



Delaware River Flood Inundation Mapping Effort



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



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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



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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



- 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



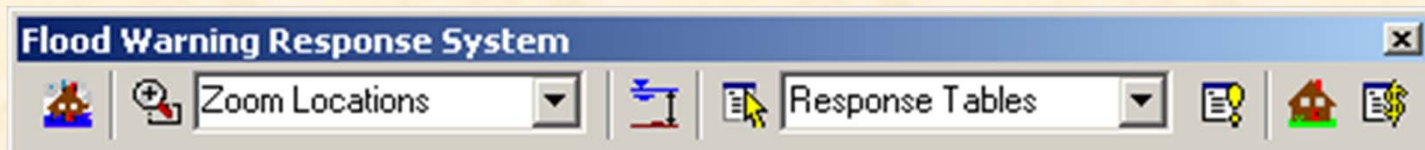
- Topographic data limitations (some areas use 4-foot contour interval)
- Supporting hydraulic modeling is old
- Static mapping; no real-time calculations of flood depths
- NWS forecast limitations will carry through
- Not meant to be used for flood depths in the channel
- Quick: static mapping means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



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- 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



Untitled - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

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NewHope-Lambertville

Response Tables

Layers

Forecast

- MapData
 - cities
 - roads
- counties
- municipalities
- structures
- impact_areas
- 14:18 17Sep2010
 - BaseData
 - buckn27.img
 - RGB Composite
 - Red: Band_1
 - Green: Band_2
 - Blue: Band_3

Delaware River Flood Warning Response S...

File Settings Tools Help

Forecast: Test Forecast

	Elevation	Stage
Trenton	32	32
NewHope-Lambertville		
Stockton		
Frenchtown		
Riegelsville		
Easton-Phillipsburg		
Montague		

Map Forecast

Hunterdon Co.
West Amwell

Hope well

Mercer Co.

Ewing

Lower Makefield

Blue: Band_3

- north27a.jpg
 - RGB Composite
 - Red: Band_1
 - Green: Band_2
 - Blue: Band_3

Display Source

Drawing

Arial

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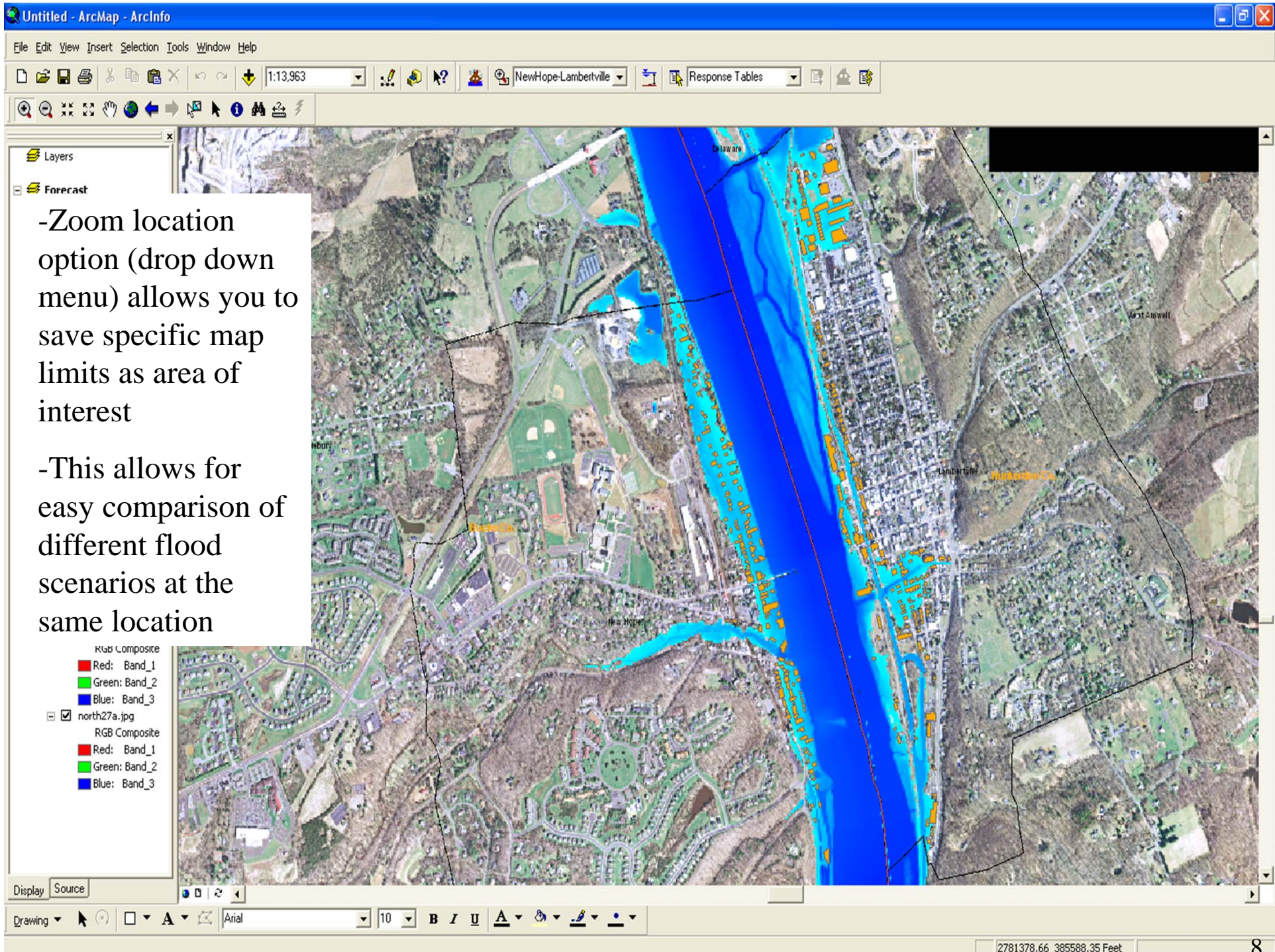
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2759925.04 381856.36 Feet

