Delaware River Flood Inundation Mapping Effort

Philadelphia Engineer District

General Overview

- Inundation mapping and structure surveys prepared under multiple Corps studies
- Utilized existing hydraulic models and best available digital base data due to time & budget constraints
- Created flood inundation maps for about **100-miles of the main stem Delaware River** and select other areas
- Economic component for damage centers
- Two products to be used for **planning purposes**:
  - Stand-alone GIS application for Emergency Managers
  - **NWS/AHPS inundation mapping** available to the public

Delaware River Flood Inundation Mapping Effort

Philadelphia Engineer District

Data and Analysis

•Existing hydraulic models from 1996 & 1999 FEMA Flood Insurance Study (Main Stem Delaware River): Run multiple flood scenarios at 1-foot increments.

•Available digital topography: Develop digital floodplains for all flood scenarios; depth of interior flooding at select structures

•Once modeling and mapping was developed, it was tested against high water marks, any new data that was available, and NWS impact statements with satisfactory results.

•User input at one or more river forecast points on main stem by stage/elevation

•Damage estimates for each flood scenario are available for limited number of structures in database

Delaware River Flood Inundation Mapping Effort

Philadelphia Engineer District

Structure Inventory

- Type of data Collected:
  - First floor elevation
  - Digital photos
  - Type of building
  - Value of structure and contents

New Jersey

Belvidere: 73 Residential, 20 Commercial
Harmony: 143 Residential, 3 Commercial
Lambertville: 109 Residential, 63 Commercial
Stockton: 95 Residential, 33 Commercial

Pennsylvania

Easton: 18 Residential, 80 Commercial
New Hope: 88 Residential, 68 Commercial
Upper Makefield: 318 Residential, 48 Commercial
Yardley: 282 Residential, 35 Commercial

NWS Coordination

Philadelphia Engineer District

- Map layers created, edited, QA/QC'ed for nine forecast points (Trenton, New Hope-Lambertville, Stockton, Frenchtown, Riegelsville, Easton-Phillipsburg, Belvidere, Montague, Port Jervis)
- Hydraulic profiles run for increments <= 1-foot
- Submission to NWS: Lowest inundation level depth grid & 33 shapefiles covering range of flooding for each forecast point
- NWS has their own review process. Most forecast points went through 4 or 5 submissions before considered final

