# Creating a Custom DEM and Measuring Bathymetric Change for the Multnomah Channel & Willamette River Confluence

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GEOG 593
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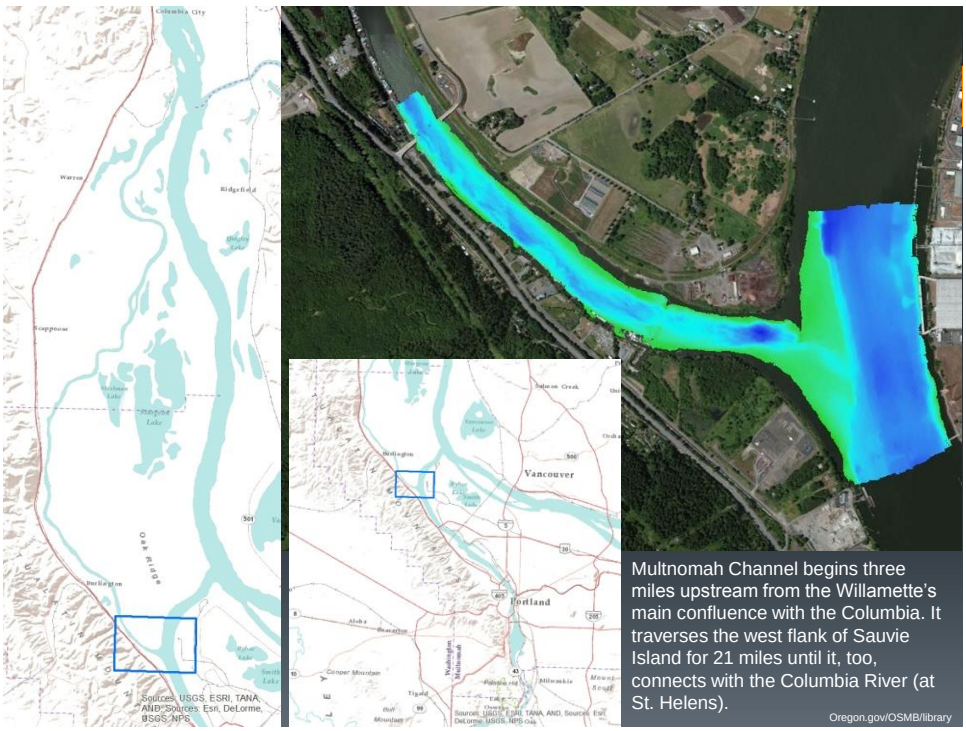
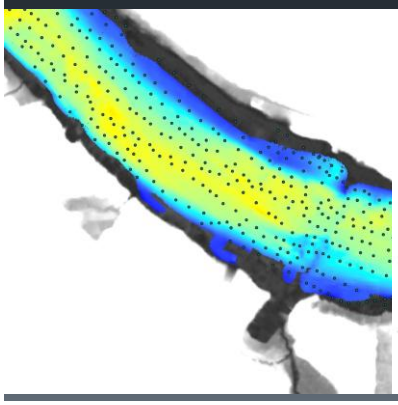


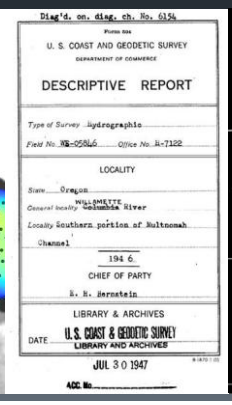

Multnomah Channel begins three miles upstream from the Willamette's main confluence with the Columbia. It traverses the west flank of Sauvie Island for 21 miles until it, too, connects with the Columbia River (at St. Helens).

