Driving into danger

Perception and communication of flash flood risk from a cultural perspective

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Case study: Tucson, AZ

- Frequent heavy downpours during summer monsoon season
- Many low water crossings and roads built to convey water
- Barricades, signs, and even laws meant to deter motorists often fail

Dangerous AND Illegal

By state law, if you drive into rising water, you may be charged with reckless driving, a Class 2 misdemeanor. In addition, you can be charged up to $2,000 for the cost of rescue and/or car removal in flood areas.

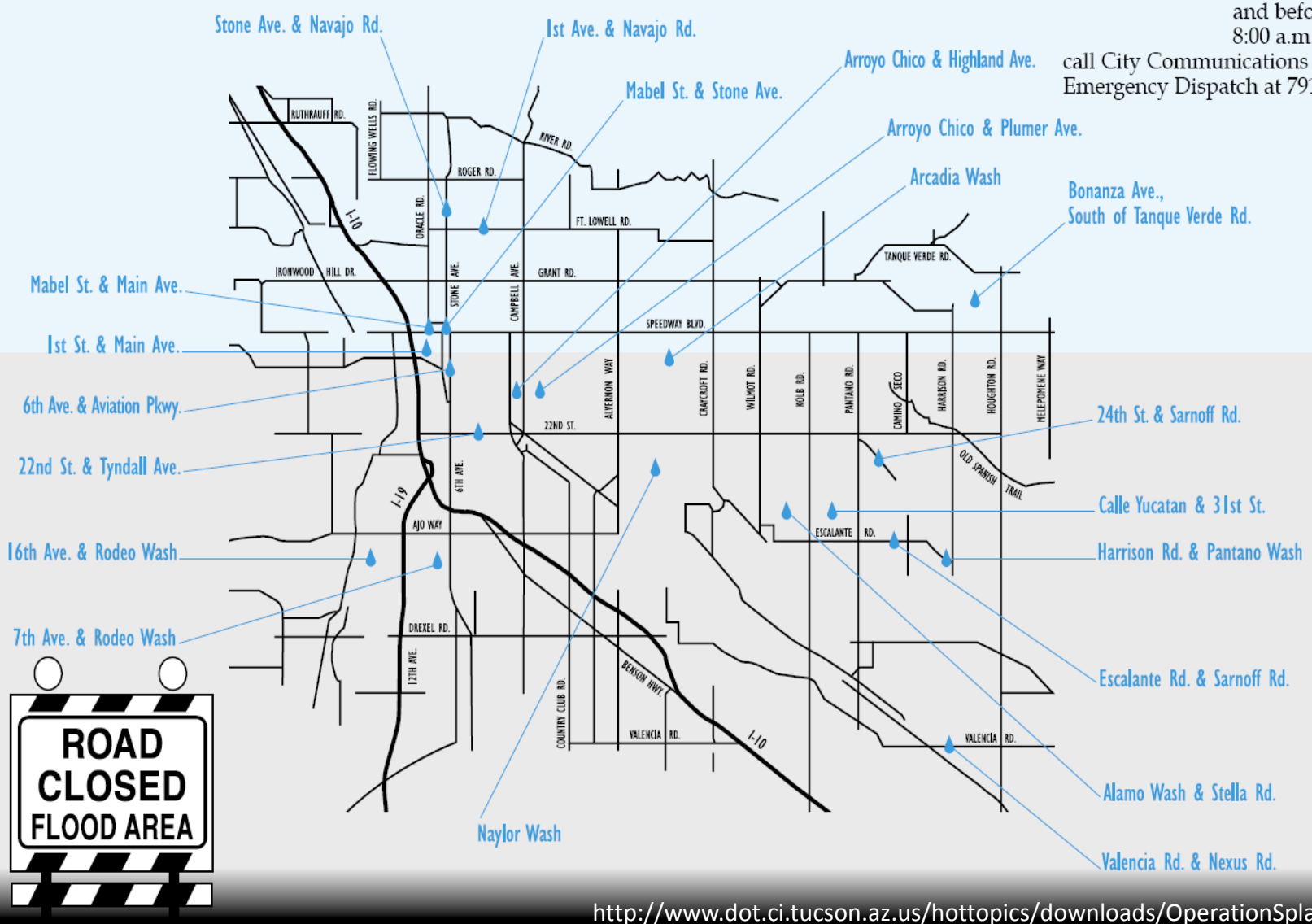
These Are Some of the "Flood Area" Locations Which May Be Barricaded During Heavy Rains

All low lying areas in the City of Tucson are subject to flooding during heavy rains.

