

For Emergency Preparedness: Using ArcGIS, Census Data, and Local Data to Analyze Potential Human and Economic Impacts of River Flooding in Reno, Nevada



Reno-Tahoe Airport, 1997

Source: Truckee River Flood Management Project

Penn State MGIS
Capstone Project Peer Review
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Outline

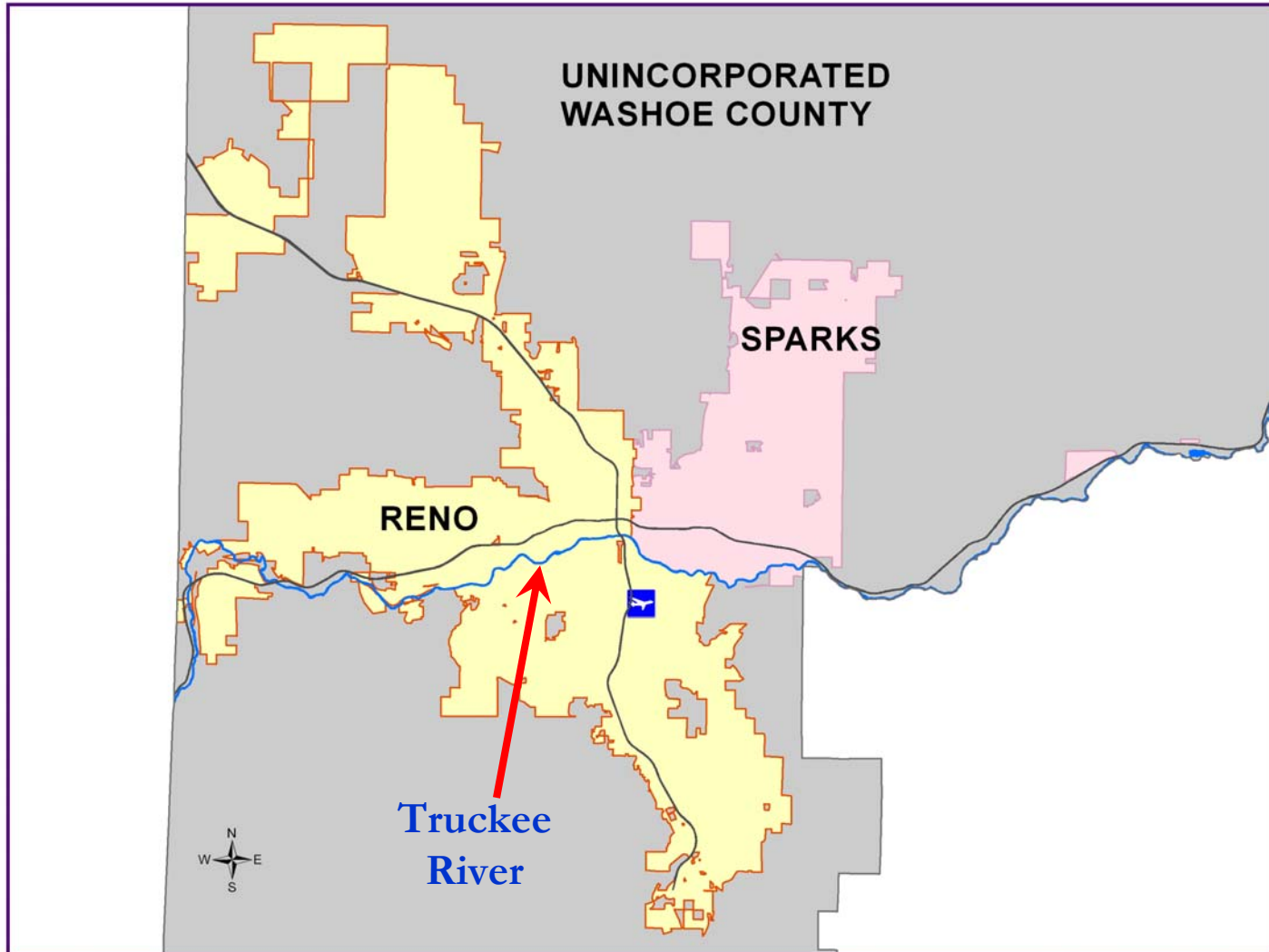
- Background – Flooding in Reno
- Area of Interest Maps
- Background Continued – Mitigation Efforts
- The Problem with Current Efforts
- Proposal – Goals and Objectives
- Proposed Methodology
- Data
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- Timeline

