21st Annual GIS/CAMA Technologies Conference Chattanooga Convention Center

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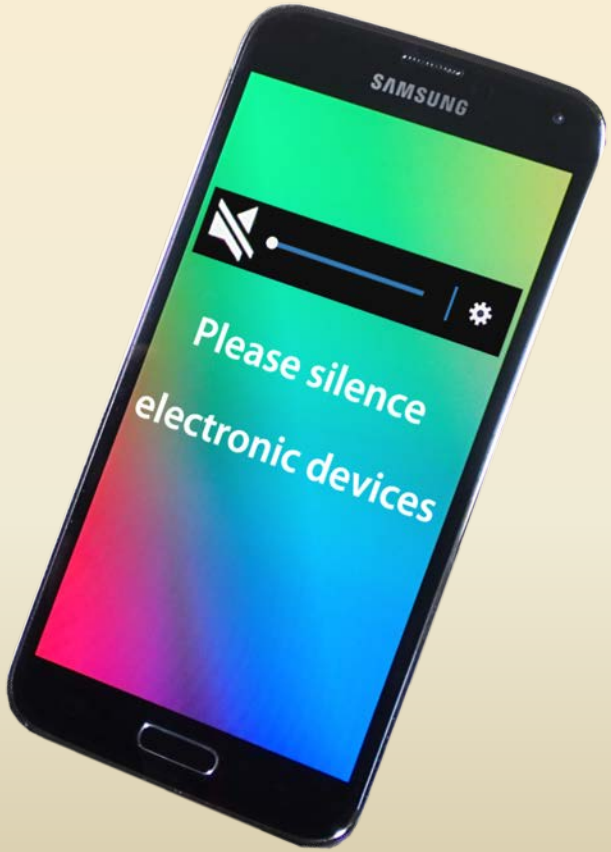
Recertification Credit forms for CE credit can be collected from the Registration Desk on <u>Thursday</u>.

Housekeeping

The conference proceedings will be available approximately 8 weeks after the conference.



Developing Natural Hazard Mitigation Plan with Parcel Data

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In Y2K, the Congress approved **Disaster Mitigation Act (DMA)**, commonly known as the 2000 Stafford Act amendments.

The Act encourages and rewards those county and state governments that develop and implement their community-specific mitigation plans.

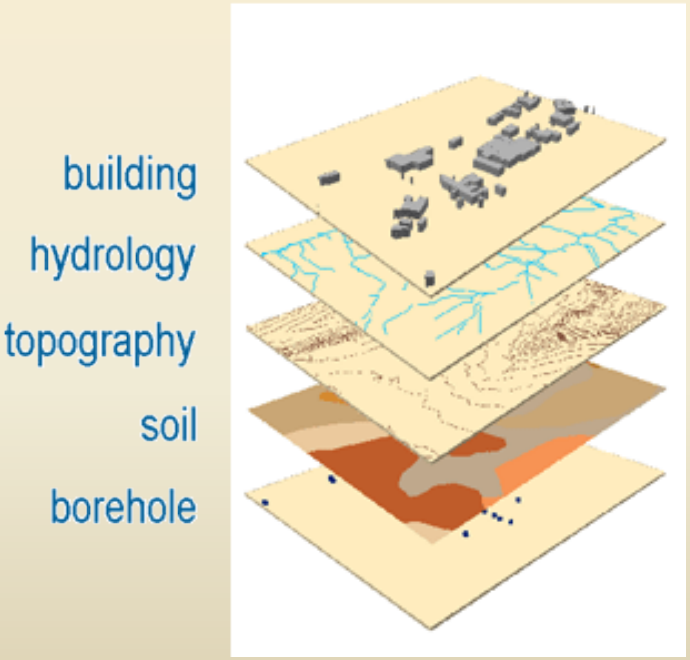
As an incentive, the State of Ohio requires county governments to develop and submit mitigation plans in order to obtain disaster relief funds.

To produce a natural hazard mitigation plan, the first step, according to FEMA (the Federal Emergency Management Agency), is to:

(1) identify the types of natural hazards that might affect the community; and

(2) estimate the possible financial losses that might result from those hazards.

GIS (Geographic Information Systems) is a tool necessary to achieve the goals.



Many county governments, however, do not have sufficient resources to produce their Natural Disaster Mitigation Plan.