For More Information About Barricades and Street Closures

Call the City of Tucson's Street and Traffic Maintenance Division at 791-3154.

After 5:00 p.m. and before 8:00 a.m., call City Communications Emergency Dispatch at 791-4144.



http://www.dot.ci.tucson.az.us/hottopics/downloads/OperationSplash.pdf

Methods

- Focus group interviews with flood risk managers
- 1000 mail-in surveys
- Survey demographics:
  - n = 168
  - 88% white
  - 45% male, 54% female
  - 63% with at least college degree
  - Mean age 58 years

Survey content

- Cultural factors
  - How does a person's worldview affect their perception of risk and decision making?
- Situational factors
  - How much influence do various factors have over a person's decision whether or not to drive through a flooded roadway

Disagree				Agree
1	**2**	**3**	**4**	**5**
[ ]	[ ]	[ ]	[ ]	[ ]

No influence			Strong influence
0	**1**	**2**	**3**
[ ]	[ ]	[ ]	[ ]

Have you ever driven through a flooded roadway?

- 61% Yes (“Crossers”)
- 49% No (“Non-crossers”)

- Pearson χ^2 analysis used for discrete variables
- ANOVA used for scales

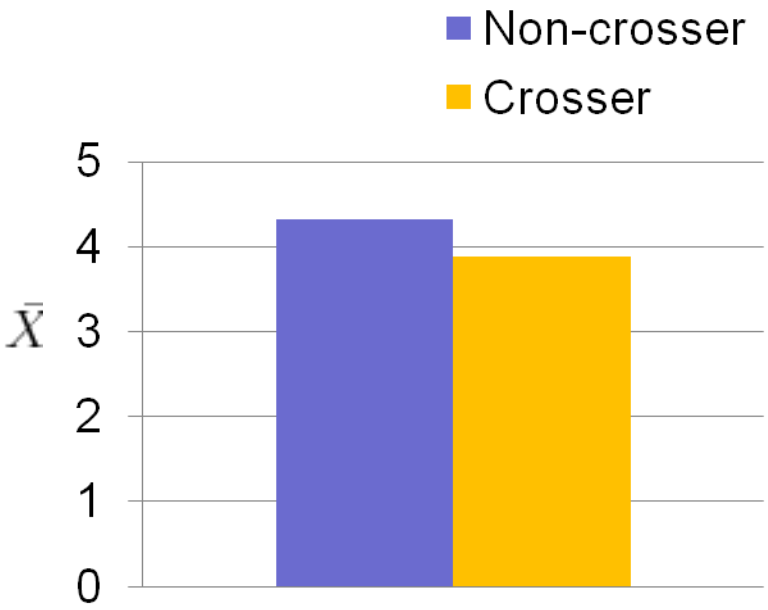
Results

- Challenge some of the common assumptions about the behavior of driving through flooded roadways, such as:
  - Young, confident men are more likely than others to drive through flooded streets
  - Drivers do not believe warnings or those who provide them
  - Drivers enter flooded roadways without considering the potential consequences

