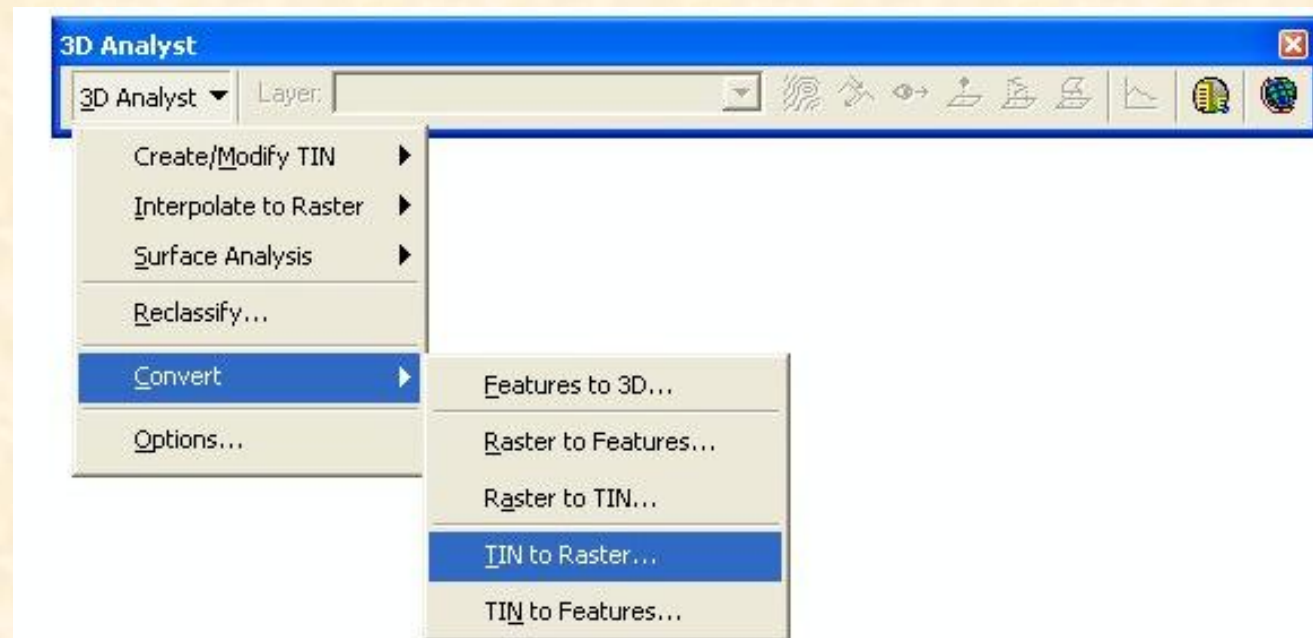
## **Steps for interpolating your points in ArcGIS:**

- **Digitize and delineate a shoreline (or decide on a existing one)**
- **Use 3-D Analyst Extension to create a surface (TIN)**
- **Create Grid (raster) from TIN**
- **Create contour lines**