Universities, with GIS resources and expertise, can help county governments producing natural disaster mitigation plans efficiently.


Wood
Sandusky
Huron
Hardin
Preble

GIS was used to analyze natural hazards and estimate the possible financial losses from the hazards.

GIS analysis and the resulting maps became the centerpiece of each county's natural hazard mitigation plan.

Each county's mitigation was then submitted to the Ohio Emergency Management Agency (OEMA) and the Federal Emergency Management Agency (FEMA) for peer review.

Once a plan is approved by OEMA and FEMA, a certificate will be awarded to the county.

The county is then compliance with the federal Disaster Mitigation Act and qualified for natural disaster relieve fund.

The steps of using GIS to build a county-level mitigation plan including:

1. Collecting data

2. Performing GIS analysis

3. Producing maps

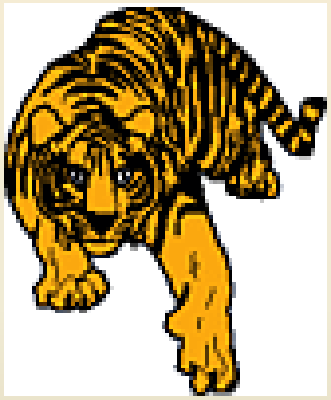
Data Collection

GIS data were first collected from each county's Auditor's office.

The data from county Auditor's office normally includes limited GIS layers (e.g., township, parcel) and aerial photos.

Parcel data is the most important layer in the planning process.

TIGER data, downloaded from www.esri.com, were also used as a supplement the county data.



Two major natural hazards were identified in the five counties: flood and tornado.

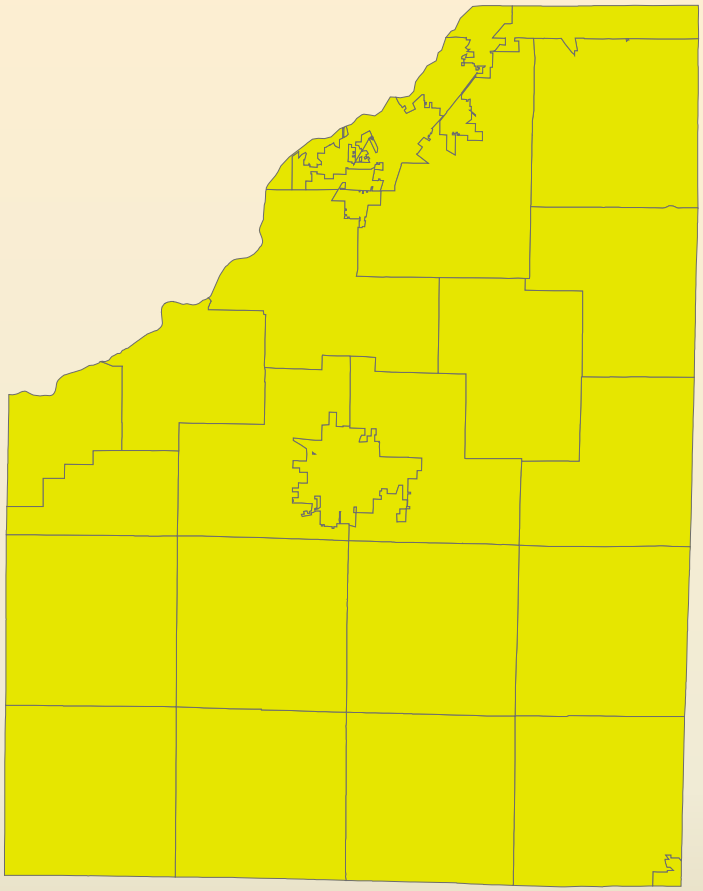
The flood maps, originally from FEMA, in shapefile format, were downloaded from the Ohio Department of Natural Resources' GIS warehouse **http://www.dnr.state.oh.us/gismain/** .

The historic tornado data can be found at NOAA's (National Oceanic and Atmospheric Administration) website at **http://www.noaa.gov/** .

GIS Operations

GIS operations for the mitigation planning are relatively **simple** and **straightforward**.

First, all GIS layers need to be converted into the same coordinate system: Ohio State Plane Coordinate System (North Zone).