Cultural factors: self-efficacy

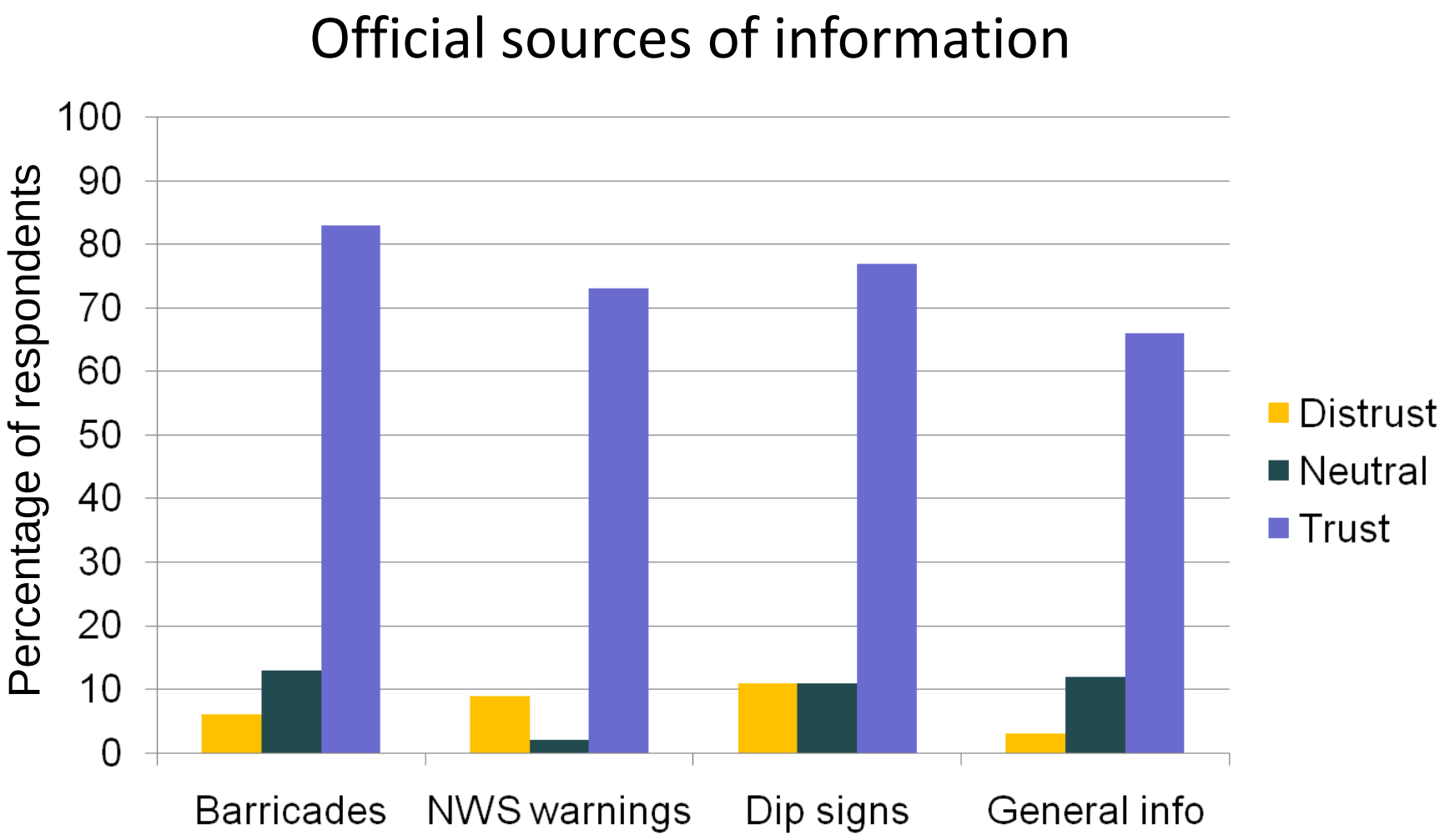
- A sense of control over one's own actions and outcomes can lead toward either risk-taking or risk-aversive behavior
- Men with high self-efficacy are LESS likely to cross
- No variation among women

Men's average self-efficacy



p = .03

Cultural factors: trust



Cultural factors: trust

- 90% of respondents said that the presence of a sign or barricade would strongly influence their decision NOT to cross
- 90% of respondents agree that signs indicate likelihood of flood danger
- Only 44% agree that signs indicate degree of flood danger

Signs and barricades: influential but incomplete message

- False sense of security – lack of sign indicates it is safe to cross?
- Signs are up even when the water is “a trickle, not flooded,” so drivers rely more on environmental cues or other sources of information

Social networks: other sources of flood information

- 79% of all respondents listed at least one person they would go to for help or advice <u>during</u> a flash flood
  - "someone who might be familiar with route I am taking"
  - "If I got caught in one – dad, brother. Where it is and how to avoid – dad, brother, friends."