Strengths & Limitations

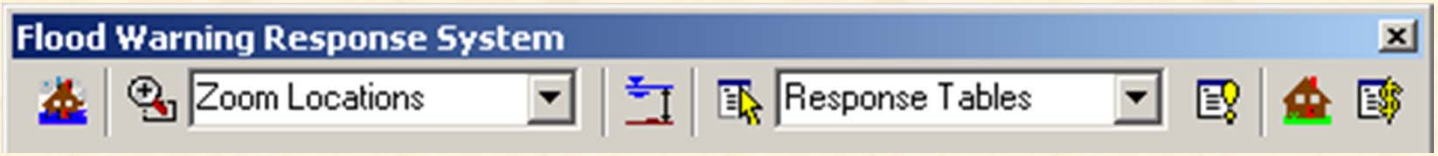
Philadelphia Engineer District

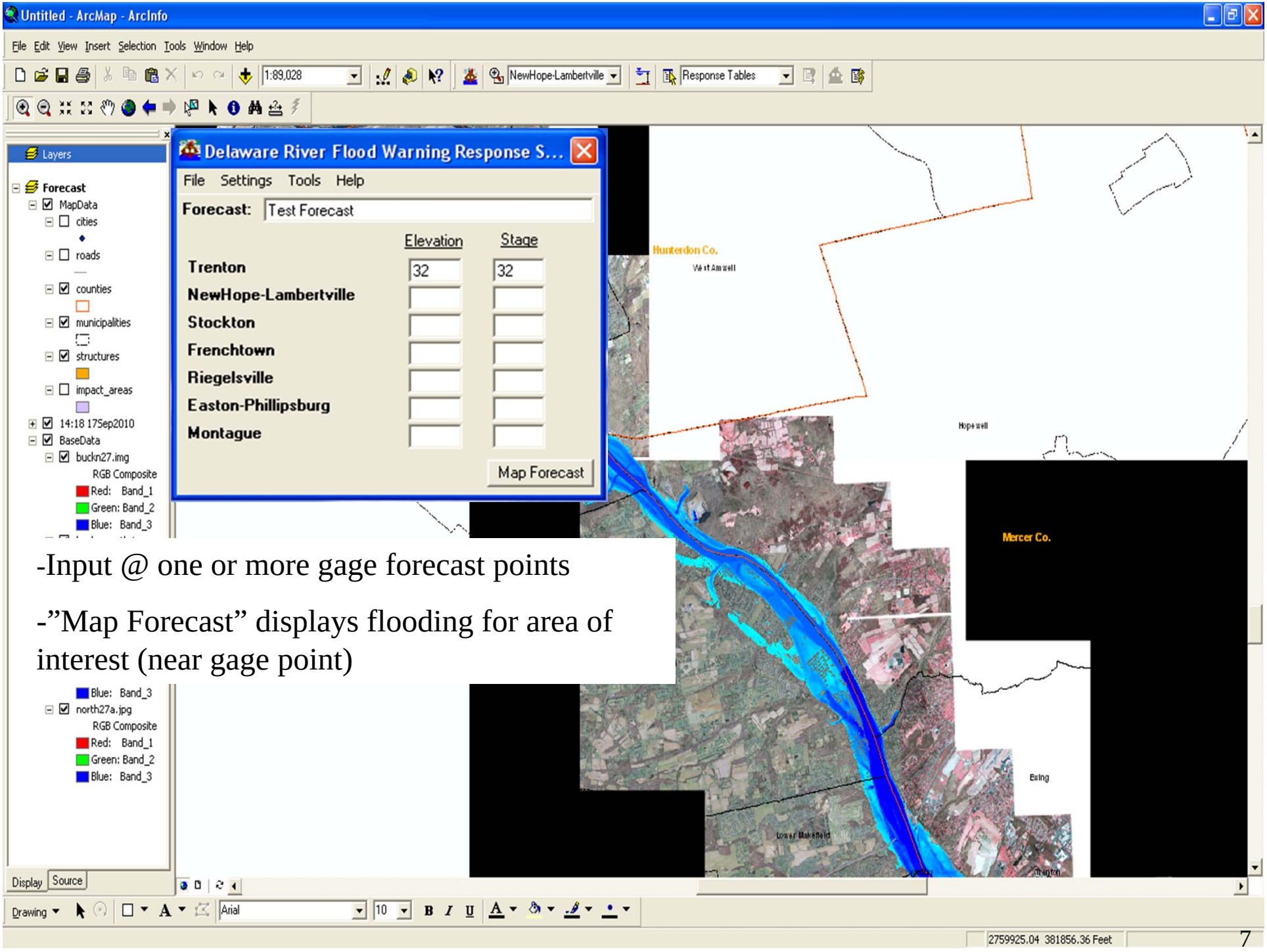
- Topographic data limitations (some areas use 4-foot contour interval)
- Supporting hydraulic modeling is old
- Static mapping; no real-time calculations of flood depths
- NWS forecast limitations will carry through
- Not meant to be used for flood depths in the channel
- Quick: static mapping means displays are readily available
- User can add their own data easily as overlay/underlay