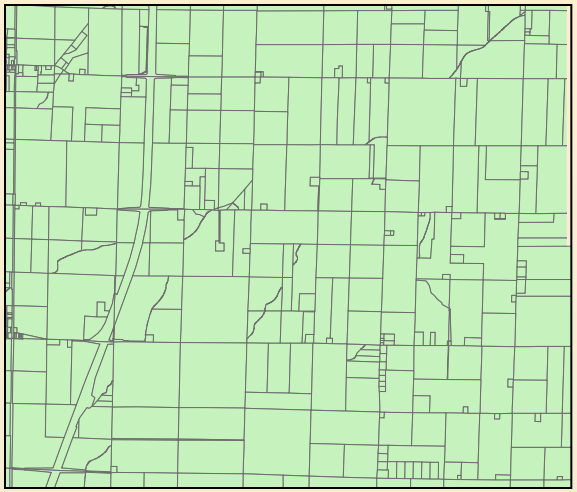
Ohio SPCS North Zone

Overlay is an essential operation in the GIS process.

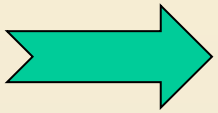
Example:

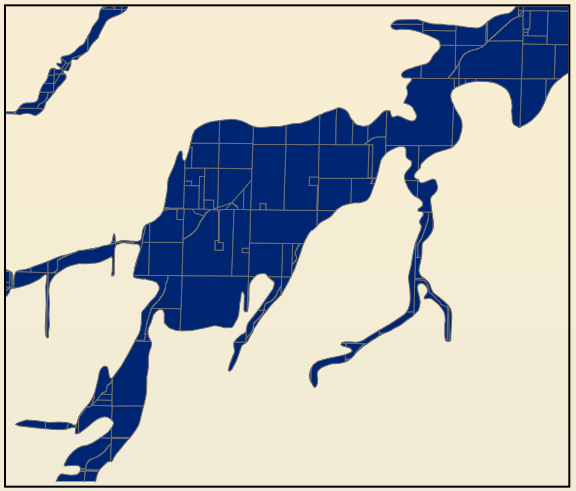
find all parcels within 100-year flood zone

parcel



flood





parcels within flood zone

Buffer function is also used in the process.

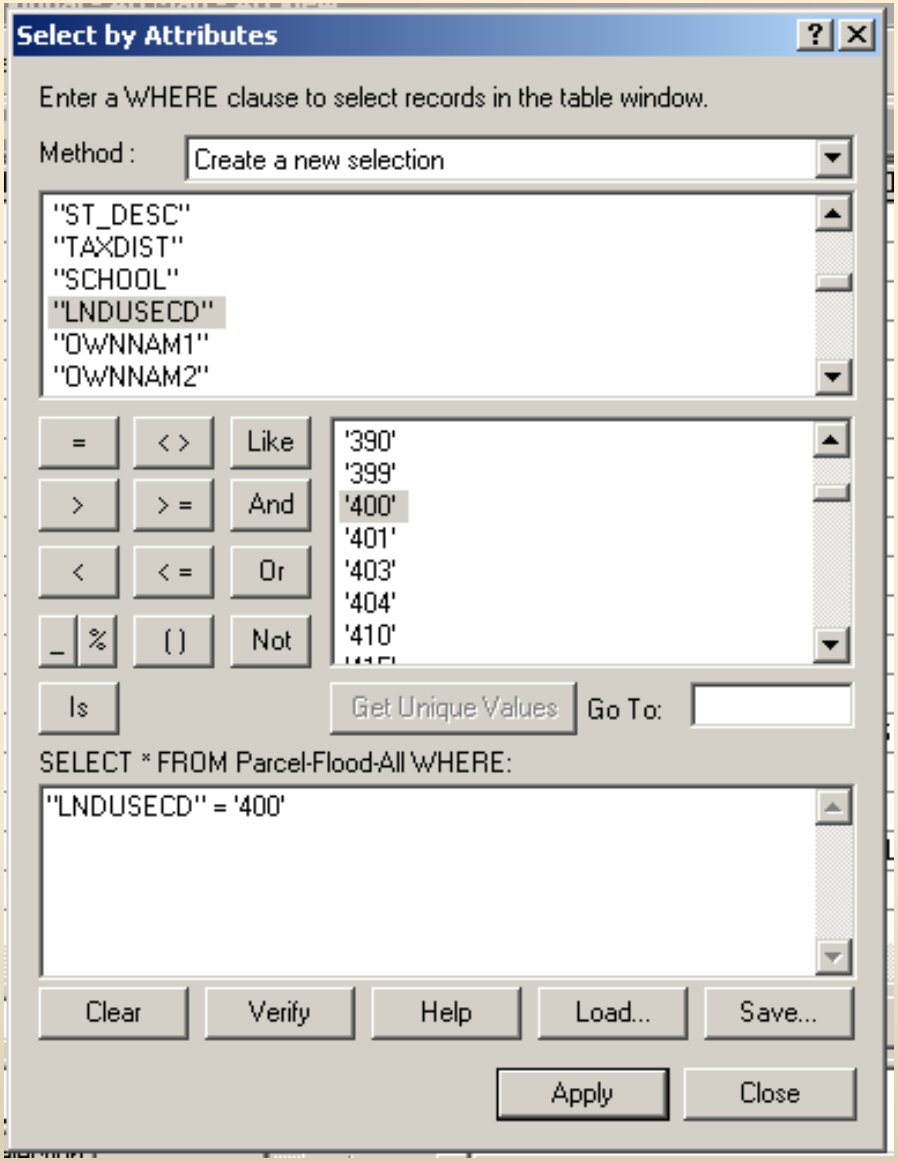
Example:

Buffer around the Class I dams

500/1000 feet vulnerability zones around Bowling Green water treatment reservoir

Attribute query is a fundamental function in estimating possible losses from a natural hazard.

Find all LULC code 400 in 100-year flood zone



Estimate possible losses of LULC code 400 from a 100-year flood

Selected Attributes of Parcel-Flood-All

LNDUSECD	MKTTOTVAL	ACRES	PARCELS_ID	PARCEL_NO	SALEAMT	DATE_	C
400	13600	5.97	3282	310350403009000	0		
400	3700	2.51	1701	512290301015000	48000	19921210	2
400	400	0.1	2659	511270000010000	0	19960930	1
400	7600	10.9	1384	512220000018000	55551	19951205	2
400	700	1.01	1362	512150000046000	0	19970121	9
400	700	1.01	1362	512150000046000	0	19970121	9
400	17800	0	447	509070205020000	6720	19850923	
400	5600	0	216	509070201023000	18000	19940816	1
400	16800	0	214	509070201022000	18000	19940816	1
400	8400	0.75	148	509080101016000	105000	19930811	1
400	224900	7.14	0	612150000022002	3646	20010606	1
400	401300	12.74	1087	612150000018002	3646	20010606	1
400	484500	15.38	1084	612150000017002	3646	20010606	1
400	13100	5.27	5209	712270000045000	25000	19880316	
400	400	0.08	2878	400180000009001	0	20000818	1
400	639400	0	2309	400070406004000	0	19941215	

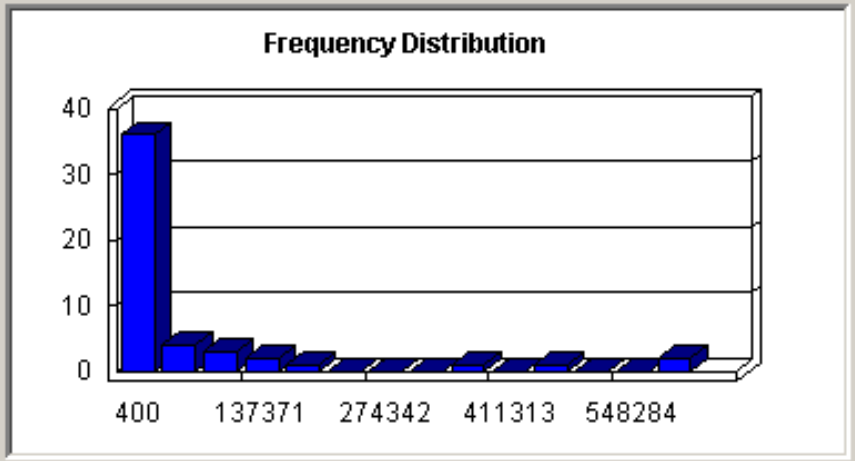
Record: 0 Show: All Selected Records (50 out of 5760 Selected.) Options

