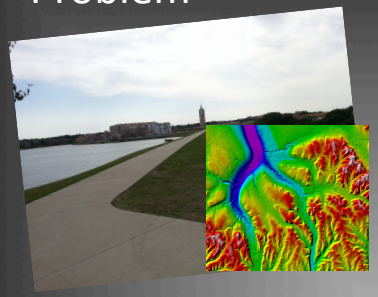
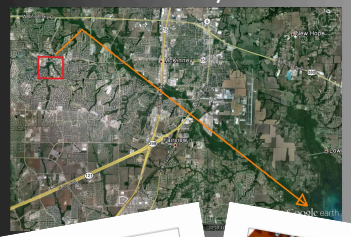
Analysis of a probable flood zone in the case of dam failure in Collin County

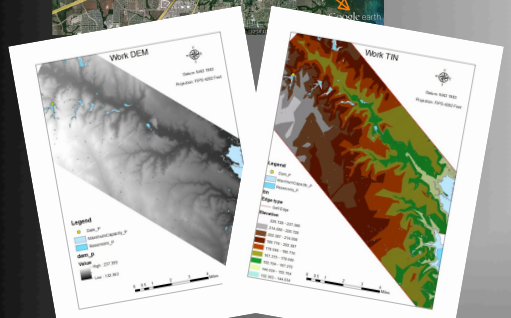
Problem

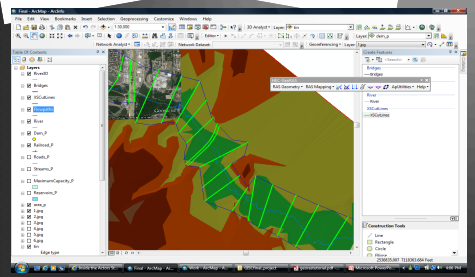


Data & Methods

Actual dam from Collin County
Built in 1958 by USDA
Emergency Action Plans for floods mandated by state







Determining the Flood zone

$$Q_t = Q_b + Q_s$$

Q_b = Peak Total Discharge (in cfs)

Q_s = Breach Discharge from spillway (emergency discharge) when the reservoir water surface is at the top of the dam (in cfs)

$$Q_b = 3.1B * H^{1/2}$$

B = Bottom width of the breach, assumed to be 3*H or ½ the width of a structural spillway.

H = Maximum height of the Dam (in feet)

Determining the Flood zone

$$L_w = 0.012 * K_s * \sqrt{2} * C * H$$

K_s = Correction factor for spillway size;

$$K_s = \frac{Q_b}{Q_s}$$

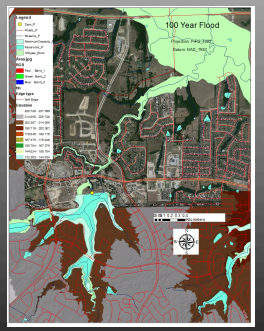
C = Total capacity of the reservoir at the top of the dam (acre-feet)

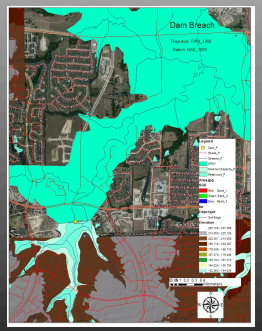
H = Maximum height of the Dam (in feet)

Defining the Flood zone

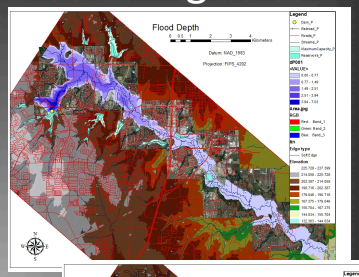
- There is a linear decrease relationship where at 0 feet from the dam the flow will equal Qb (94,109 cfs), while at 5.19 miles, the deluge's extent, the flow will equal Qs (3,260 cfs)
- Determine the slope using y=mx+b
- 3,260 = m? * 5.19 + 94,109
  m? = (3,260 – 94,109) / 5.19
  m = - 17,505
- After 5.19 the flow will be a constant 3,260 cfs

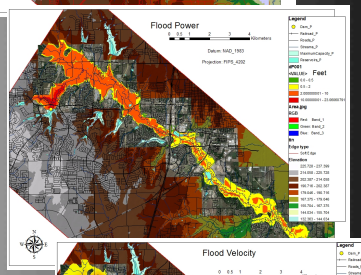
Dam Breach Analysis

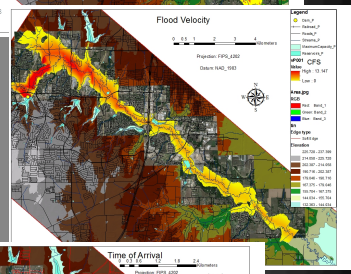


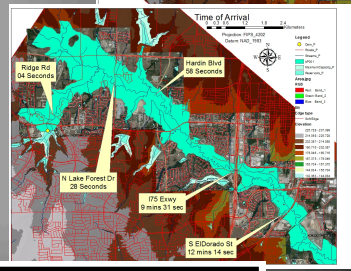


Findings









Results – Population Effected

- 1,400 people

Igor Mikheev, Amir Najian, Christopher Franklin, Bryan Chastain
Geospatial Information Science