The Role of GIS in a Disaster Recovery Plan

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Introduction

- Four phases of disaster related planning
  - Mitigation
  - Preparation
  - Response
  - Recovery
- Considerable emphasis on response phase
- Recovery plans are vital to a region after a natural disaster
  - The recovery phase is characterized by activity to return life to normal or improved levels
- This presentation will discuss the use of GIS as an integral part of a transportation recovery plan after a natural disaster

Current Role of GIS in Disaster Recovery

- GIS is an integral tool in supporting damage assessment, network prioritization, and public education after a disaster
- Establish an extensive database in GIS, so that information is readily available when a disaster strikes
  - The use of GIS software is ideal for handling all of the data necessary for modeling after a natural disaster because an extensive database, including information such as system facilities, year they were built and current condition, is needed
- Widespread use of GIS by emergency management agencies to enhance the efficiency and productivity of their efforts
  - GIS enables an emergency manager to visualize and analyze natural disaster situations more accurately.
- The visualization capabilities also make GIS ideal for natural disaster modeling
  - HAZUS-MH
  - REDARS
- GIS needs to become a more integral tool pre-disaster

Developing a Disaster Recovery Plan

- 1) Identify key facilities to be given priority for reconstruction
  - Examples are industry, hospitals, residential areas, schools
- 2) Once facilities have been identified as a priority for reconstruction, roadways between those facilities and the edge of the damage perimeter are identified ("paths")
  - Network Analyst tool is used to determine the paths
  - Each path can contain any number of transportation components
- 3) Develop a database for all transportation components along a path
  - Each transportation component has a replacement cost and replacement time associated with it
  - A GIS database is ideally suited for the amount of data and the manipulation of the data
- 4) Assign a "benefit" associated with the repair of each path
- 5) Run data through mathematical model to prioritize routes for reconstruction

Data Description and Sources

- Benefit
  - Weighting factor based on the facilities importance to local and regional goals
- Paths
  - Section of roadway between a key facility and the edge of the damage perimeter
- Budget
  - Determined by state and local agencies
- Time period allowed for repairs
  - Determined by state and local agencies
- Transportation components
  - Include the roadway, bridges over water, overpasses, tunnels
  - Classified by 5 damage levels: none, slight, moderate, extensive and complete

Data Description and Sources

- Repair Costs of Transportation Components
  - Replacement Cost Ratio (REDARS)

Damage State	Mean Repair Cost Ratio
None	0.0
Slight	0.03
Moderate	0.08
Extensive	0.25
Complete	1.0