Delaware River Flood Inundation Mapping Effort

Philadelphia Engineer District

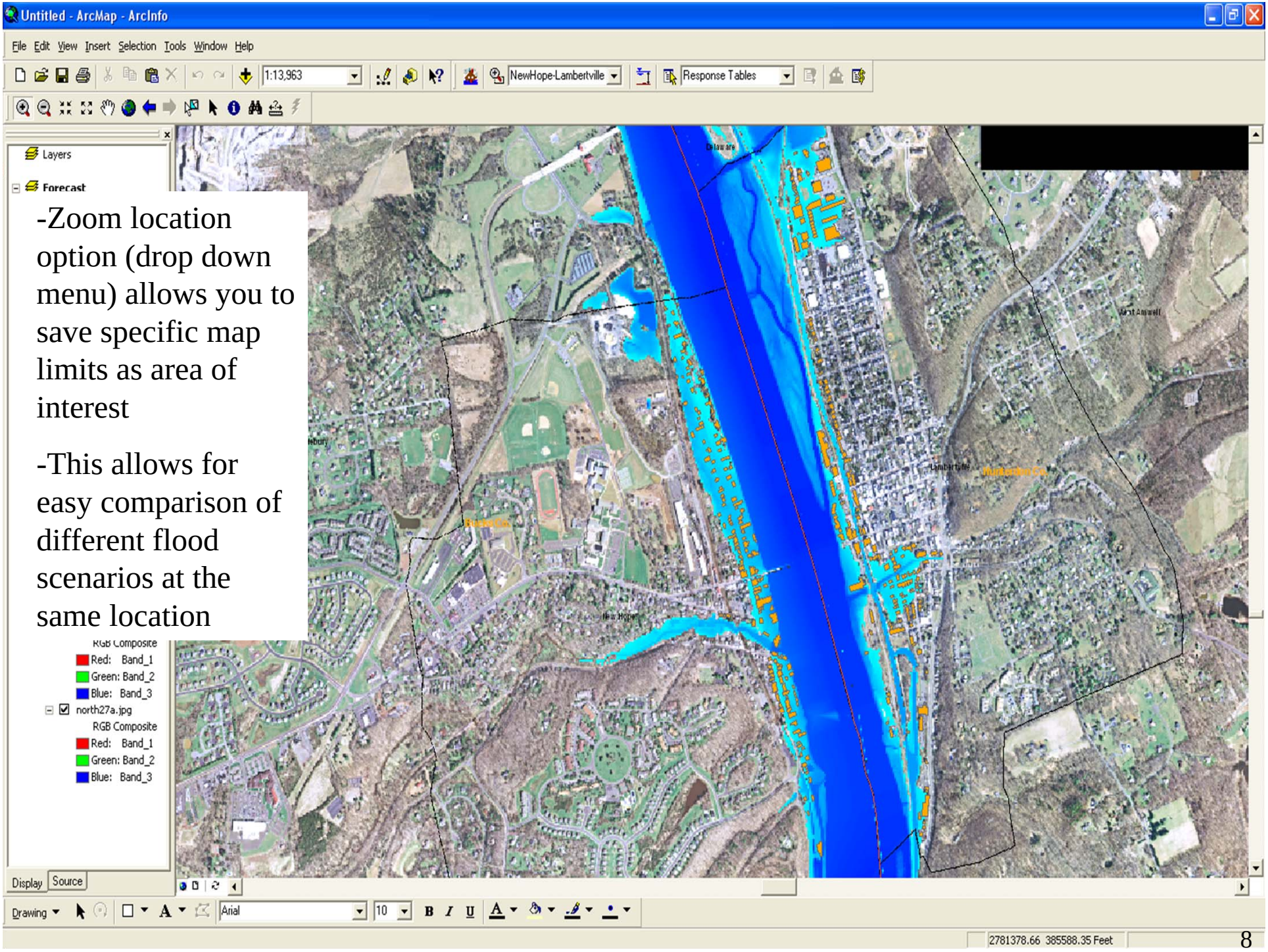
- Stand alone GIS application runs with ArcMap 9.x
- Graphical user interface added as custom toolbar
- Screen shots follow that illustrate function of each button on toolbar