Selection Statistics of Parcel-Flood-All

Field: MKTTOTVAL

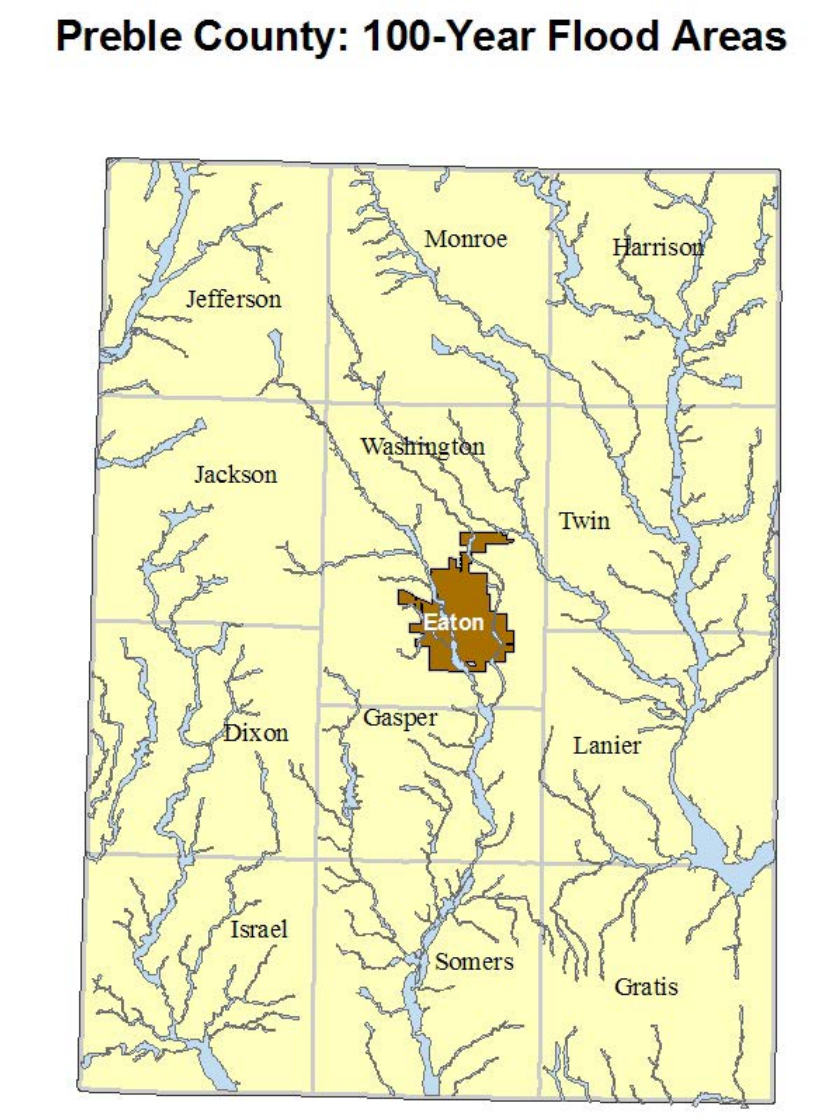
Statistics:

Count:	50
Minimum:	400.000000
Maximum:	639400.000000
Sum:	3810970.000000
Mean:	76219.400000
Standard Deviation:	147411.424827