Social networks: other sources of flood information

- 51% list at least one person with whom they discuss flood-related information when it is <u>not currently flooding</u>
- Do not discuss
  - "unless it is monsoon season"
  - "not relevant" between events
- Do discuss: warnings to newcomers
  - "I tell newcomers to pull off the road and have a cup of coffee during heavy rains."

Influence NOT to cross

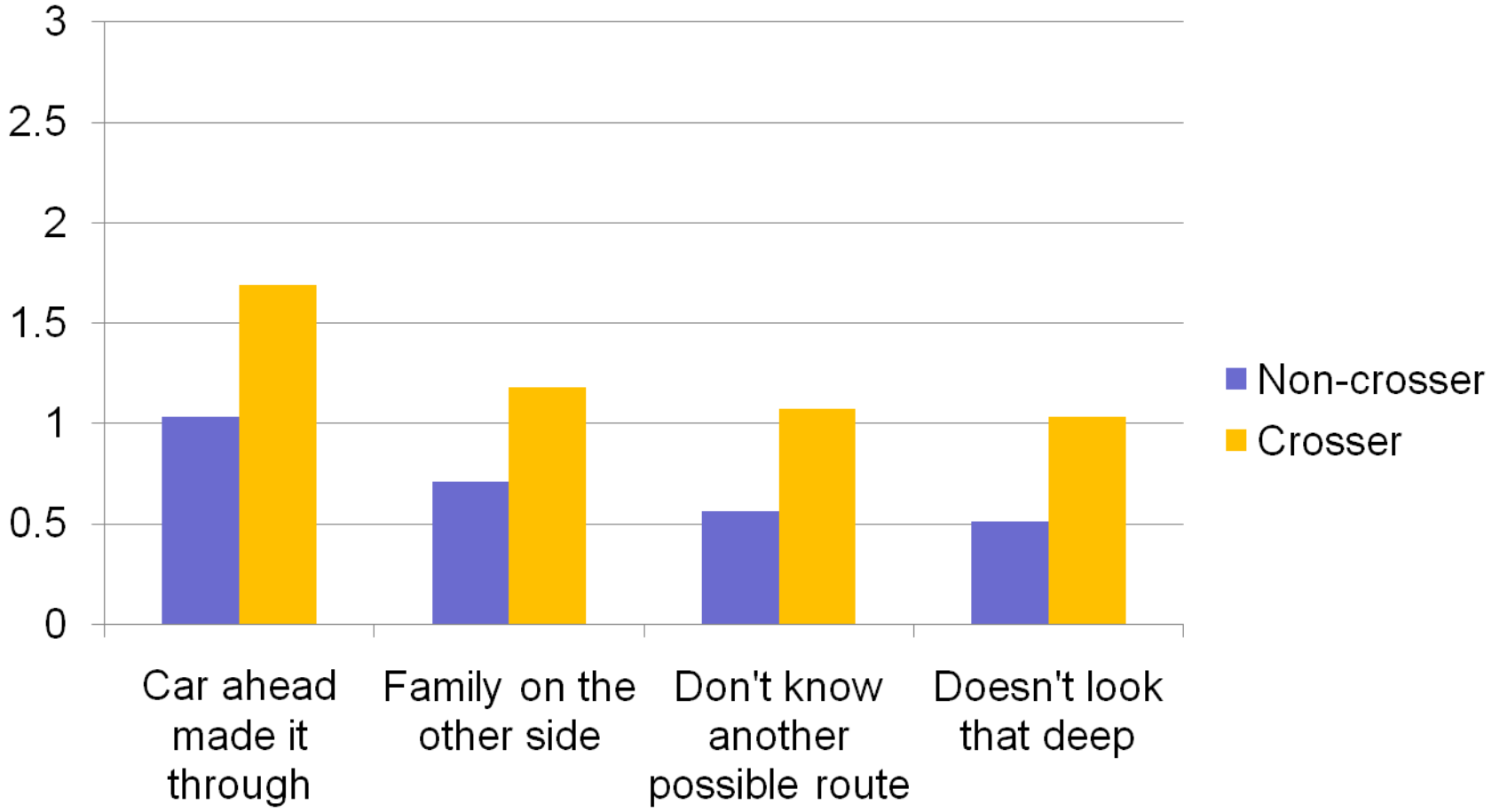
- Risk of injury or death the strongest influence (2.90)
- 64% of respondents said that there had been at least one incident where they considered crossing and decided against it
  - 72% of those individuals have crossed a flooded roadway