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-Input @ one or more gage forecast points

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



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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

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2812740.61 345198.42 Feet

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The screenshot shows the ArcMap interface with a flood depth map. A pop-up window titled 'Inundation Depth' is open over a specific location on the map. The window displays the following information: Depth: 3.65 ft, Reference Gage: Trenton, Reference Elevation: 024.2 ft, and Forecasted Elevation: None. The map shows a residential area with buildings highlighted in orange and flood depths indicated by a color gradient from light blue to dark purple. A text box on the right side of the map states: '-Flood Depth tool allows you to check depth of flooding at any location within inundation area'. The interface includes a menu bar, a toolbar, a layers panel on the left, and a status bar at the bottom.

-Flood Depth tool allows you to check depth of flooding at any location within inundation area

Untitled - ArcMap - ArcInfo


File Edit View Insert Selection Tools Window Help

1:2,028 Trenton Response Tables

Layers

Forecast

yar0118a.jpg - Windows Picture and Fax Viewer



Identify Results

Layers: structures

structures

yar0118

Location: (2813919.971681 344330.234539)

Field	Value
FID	1295
Shape	Polygon
OBJECTID	1727
STRUCT_ID	yar0118
BLDG_TOTAL	2258
SHAPE_Leng	120.324045
SHAPE_Area	903.346188
FID_1	1088
STRUCT_I_1	yar0118
LATITUDE	40.241844
LONGITUDE	-74.833619
ADDRESS	49 east college ave
CITY	yardley
STATE	pa
ZIP	19067
SURVEY_DAT	3/5/2008
CONST_TYPE	Site Built
RESID_TYPE	Single-Family
MANUTYPE	
STYLE1	2 1/2 Finished
STYLEPERC1	100
STYLE2	NA
STYLEPERC2	0
STYLE3	NA
STYLEPERC3	0
SQ_FOOTAGE	2258
NUMBER_UNI	0
BASEMENT	Yes
GARAGE	No
GARAGE_ATT	NA
QUALITY	3-Average
CONDITION	3-Average
ROOFING1	208 Composition Shingle
ROOFER1	100
ROOFING2	NA
ROOFER2	0
ROOFING3	NA
ROOFER3	0
EXTWALLS1	108 Siding, Wood
EXTPERC1	100
EXTWALLS2	NA
EXTPERC2	0
EXTWALLS3	NA
EXTPERC3	0
EFFECTIVE_	87
DEPRECIATE	40406
STRUC_DEPT	Two or More Stories, With Basemen
CONT_DEPTH	Two or More Stories, With Basemen
GROUND_ELE	33.9
FIRST_FLR_	36.4
ZERO DAM E	34.4