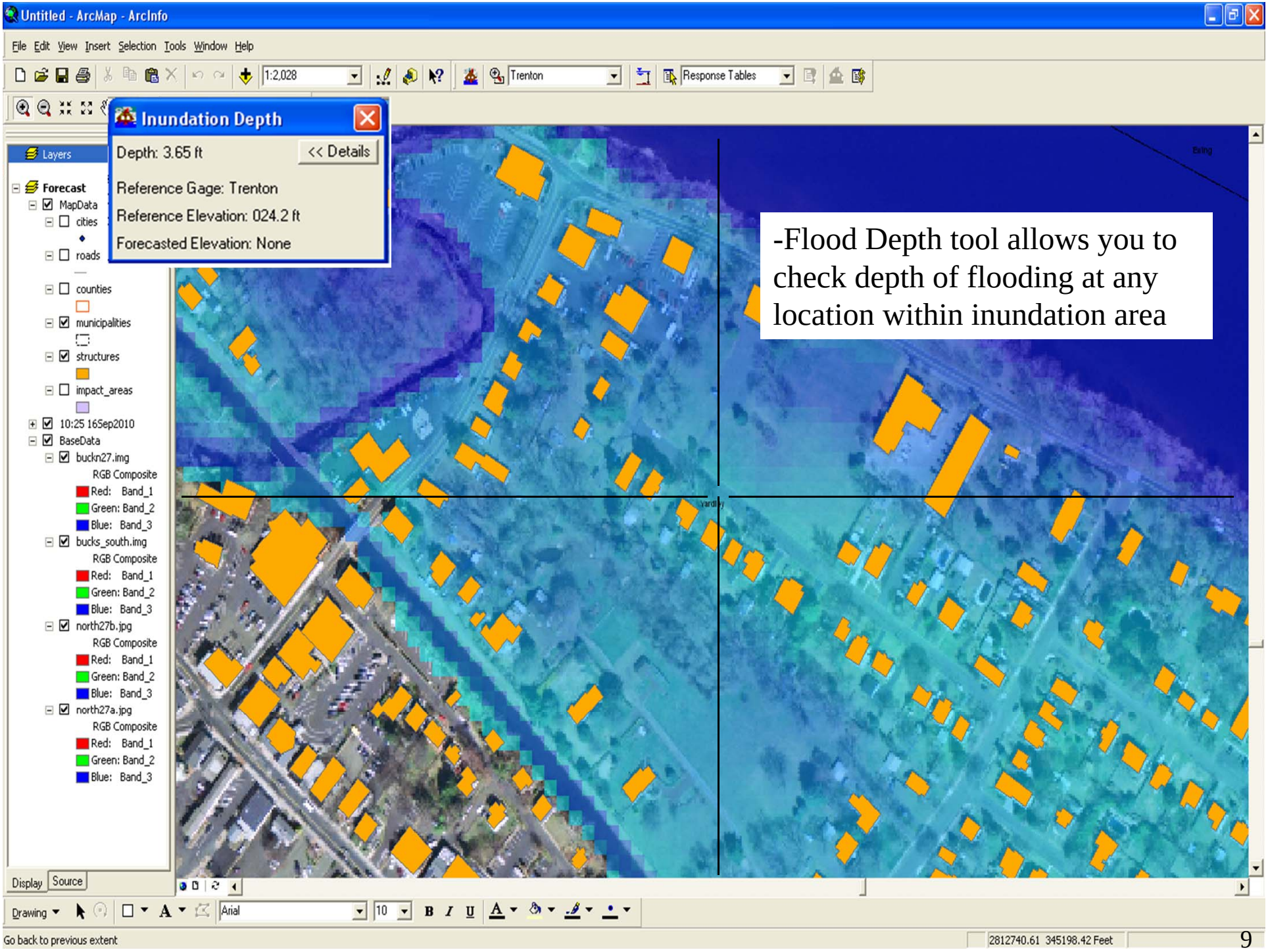


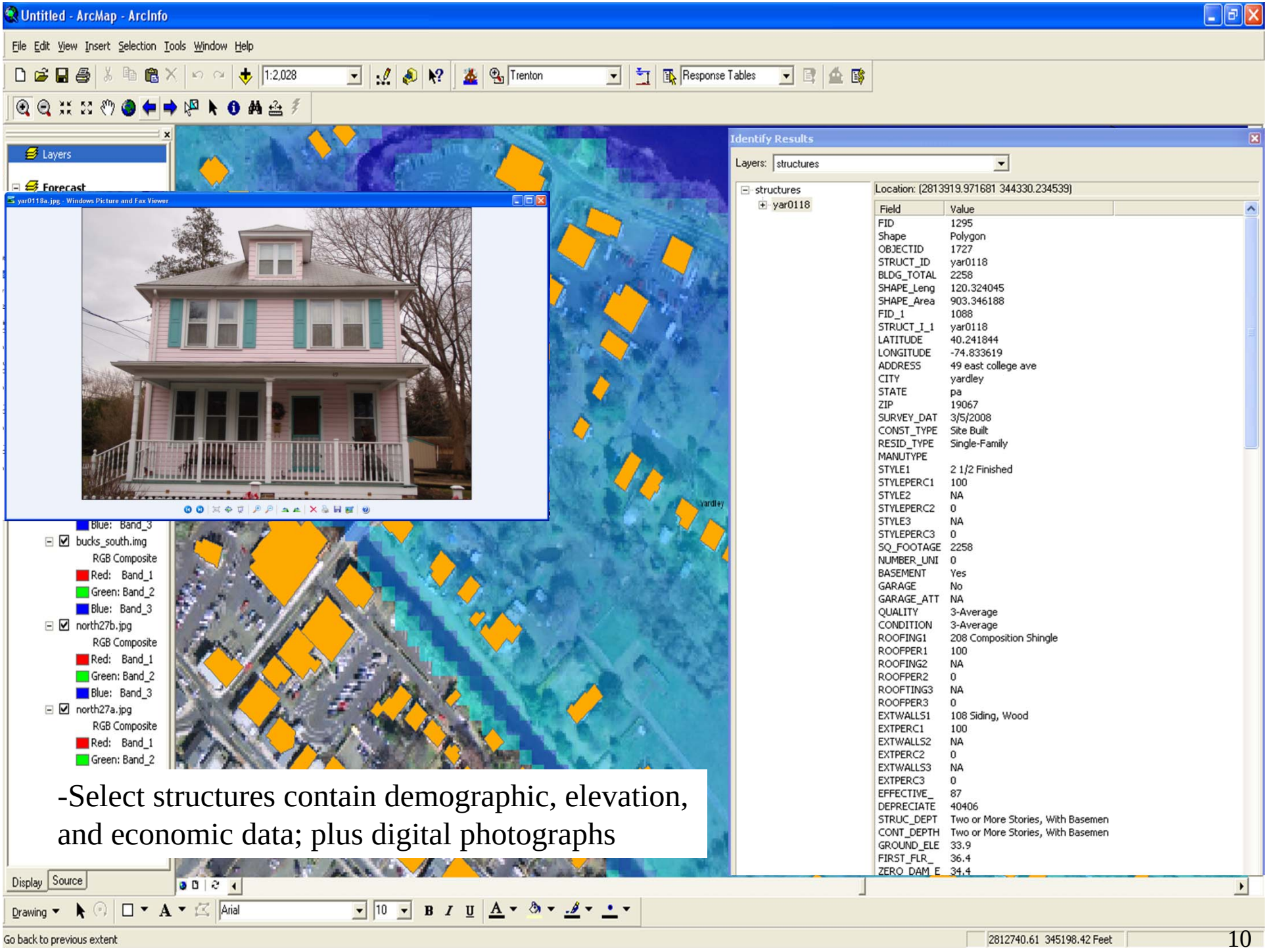


-Input @ one or more gage forecast points