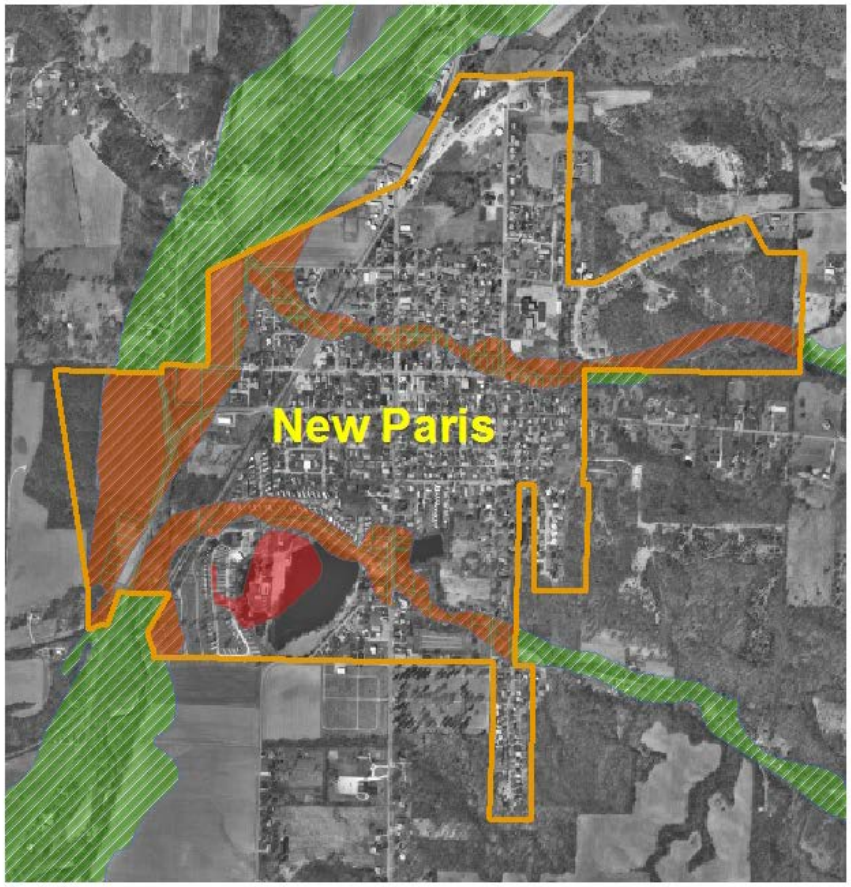


Many maps and tables are generated from GIS. These maps and tables are used in the final mitigation plans.