Oregon.gov/OSMB/library

# Data

- 2007 Data
  - Bathymetric surface from David Evans and Associates
  - DOGAMI LiDAR bare earth DEMs (Linnton and Sauvie Island Quandrangles)
- Historical Data
  - NOAA Bathymetric Soundings from 1946

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U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. HB-05046 Office No. H-7122

LOCALITY

State Oregon

General locality Willamette - Columbia River

Locality Southern portion of Multnomah Channel

194 6

CHIEF OF PARTY

R. R. Bernstein

LIBRARY & ARCHIVES

DATE U. S. COAST & GEODETIC SURVEY LIBRARY AND ARCHIVES

JUL 30 1947

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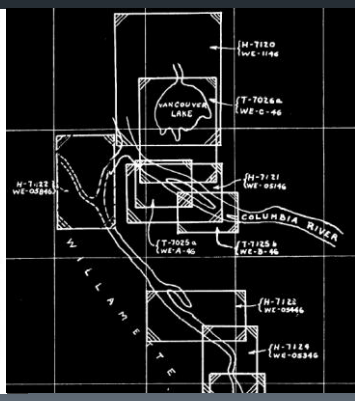
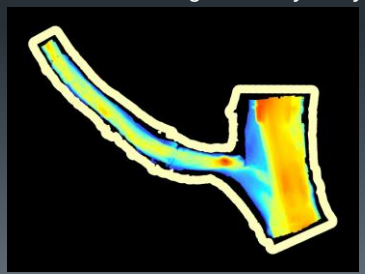



# DOGAMI LiDAR DEMs

## Linnton, Sauvie's Island Quads

# Initial Processes and Project Setup

- Abstract:
  - Combine a current (2007) bare earth digital elevation model with bathymetric data to create a custom terrain model for the Multnomah Channel
  - Combine a historical survey (1946) with modern day topography to create a custom terrain model.
  - Calculate change in bathymetry.



Datum Conversion

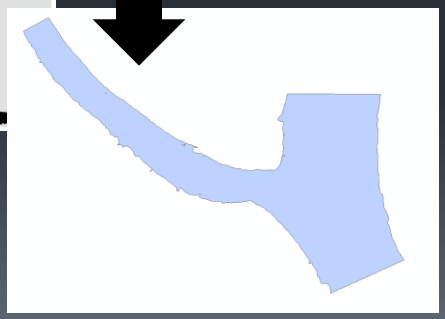
Convert LiDAR and Bathymetry to Point Data using **Sample (Spatial Analyst)**

Delineate model study area by creating a water polygon using a conditional statement (from LiDAR)

Buffer River polygon 200 feet, remove all LiDAR and bathymetry points from outside the buffer area.

Eliminate River Area points from LiDAR using River Polygon (creates space for the bathymetry points)

# Shoreline Polygon



Con statement on raster. If value greater than 20, assign a value of 0 if not then 1.

Con("Linnton_clip">20,0,1)