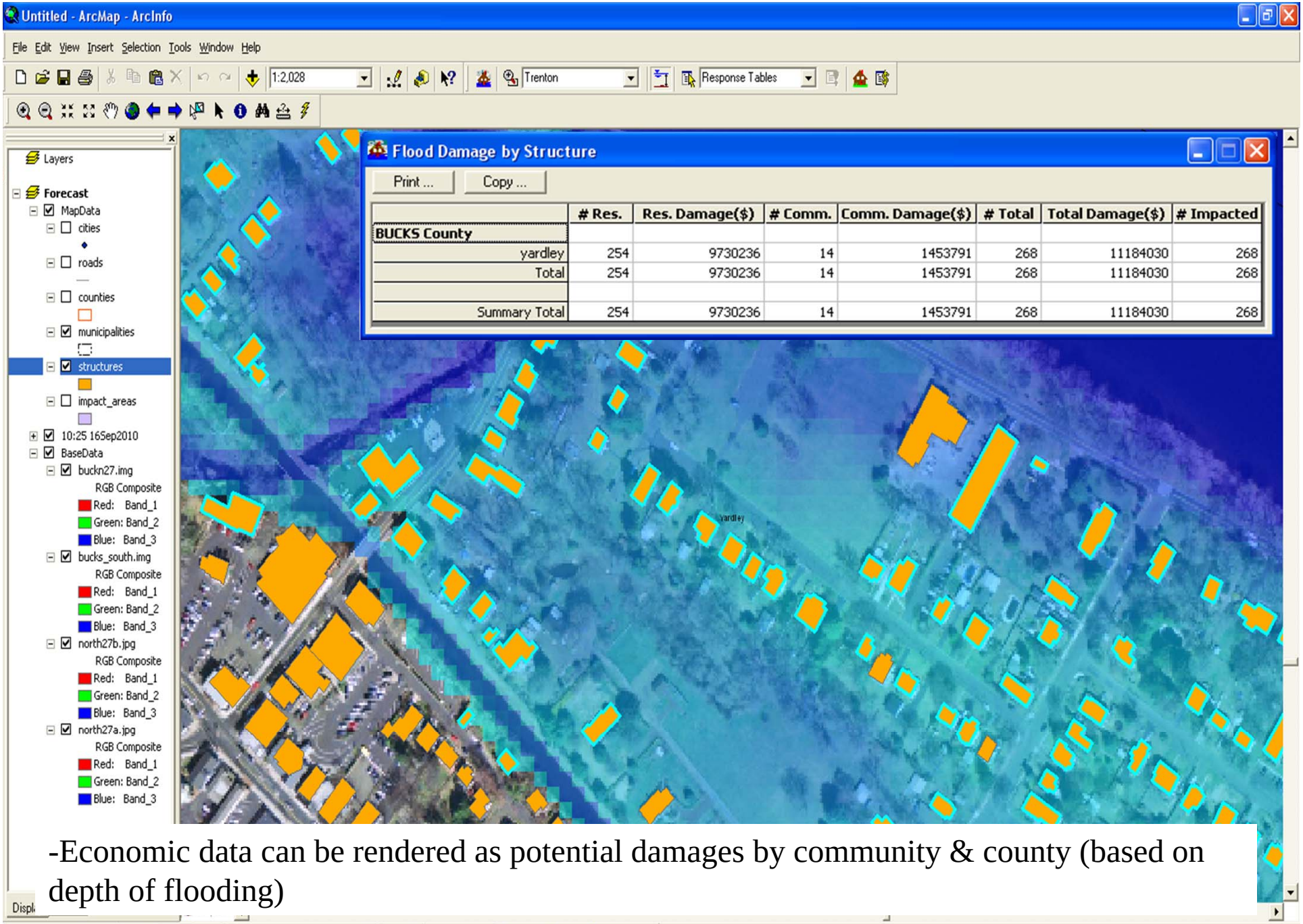
-"Map Forecast" displays flooding for area of interest (near gage point)