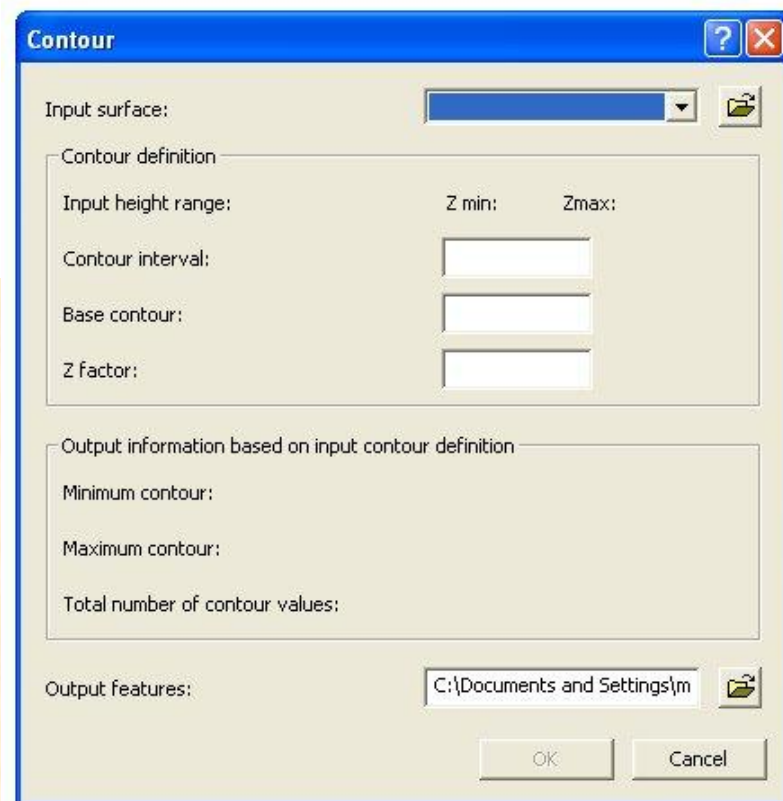
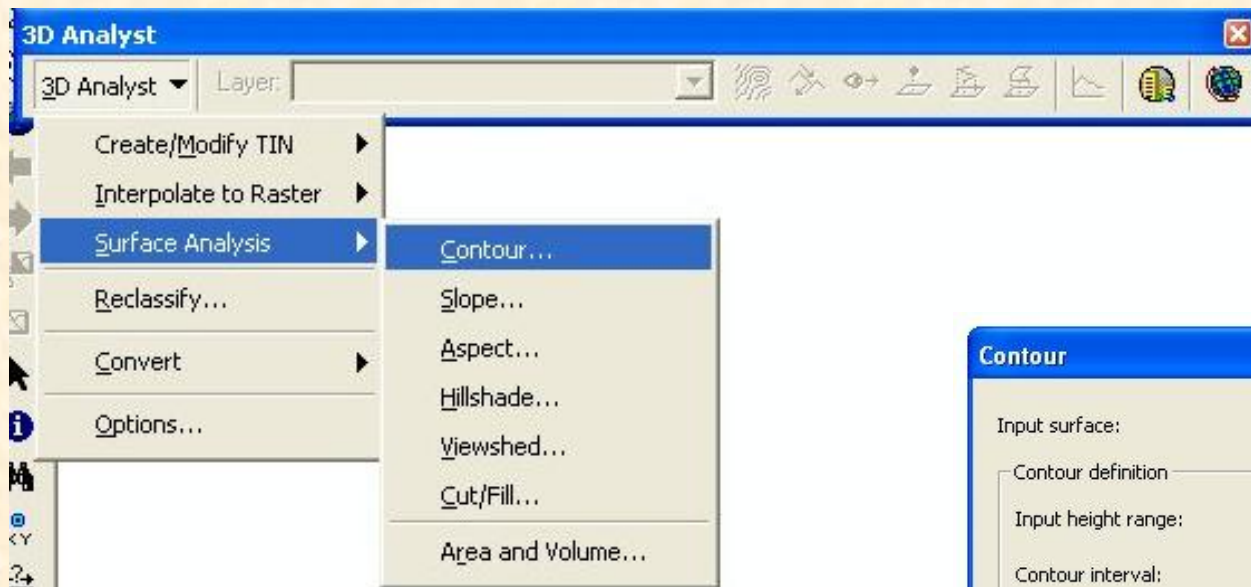