Examples of GIS Results



100-Year Flood Area: New Paris



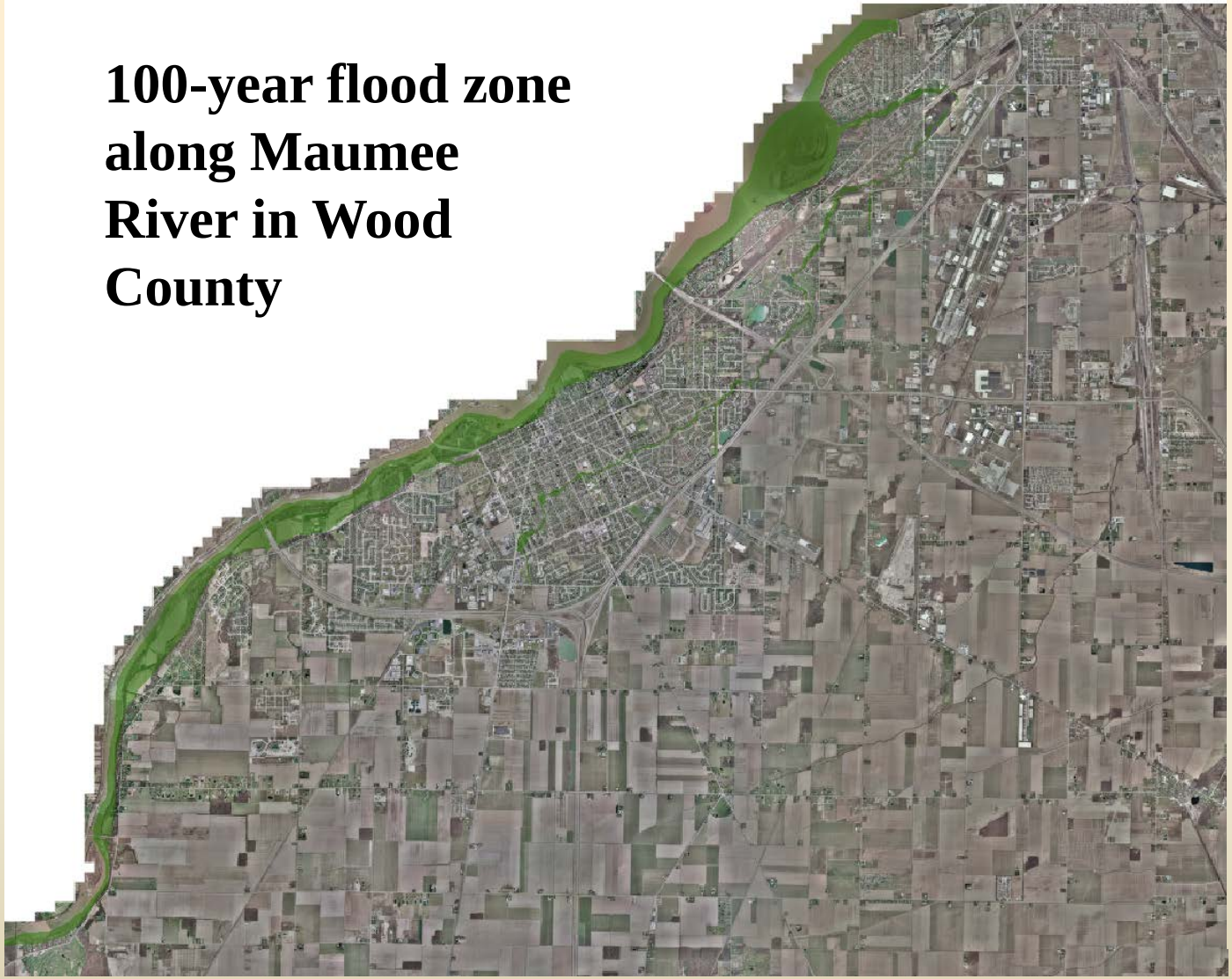
0 0.25 0.5 1 Miles

City Boundary

Parcels in flood zone

Land Use Types	Number of Parcels			Value of Parcels		
	# in County	# in Hazard Area	% in Hazard Area	$ in County	$ in Hazard Area	% in Hazard Area
Residential	21,110	2,520	12%	1,598,458,740	193,951,260	12%
Commercial	1,500	315	21%	184,943,410	33,137,550	18%
Industrial	211	44	21%	127,694,450	21,921,480	17%
Agricultural	9,668	3,380	35%	739,563,220	278,241,120	38%
Religious	334	53	16%	44,408,600	4,873,700	11%
Government	696	220	32%	208,514,200	74,315,700	35%
Education	78	9	12%	97,436,600	688,700	1%
Total	**37,085**	**7,227**	**19%**	**3,001,027,820**	**607,198,110**	**20%**

100-year flood zone along Maumee River in Wood County



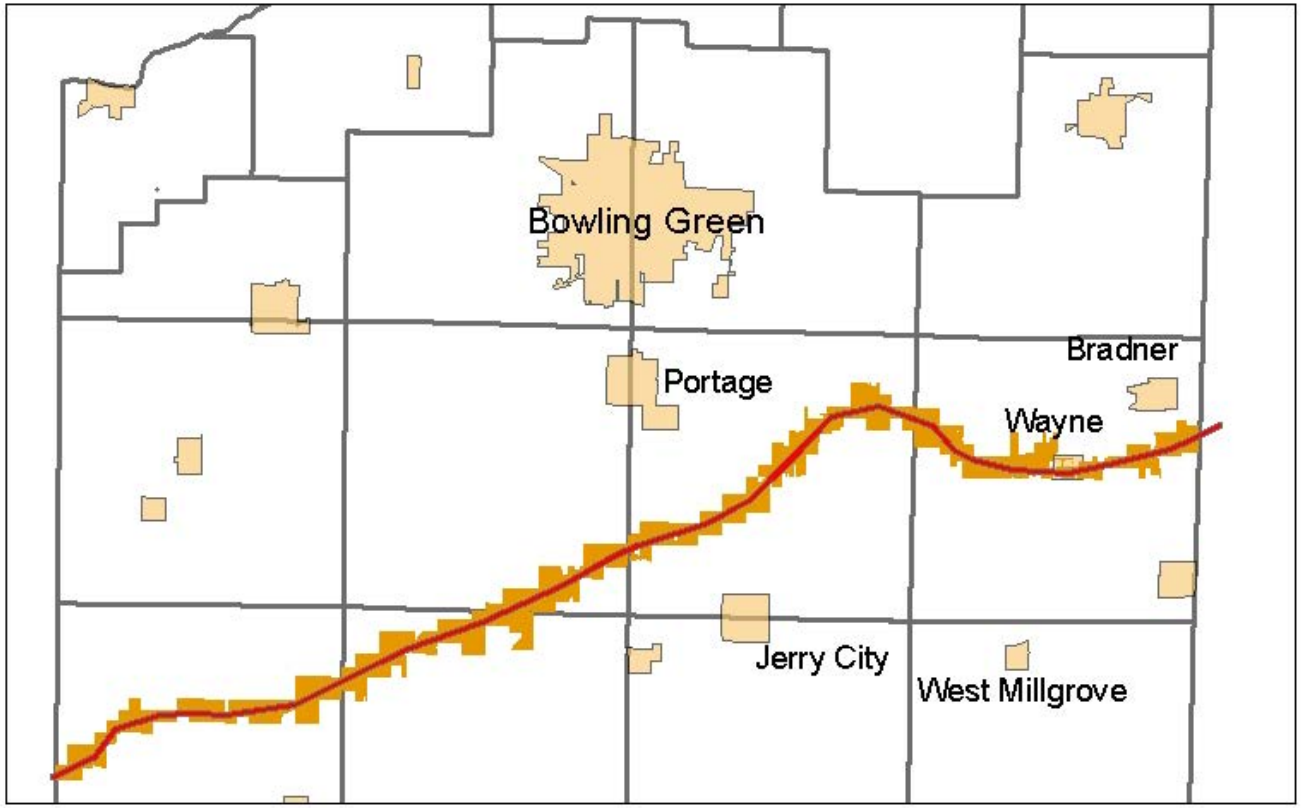
Estimation of Losses – Maumee River flood