Untitled - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
1:13,963
NewHope-Lambertville
Response Tables
Layers
Forecast
-Zoom location option (drop down menu) allows you to save specific map limits as area of interest
-This allows for easy comparison of different flood scenarios at the same location
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
north27a.jpg
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
Display
Source
Drawing
Arial
10
2781378.66 385588.35 Feet

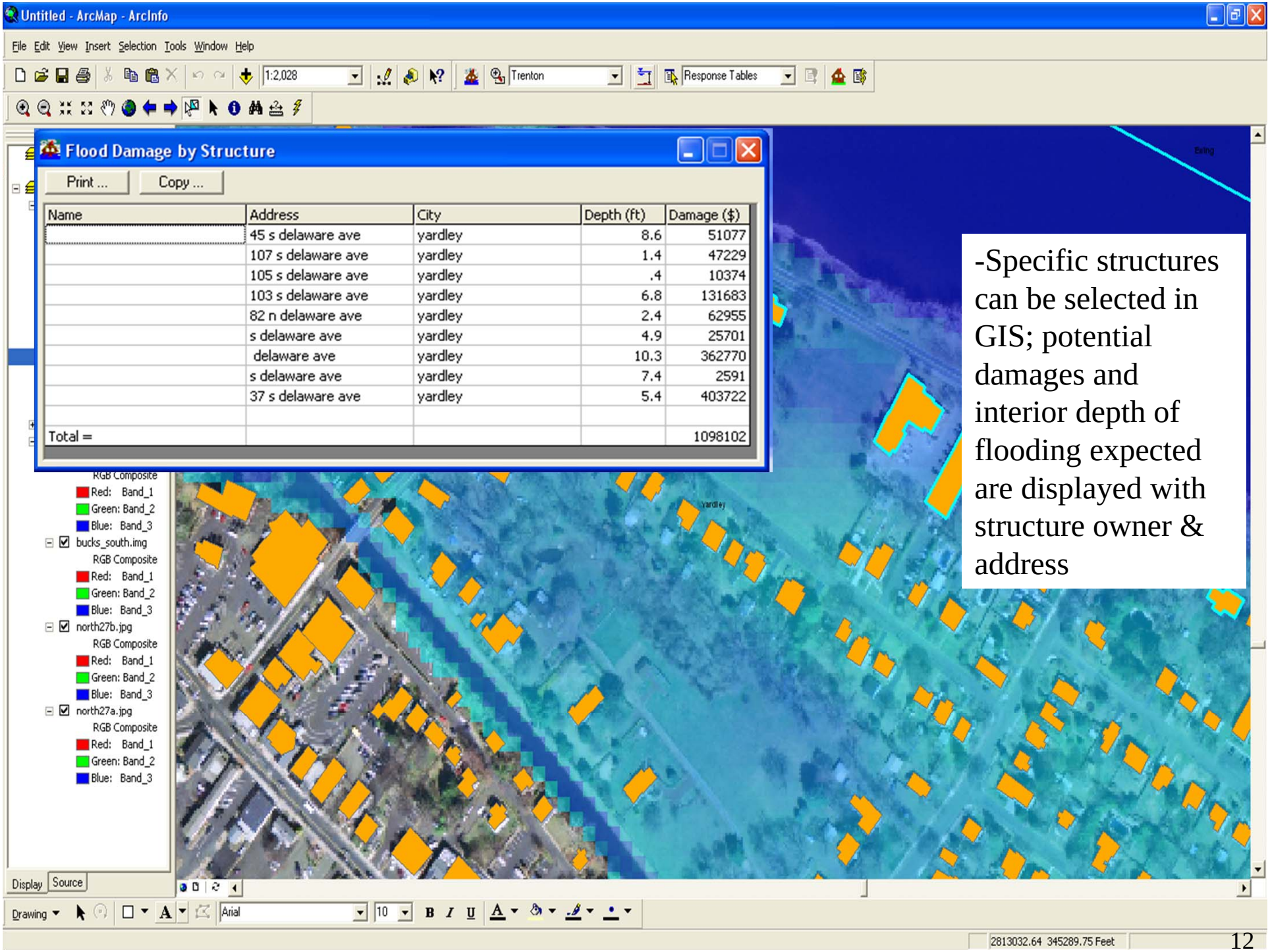

Untitled - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
1:2,028
Trenton
Response Tables
Inundation Depth
Depth: 3.65 ft
<< Details
Reference Gage: Trenton
Reference Elevation: 024.2 ft