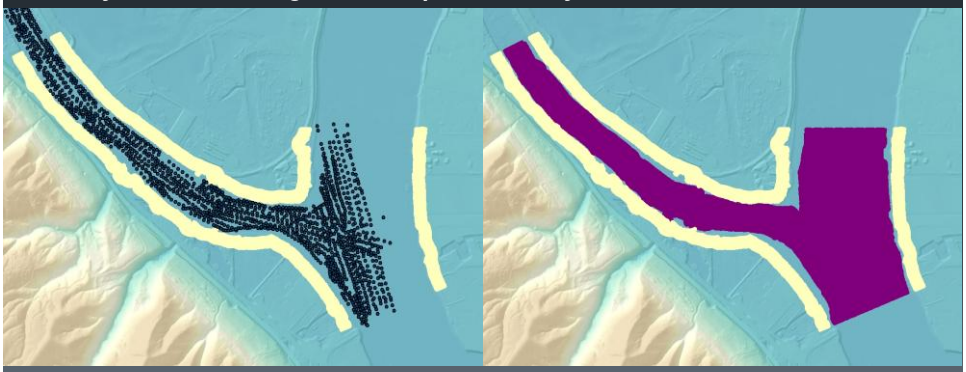
0 = land

1 = water

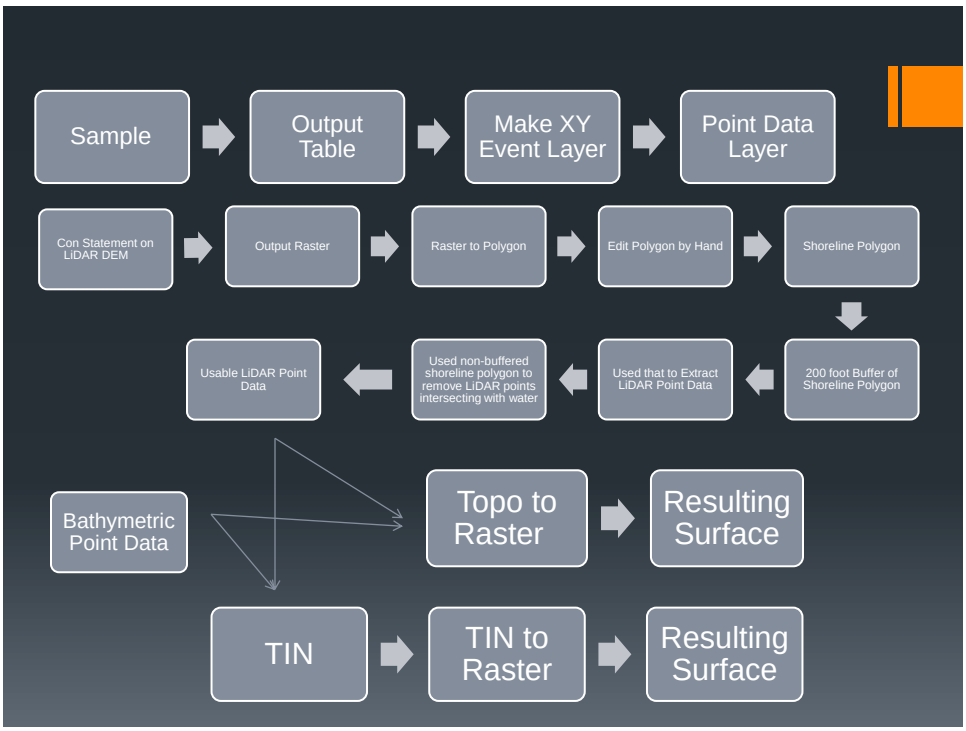
*based on visual inspection*

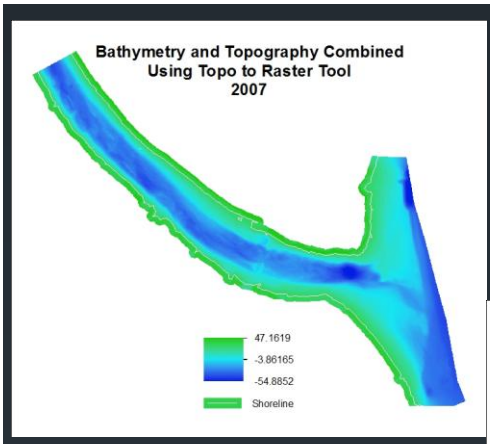
# Setting up the Interpolation

- Selected all LiDAR points that intersected with the 200 ft buffered water polygon
- Then erased the LiDAR points that intersected with the water polygon:
- To help eliminate edge effects, points were cut at the three edges.
- **Interpolate the "gap" in bathymetry between the bathymetric data and the shoreline. There was no data for this area because the boats used to collect bathymetric soundings cannot operate in very shallow water**

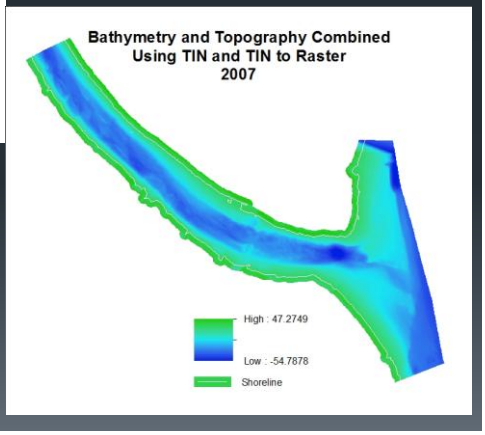


1946 2007





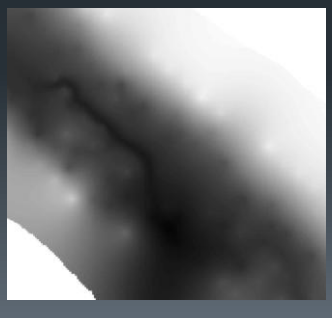

For the 2007 data, the Topo To Raster produced a better surface with less edge effects than the surface created from a TIN.