Background – Truckee River Flooding

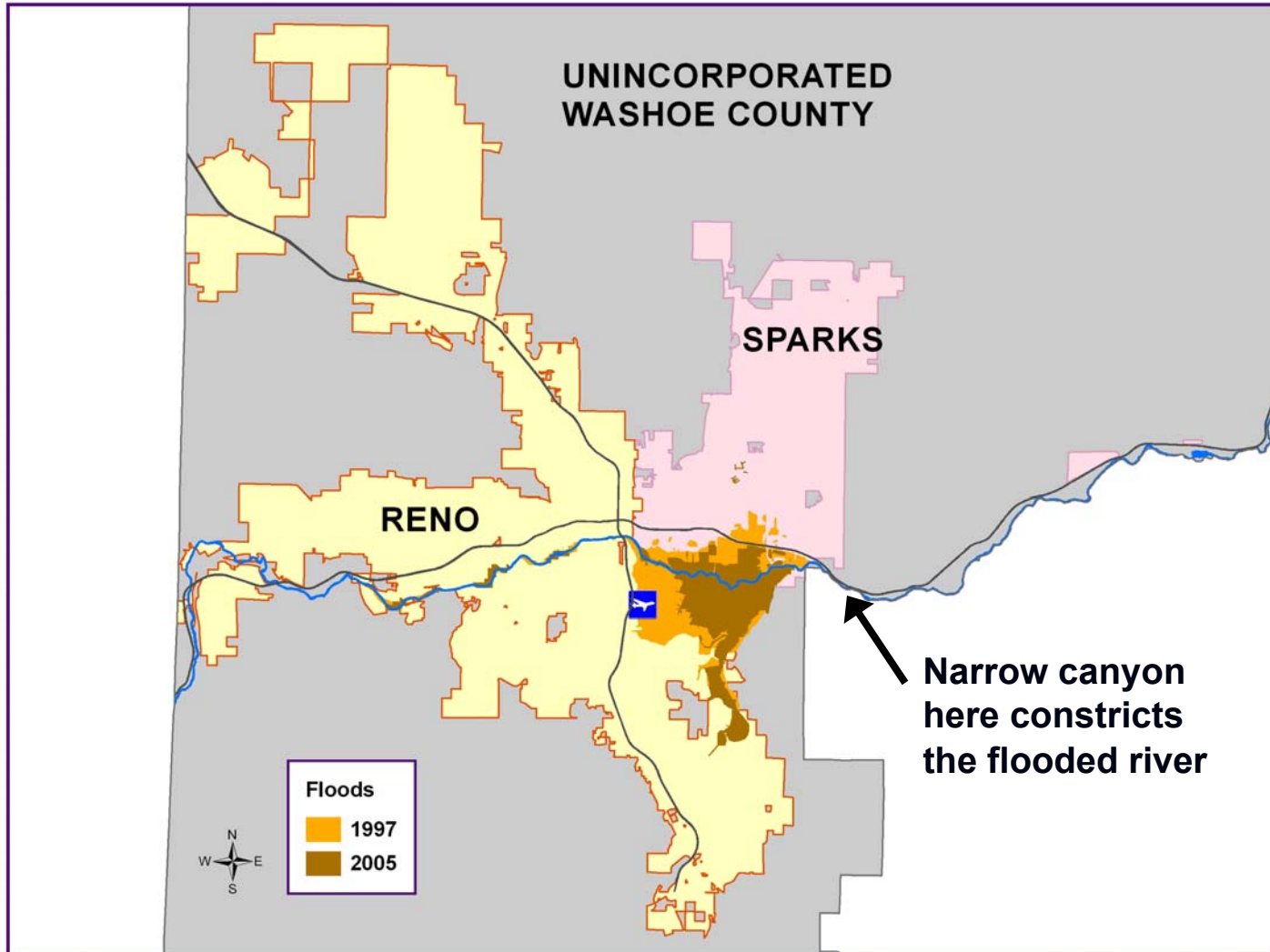
- The Truckee River flows from Lake Tahoe in California and through the hearts of the adjacent cities of Reno and Sparks in Nevada, before it ends in Pyramid Lake.
- Flooding is a natural disaster that occurs frequently in this area.