Forecasted Elevation: None
Layers
Forecast
MapData
cities
roads
counties
municipalities
structures
impact_areas
10:25 16Sep2010
BaseData
buckn27.img
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
bucks_south.img
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
north27b.jpg
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
north27a.jpg
RGB Composite
Red: Band_1
Green: Band_2
Blue: Band_3
Display
Source
Drawing
Arial
10
Go back to previous extent
2812740.61 345198.42 Feet
-Flood Depth tool allows you to check depth of flooding at any location within inundation area



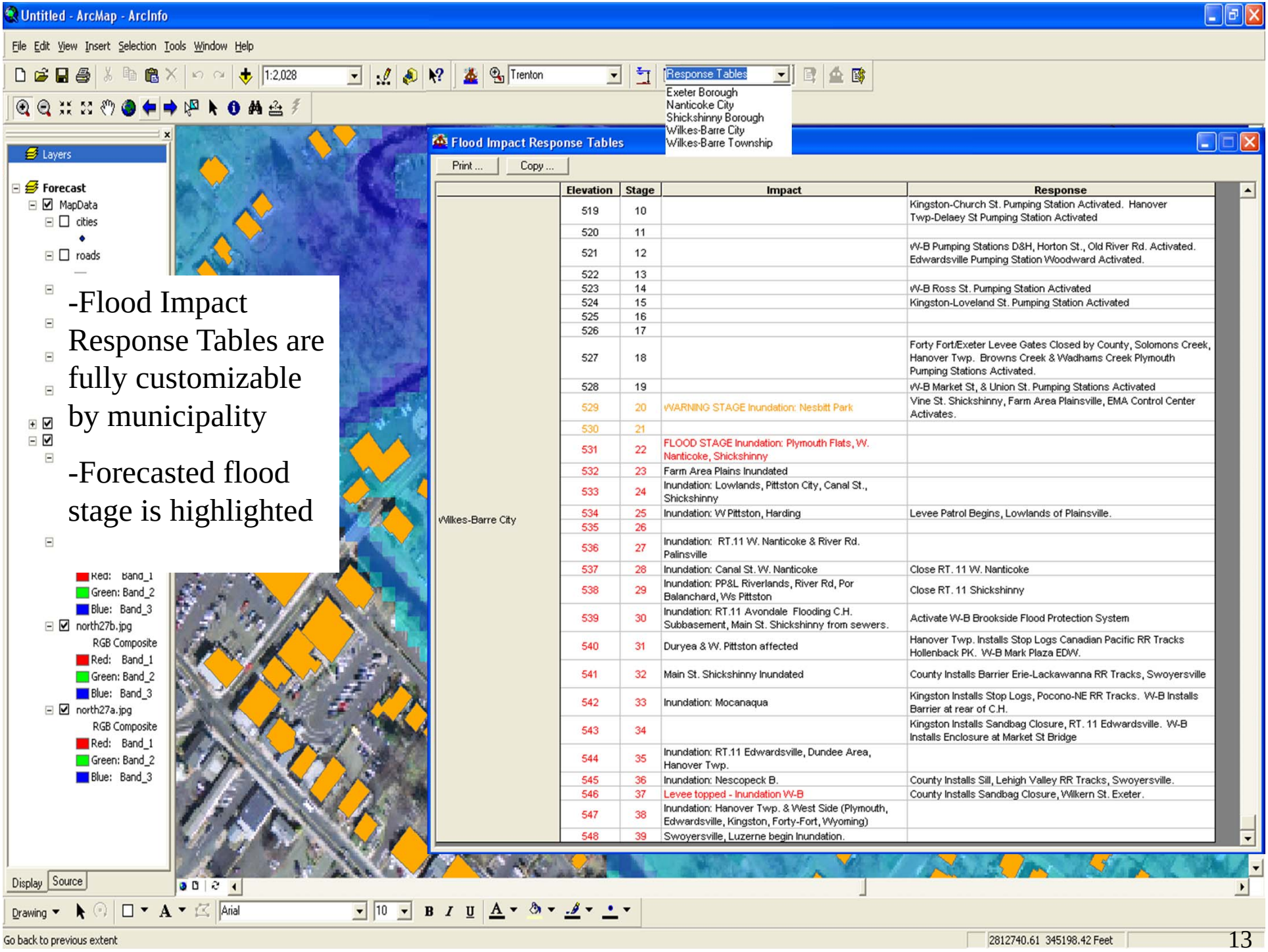
-Select structures contain demographic, elevation, and economic data; plus digital photographs