# Creating the Historic Surface

**Topo to Raster (Spatial Analyst)**

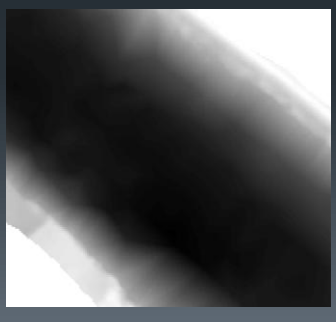
- Run Tool
- Extract by Mask (100 ft water buffer to eliminate edge effects)

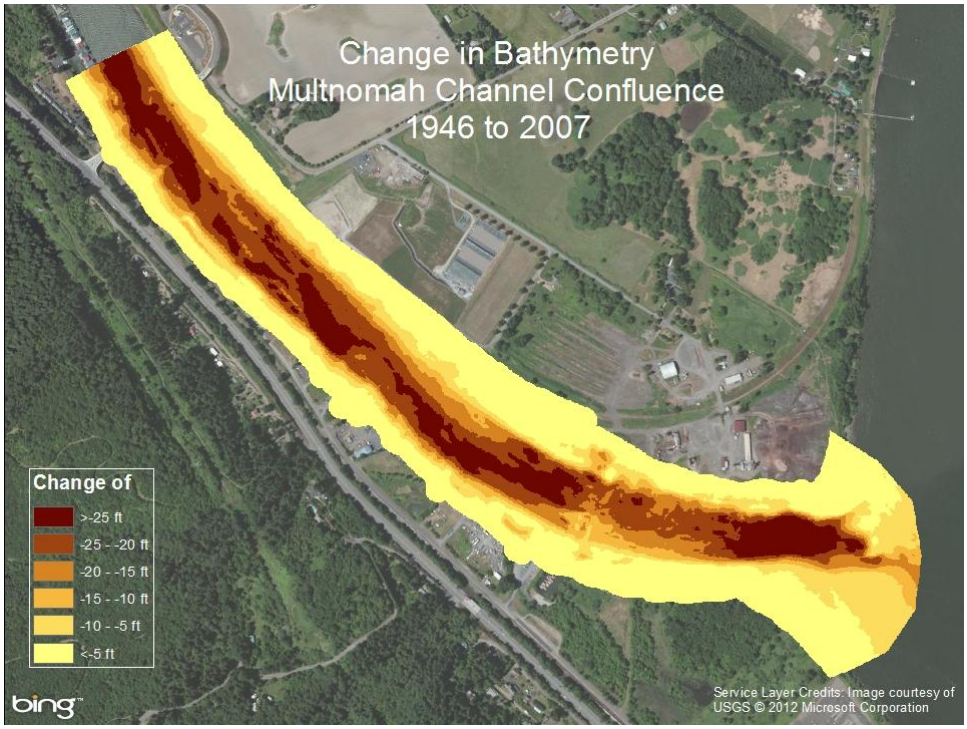


VS.

**Create TIN (3D Analyst)**

- Run Tool
- Run Tin to Raster (3D Analyst)
- Extract by Mask (100 ft water buffer to eliminate edge effects)






# Using the Minus tool to calculate change in Bathymetry

## Final Thoughts, Room for Improvements

- Based on our results, the historical channel appears to be significantly more shallow than the current day surface, with an average change of approximately 11 feet within the study area interpolated.
- Either there has been a significant dredging operation, flooding, or some other occurrence not known to us.

- Datum issues – no REAL guarantee that the 2007 bathymetry was in NGV88
- Conversion factor from Columbia River Datum to NGVD is large (+5.4 feet)
- Shoreline changes: is it safe to say that the shoreline topography stayed the same over 60 years? It would be ideal to combine the historical soundings with a historical surface.
- Using a 'Nested Buffer' method to interpolate the historical soundings may have yielded a more accurate/smoother historical surface.

## SOURCES


- Gesch, D., and Wilson, R., 2002, Development of a seamless multisource topographic/ bathymetric elevation model of Tampa Bay: Marine Technology Society Journal, v. 35, no. 4, p. 58-64.
- NOAA (http://www.ngdc.noaa.gov/mgg/bathymetry/hydro.html)
- DOGAMI
- David Evans and Associates
- ArcGIS 10.1 Help – How Topo to Raster works