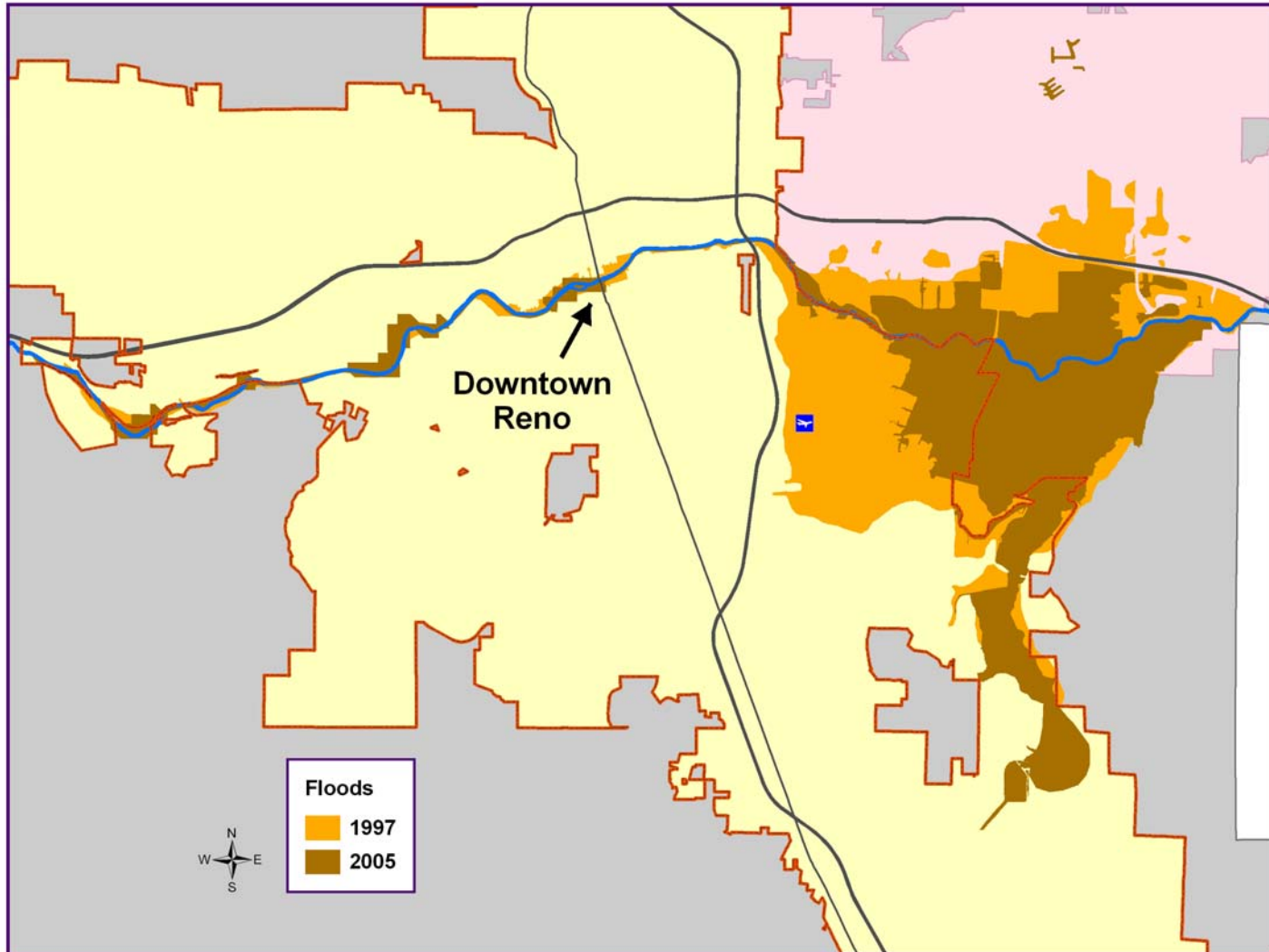
Area of Interest



Area of Interest – Recent Floods

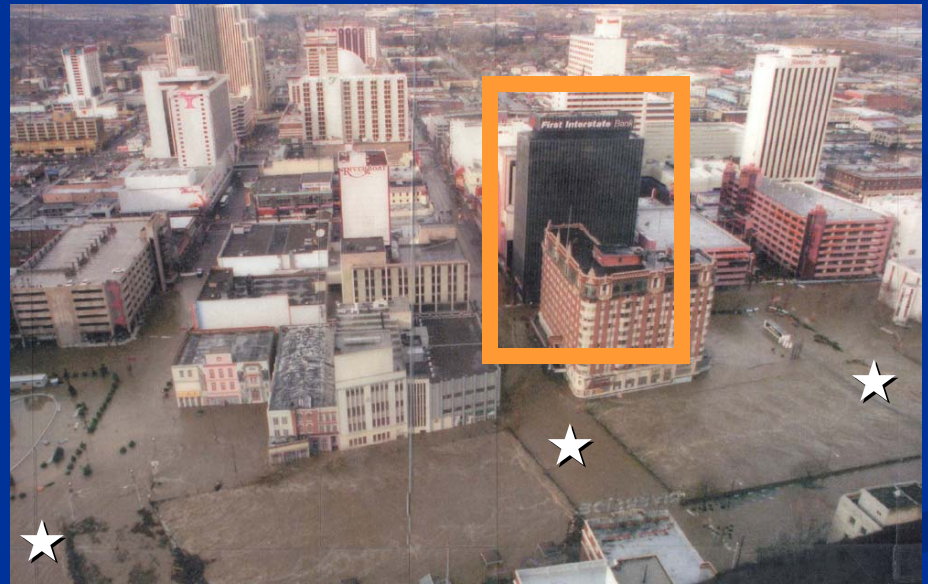


Area of Interest – Zoomed In



Background – Truckee River Flooding Continued

- In the past 30 years, Nevada has had more flood claims than any other non-coastal Western state, and 75% of them are in Sparks, Reno, and Washoe County.
- Recent Truckee River events include:
 - 117-year flood in 1997, with damages of \$650-\$700 million.
 - 50-year flood in 2005 (shown at right), with damages of \$18 million.

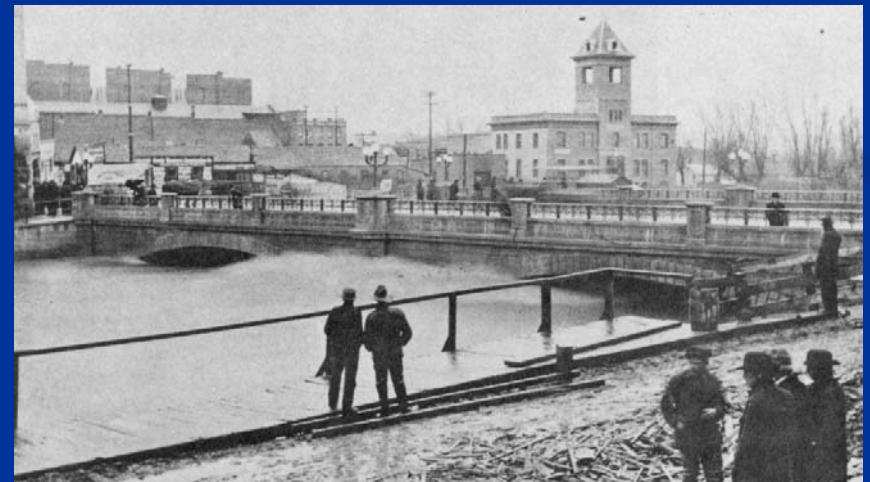


★ = Bridge over river

Source: Truckee River Flood Management Project

Background – Mitigation Efforts

- Since 2005, a consortium of local agencies and the U.S. Army Corps of Engineers have developed plans to mitigate the damage caused by flooding.
- Plans included:
 - ☑ Building new levees.
 - ☑ Restoring downstream river channels so they meander.
 - ☑ Buying flood-prone parcels.
 - ☒ Replacing 6 bridges with new, taller ones that won't clog floodwaters.



1907 Flood – The bridge, built in 1905, is still in use today.

Source: Truckee River Flood Management Project

The Problem

- With the economic downturn, many mitigation plans have been postponed or downsized.
 - Only 1 bridge will be replaced ... and that project is still in the design phase.
- The Truckee River has a significant damaging flood event about every 10 years.
- City decision-makers and emergency management staff would benefit from knowing the human and economic impacts a flood today would have, based on current data.

The Problem Continued

- Local governments had a consulting company complete a “Multi-Hazard Mitigation Plan” in early 2010. This 600-page document includes results output by FEMA’s free Hazus-MH software for floods, earthquakes, fires, etc.
- However:
 - Data used were from the 2000 Census and 2008 state demographic office. More current data from the 2010 Census and the American Community Survey are now available.
 - The Hazus-MH results describe total numbers for the value of “at-risk” property and population in the FEMA 100-year flood zones. The results don’t describe the ages and income levels of the at-risk population.