-Economic data can be rendered as potential damages by community & county (based on depth of flooding)



-Specific structures can be selected in GIS; potential damages and interior depth of flooding expected are displayed with structure owner & address



-Flood Impact Response Tables are fully customizable by municipality

-Forecasted flood stage is highlighted

Flood Impact Response Tables

Print ... Copy ...

	Elevation	Stage	Impact	Response
	519	10		Kingston-Church St. Pumping Station Activated. Hanover Twp-Delaey St Pumping Station Activated
	520	11		
	521	12		W-B Pumping Stations D&H, Horton St., Old River Rd. Activated. Edwardsville Pumping Station Woodward Activated.
	522	13		
	523	14		W-B Ross St. Pumping Station Activated
	524	15		Kingston-Loveland St. Pumping Station Activated
	525	16		
	526	17		
	527	18		Forty Fort/Exeter Levee Gates Closed by County, Solomons Creek, Hanover Twp. Browns Creek & Wadhams Creek Plymouth Pumping Stations Activated.
	528	19		W-B Market St, & Union St. Pumping Stations Activated
	529	20	WARNING STAGE Inundation: Nesbitt Park	Vine St. Shickshinny, Farm Area Plainsville, EMA Control Center Activates.
	530	21		
	531	22	FLOOD STAGE Inundation: Plymouth Flats, W. Nanticoke, Shickshinny	
	532	23	Farm Area Plains Inundated	
	533	24	Inundation: Lowlands, Pittston City, Canal St., Shickshinny	
	534	25	Inundation: W Pittston, Harding	Levee Patrol Begins, Lowlands of Plainsville.
Wilkes-Barre City	535	26		
	536	27	Inundation: RT.11 W. Nanticoke & River Rd. Palinsville	
	537	28	Inundation: Canal St. W. Nanticoke	Close RT. 11 W. Nanticoke
	538	29	Inundation: PP&L Riverlands, River Rd, Por Balanchard, Ws Pittston	Close RT. 11 Shickshinny
	539	30	Inundation: RT.11 Avondale Flooding C.H. Subbasement, Main St. Shickshinny from sewers.	Activate W-B Brookside Flood Protection System
	540	31	Duryea & W. Pittston affected	Hanover Twp. Installs Stop Logs Canadian Pacific RR Tracks Hollenback PK. W-B Mark Plaza EDW.
	541	32	Main St. Shickshinny Inundated	County Installs Barrier Erie-Lackawanna RR Tracks, Swoyersville
	542	33	Inundation: Mocanaqua	Kingston Installs Stop Logs, Pocono-NE RR Tracks. W-B Installs Barrier at rear of C.H.
	543	34		Kingston Installs Sandbag Closure, RT. 11 Edwardsville. W-B Installs Enclosure at Market St Bridge
	544	35	Inundation: RT.11 Edwardsville, Dundee Area, Hanover Twp.	
	545	36	Inundation: Nescopeck B.	County Installs Sill, Lehigh Valley RR Tracks, Swoyersville.
	546	37	Levee topped - Inundation W-B	County Installs Sandbag Closure, Wilkern St. Exeter.
	547	38	Inundation: Hanover Twp. & West Side (Plymouth, Edwardsville, Kingston, Forty-Fort, Wyoming)	
	548	39	Swoyersville, Luzerne begin Inundation.	