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

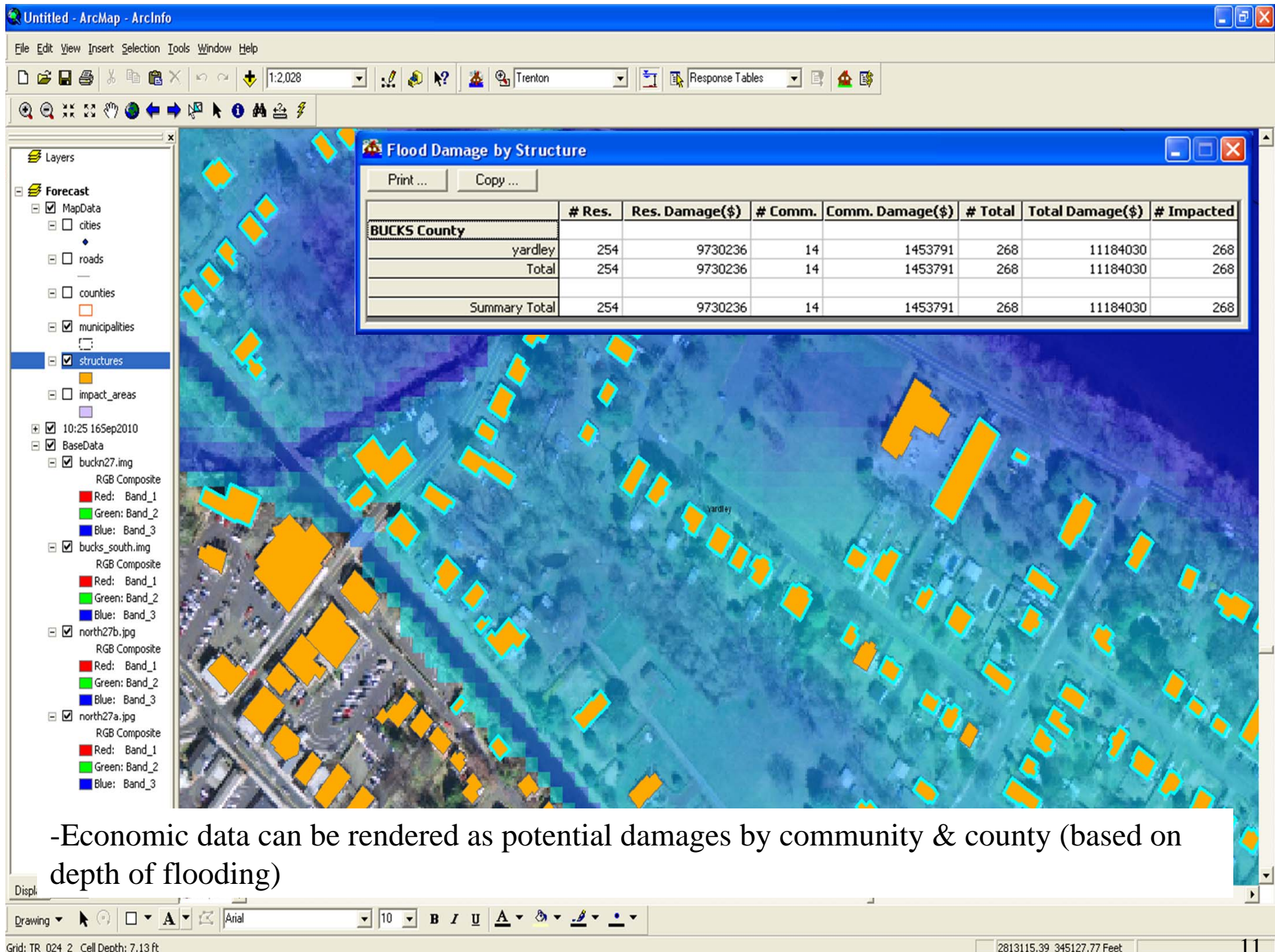
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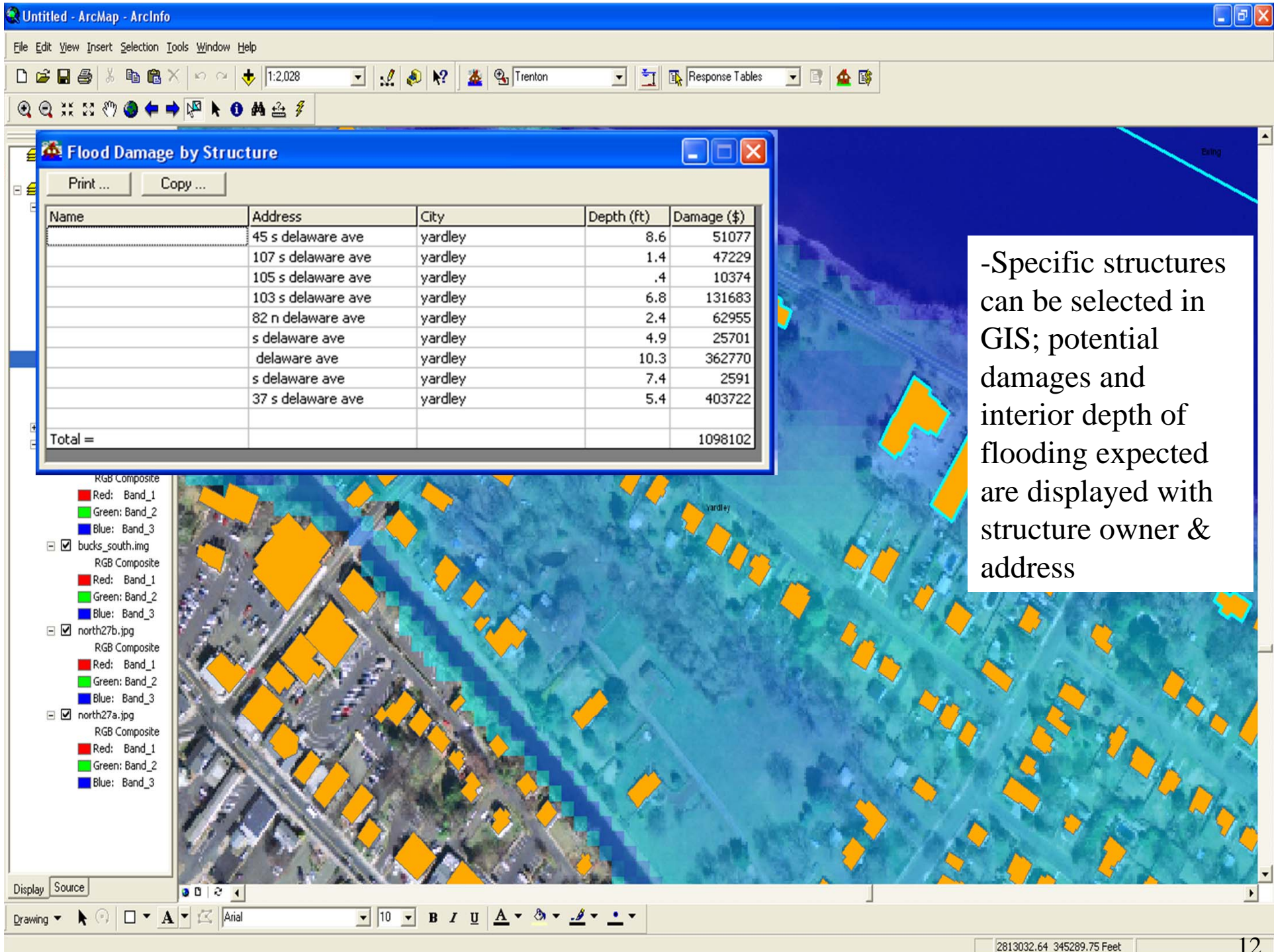
Go back to previous extent

2812740.61 345198.42 Feet

-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)



Untitled - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

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Trenton

Response Tables

- Exeter Borough
- Nanticoke City
- Shickshinny Borough
- Wilkes-Barre City
- Wilkes-Barre Township

Layers

- Forecast
 - MapData
 - cities
 - roads
 - Flood Impact
 - Response Tables are fully customizable by municipality
 - Forecasted flood stage is highlighted

north27b.jpg
 RGB Composite
 north27a.jpg
 RGB Composite

Wilkes-Barre City

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.
	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.	

Display Source

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