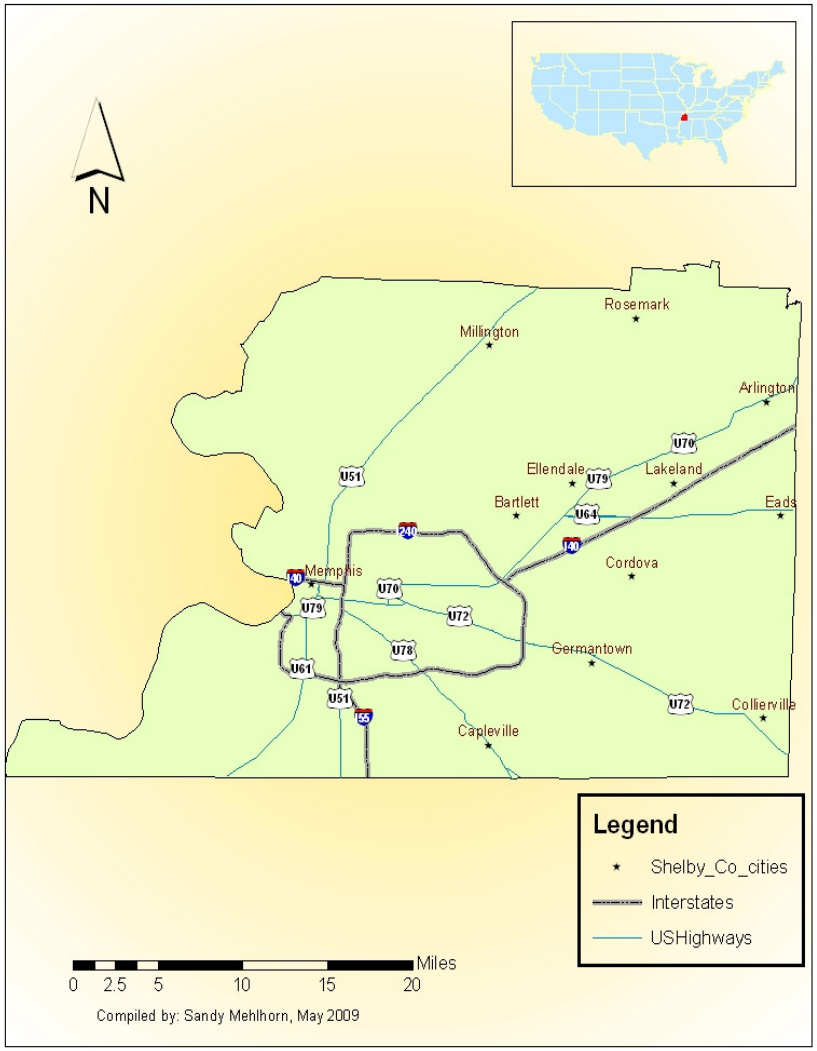
Data Description and Sources

- Repair Time of Transportation Components
  - Replacement Time Ratio (REDARS)

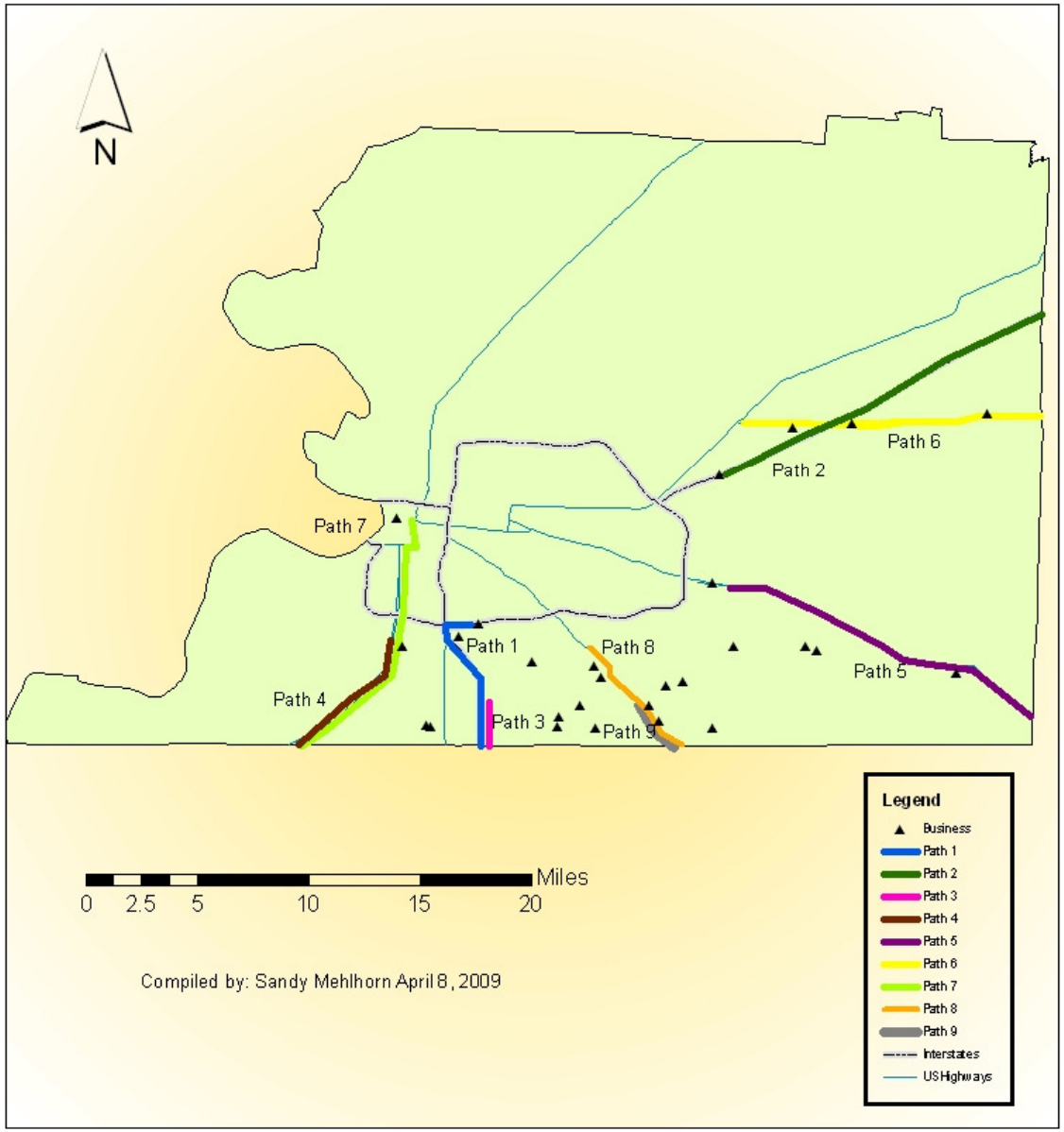
Damage State	Duration
None	1-5 days*
Slight	2-3 weeks
Moderate	2-4 weeks
Extensive	4-12 weeks
Complete	3-10 months