Type of Parcel (Occupancy Class)	Number of Parcels in Hazard Area	Value of Parcels in Hazard Area
Residential	1,240	$200,862,460
Commercial	106	$18,998,110
Industrial	2	$401,640
Agricultural	179	$10,392,390
Religious	9	$7,510,400
Government	113	$10,225,100
Education	15	$42,888,000
Total	1,664	$291,278,100

Impacts of Maumee River 100-year flood on Grand Rapids, Wood County

Affected Incorporated Area	Number of Parcels			Value of Parcels		
	# in Comm-unity	# in Hazard Area	% in Hazard Area	$ (mil.) in Comm-unity	$ (mil.) in Hazard Area	% in Hazard Area
Grand Rapids	722	146	20%	$44	$7	17%
Perrysburg	8,014	465	6%	$1,345	$66	5%
Rossford	3,648	296	8%	$428	$71	16%
Northwood	3,948	29	1%	$357	$4	1%

Parcels affected by 1953 Tornado Path



Number of Parcels		Value of Parcels	
Year: 1953	Year: 2003	Year: 1953	Year: 2003
60	403	$1,500,000	$18,108,700

Problems

Making county-level natural hazard mitigation plan is simple and easy with GIS.

It can be done with basic GIS functions.

Some problems, however, have been experienced in the GIS processes.

Data Availability

Some counties, because of short GIS program history and lack of funding, provided only minimal or otherwise inadequate data.

Data Formats

One county only had parcel map of each individual township in AutoCAD format. These maps, without spatial references, had to be joined and converted to shapefiles.

Data Standardization

In many counties, the attribute tables could not be joined to the parcel map, simply because the parcel ID were not standardized.

Data Comparability

While some counties used USGS land use/land cover (LULC) classification system, some used unknown classification schemes.

One county's parcel layer does not have LULC field.

Data Accuracy (spatial)

Many parcels were not correctly digitized. This was very evident in road-related polygons.

Data Accuracy (attribute)

In some counties, the parcel property values were not updated. The financial data generated from the queries, therefore, were not current.

Towards Better Parcel Database

The quality of county-level parcel database can be improved for the purpose of natural hazard mitigation planning.

Standardizing Database

County GIS database should be standardized.

Example:

parcel ID with same coding system

LULC with scheme (e.g., USGS)

Redesign GIS Database

Converting from shapefile to geodatabase.

Develop New Layers

It will be better if there is a building-based layer.

Utilize GIS Functionalities

In current mitigation planning, only a few basic GIS functions (e.g., overlay and query) have been used. The power of GIS spatial analysis has not been fully utilized.

Example: Evacuation plan with network functions should be included in the future for plan development.

GIS Modeling

Example:

use of risk modeling in natural hazard loss assessment.


Thank You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