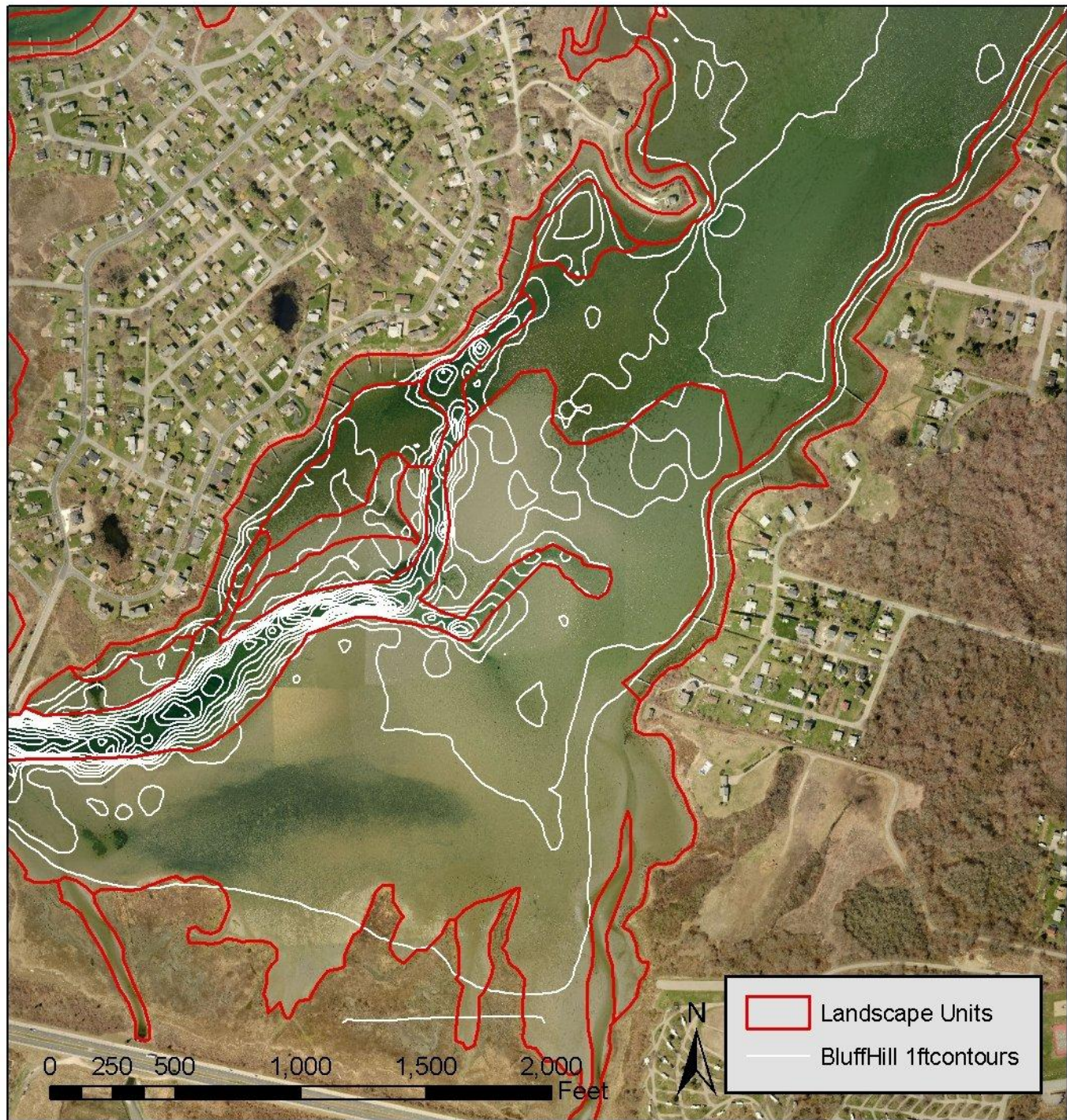






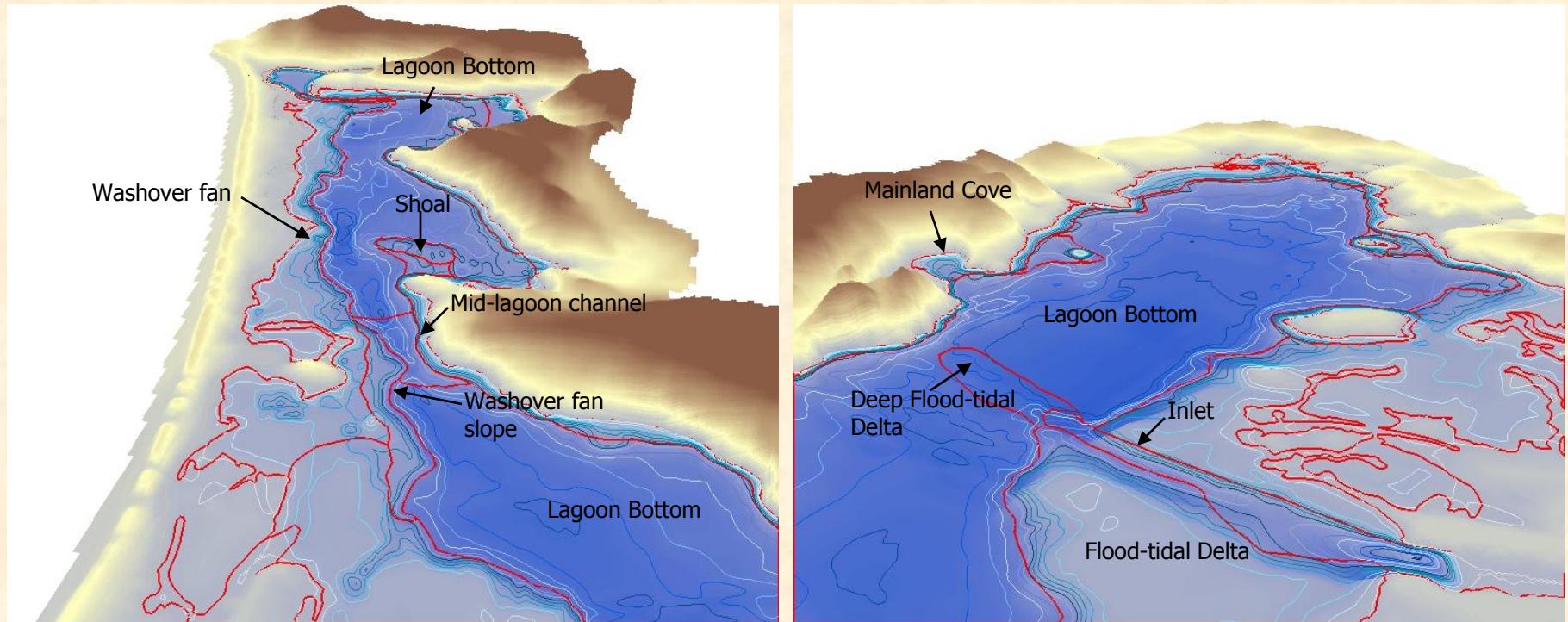








# Quonnie Sub-tidal Landscape Units (Oblique view)



# Validation

- **Rebuild TINs and grids randomly excluding 10% points**
- **Subtract modeled depth from measured depth using remainder of known depths**

**Ninigret (n = 8674)**

Overall average deviation	0.25 feet
Within 0.5 foot	87% all points
Within 1 foot	95% all points
Exceeding 1 foot deviation	5.3%

**Quonnie (n = 2990)**

Overall average deviation	0.4 feet
Within 0.5 foot	78% all points
Within 1 foot	91% all points
Exceeding 1 foot deviation	8.9%



# QUESTIONS?