Recovery Plan Example

- Shelby County, Tennessee
  - "America's Distribution Center"
- For a quick recovery, local industry must be given accessibility
  - Top 25 revenue producing industries
  - Assume the damage perimeter is the edge of the county
  - Benefit of each path is the cumulative revenue of the industries along the path

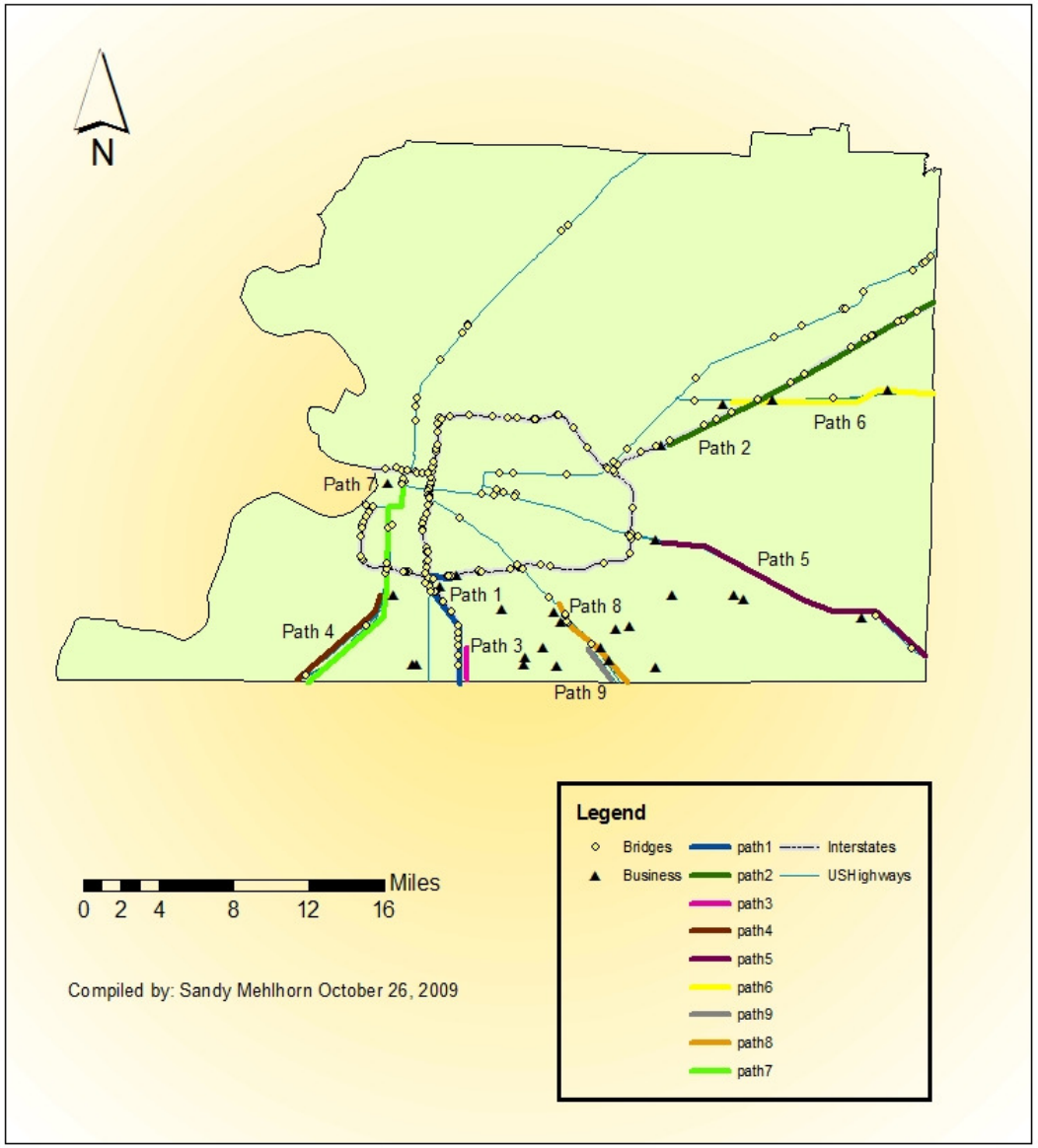


Locations of Paths and Industries



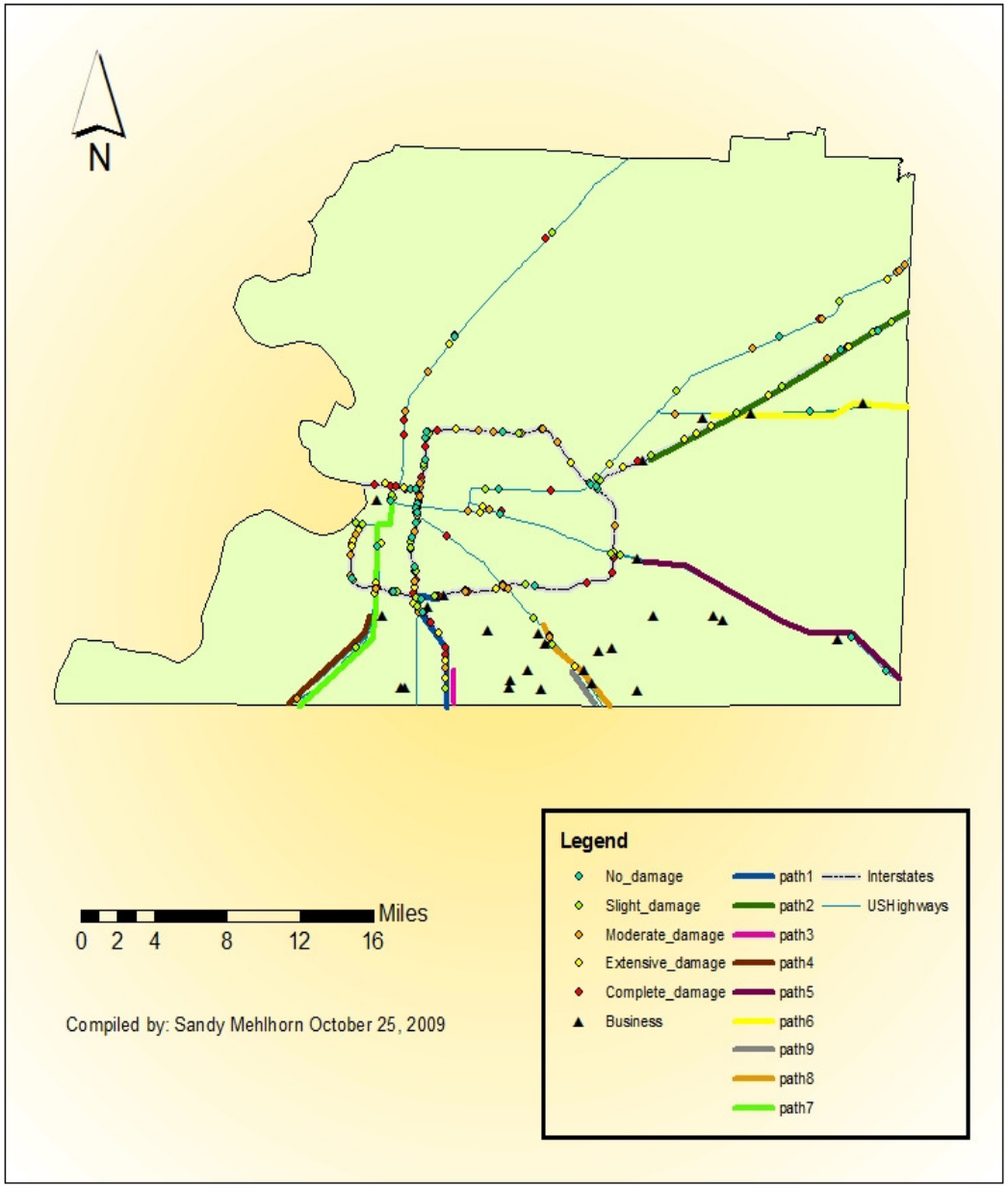
Path #	Roadway	Benefit (million $)
1	Interstates 240 & 55	13,500
2	Interstate 40	44,500
3	Interstate 55	3,400
4	US 61	9,600
5	US 72	81,600
6	US 64	5,700
7	US 61	6,200
8	US 78	166,298.3
9	US 78	116,025.5