Proposal – Goals and Objectives

- Conduct spatial analyses using ArcGIS software and appropriate datasets to determine the potential human and economic impacts that a flood similar to the 1997 and the 2005 events would have today. Produce a short, targeted report for City of Reno staff.
- GOAL 1: To provide city emergency response staff with information about citizens who could be at-risk from another flood, with the objective that staff will be better prepared to respond when a flood occurs.
 - Residents -- especially in the downtown area -- may be older, lack transportation, and have fewer financial savings and resources. They may require special emergency response measures.

Proposal – Goals and Objectives Continued

- GOAL 2: To provide city decision-makers with information about the current value of property in the areas that were flooded in 1997 and 2005, with the objective that they'll be more aware of the financial impact of damages caused by flooding.

Proposed Methodology

- Acquire spatial and demographic data. Review the data. Prepare as needed (re-project, join tables).
- Use ArcGIS 10 to perform overlay analyses (select by location) to extract demographic and economic information.
- Emphasis will be on parcels and people (Census Tracts) located in the current Reno city limits.
- Use ArcGIS to create maps, charts and tables (using Excel as needed).
- May use ArcScene to create 3-D maps.
- Produce targeted report for City of Reno staff.

Data

- Acquired from local and federal agencies.
- Local data are in NAD83 State Plane Nevada West.
- Demographic Data Sources (CSV files):
 - 2010 Census Summary File 1 (SF-1) for population
 - American Community Survey (ACS) for income and transportation data – No SF-3 or SF-4 anymore; smallest unit of data is the Census Tract
 - Must alter CSV files – blank rows, extra headings

DEC_10_DP_DPDP1_with_ann.csv

	GEO.id	GEO.id2	GEO.display-label	HD01	HD02	HD01	HD02	HD01	HD02	HD01	HD02
	id	Id2	Geography	Number	Percent	Number	Percent	Number	Percent	Number	Percent
11	1400000	3.2E+10	Census Tract 1.02,	3945	100	137	3.5	116	2.9	96	2.4
12	1400000	3.2E+10	Census Tract 2.01,	3270	100	278	8.5	254	7.8	226	6.9

Spatial Data Acquired

- Building footprints (2008)
- Bus stops
- Business data (2010 InfoUSA point data)
- Care facilities (hospitals, nursing homes)
- Census Tracts (ACS data is at Tract level)
- City limits
- Contours (2010)
- FEMA DFIRM Flood Zones
- Flood extents from 1997 and 2005 events
- Hydrographic data (lakes, river, and creeks)
- National Land Use/Land Cover (LULC)
- Parcels with land and building values
- Police and fire stations
- Raster data (2010 orthophotos, 2008 10-ft DEM and hillshade)
- Schools
- Street centerlines
- Zoning data for Reno (residential/commercial)

Anticipated Results & Products

- Determine Human Impacts
 - Total population living in flood extents.
 - Age of population (average; classify into groups).
 - Language spoken at home.
 - Identify key facilities (medical facilities, nursing homes, police stations, fire stations, bus stops, schools, etc).
- Determine Economic Impacts
 - Number of parcels and buildings.
 - Number of acres.
 - Value of buildings and land (per county assessor).
 - Value broken out by city zoning types (residential and commercial).
 - Taxes received by Reno for the above.*
- Products include maps, charts, tables, a project summary report, and a targeted report for city staff.

Timeline

SPRING QUARTER

- April - May
 - Obtain and review data
- June
 - Re-project data to State Plane Coordinate System
 - Prepare Census and ACS data tables for joining to the Census Tract polygons
 - June 22 -- Submit abstract for “GIS in the Rockies” Conference (Sept. 20-21)
 - June 25 – Peer Review
 - End of June – Incorporate feedback into project

Timeline

SUMMER QUARTER

- July
 - Perform analyses
 - Create visualization products (charts, tables and maps)
- August
 - Submit draft visualization products to Penn State for review
 - Finalize products
 - Begin writing project summary report and creating presentation
- September
 - Submit draft report and presentation to Penn State and revise
 - Produce targeted report for City of Reno staff
 - Sept. 20-21 -- Make presentation at “GIS in the Rockies” Conference

FUTURE WORK

- Learn more about demographic & economic data and Hazus-MH

Summary

By using GIS to analyze the potential human and economic impacts of flooding in Reno and by creating an easy-to-read report of the results, I hope to help city emergency response staff and decision-makers prepare for the next flood.

I would appreciate your feedback about this project. Please send comments to:

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Thank you.