Location of Bridges



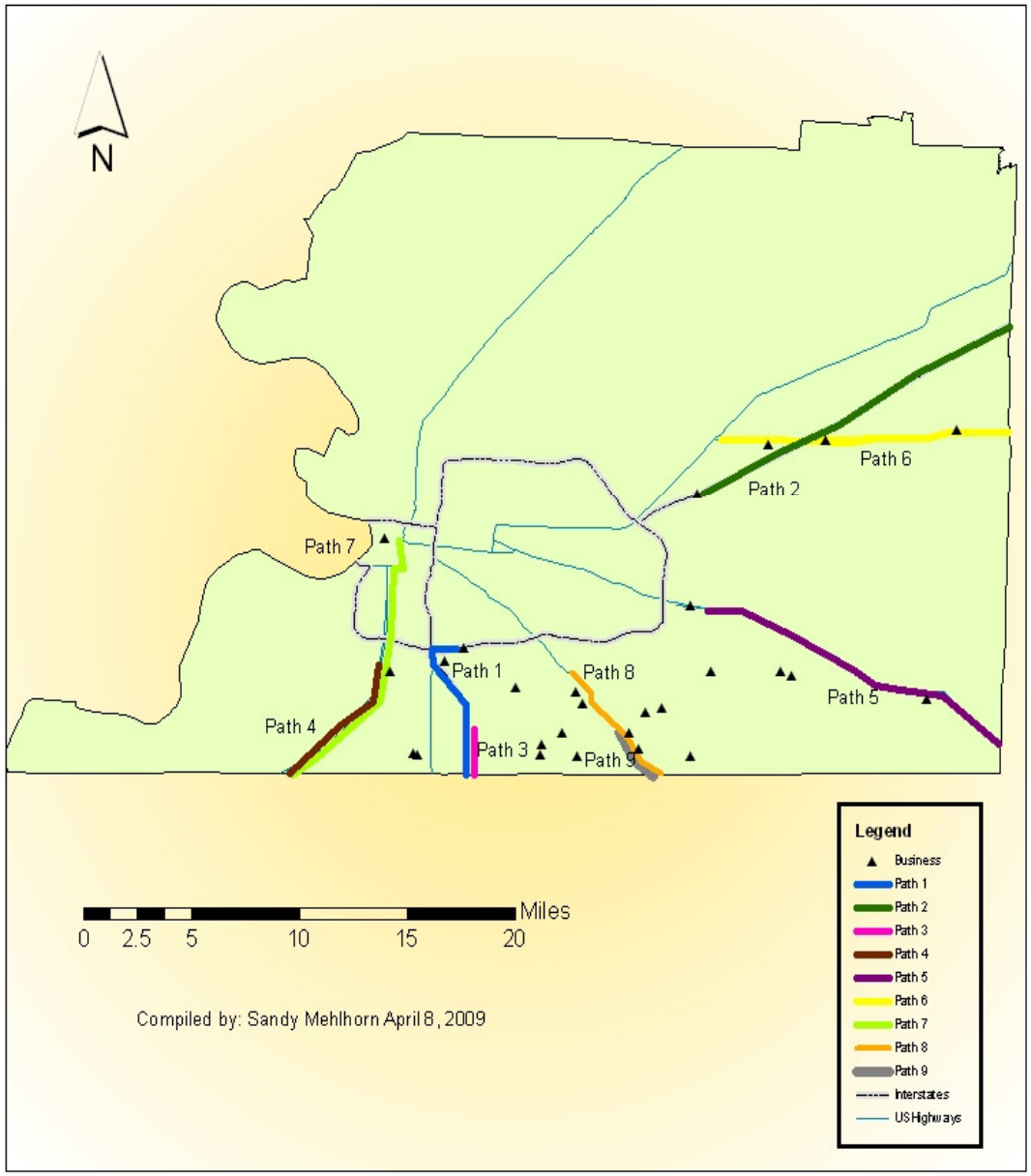
Damage Levels for Planning Scenario

- 15% not damaged
- 17% slightly damaged
- 22% moderately damaged
- 22% extensively damaged
- 22% completely damaged



Scenario Output

Budget	$10,000,000	
Time	Paths Complete	Recognized Benefit (million $)
6 months	5,6	87300
1 year	5,6,9	203325.5
1.5 years	5,6,8	253598.3
2 years	8,9	282324
2.5 years	8,9	282324
3 years	8,9	282324
3.5 years	8,9	282324
4 years	8,9	282324
4.5 years	8,9	282324
5 years	8,9	282324



Conclusion

- GIS should play a more integral role in planning for recovery from a disaster
- Network Analyst can be a valuable tool in planning for disaster reconstruction
- Time should be taken to prioritize routes for reconstruction
- There are advantages to prioritizing routes
  - Spending of maintenance money
  - Shorter time between response and beginning recovery

Questions or Comments?

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