Influence NOT to cross

- Presence of a barricade or sign
- Risk of damage to vehicle
- Against the law*
- Presence of passengers*
- Know another possible route

* Statistically significant difference in level of influence between crossers and non-crossers ($p < .05$)

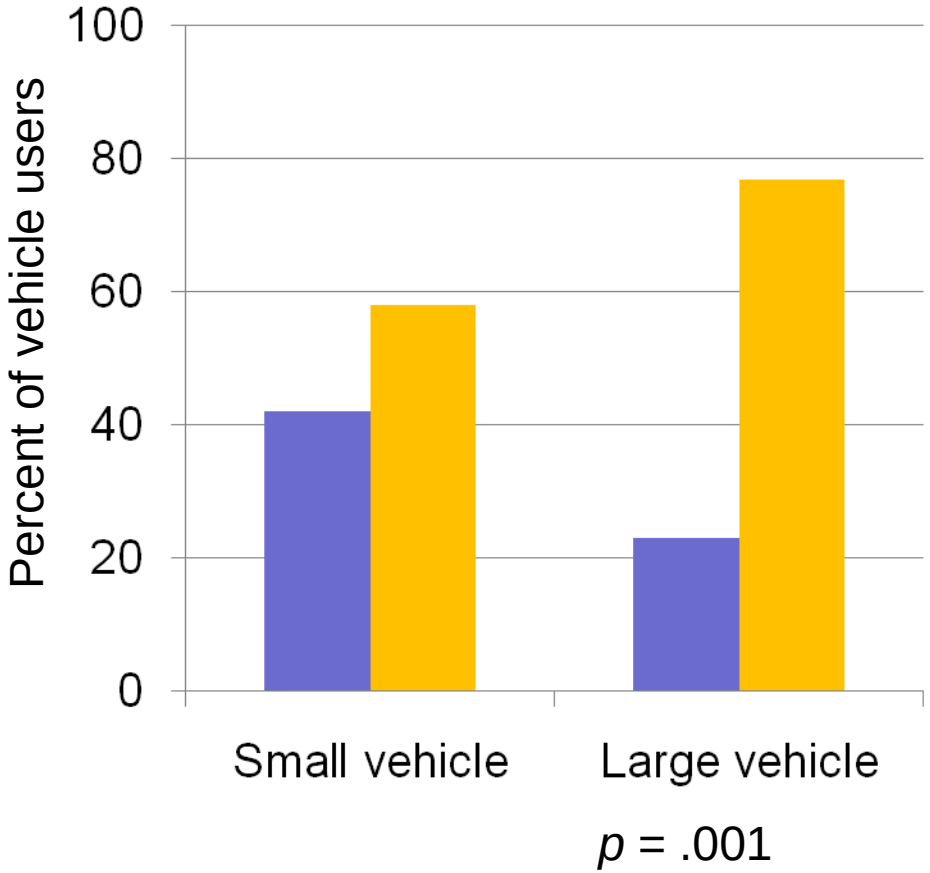
Influence to cross: greatest influence



Influence to cross: greatest influence

- Car ahead of me made it through
  - 76% said that another vehicle's successful prior crossing has at least a slight influence on their decision to cross
  - Especially if their vehicle is larger, heavier, or has higher clearance than those successfully crossing
  - Use cars ahead to determine depth and flow velocity
  - Others do not worry about the size of other cars if they feel theirs is large enough

Vehicle type (χ^2)

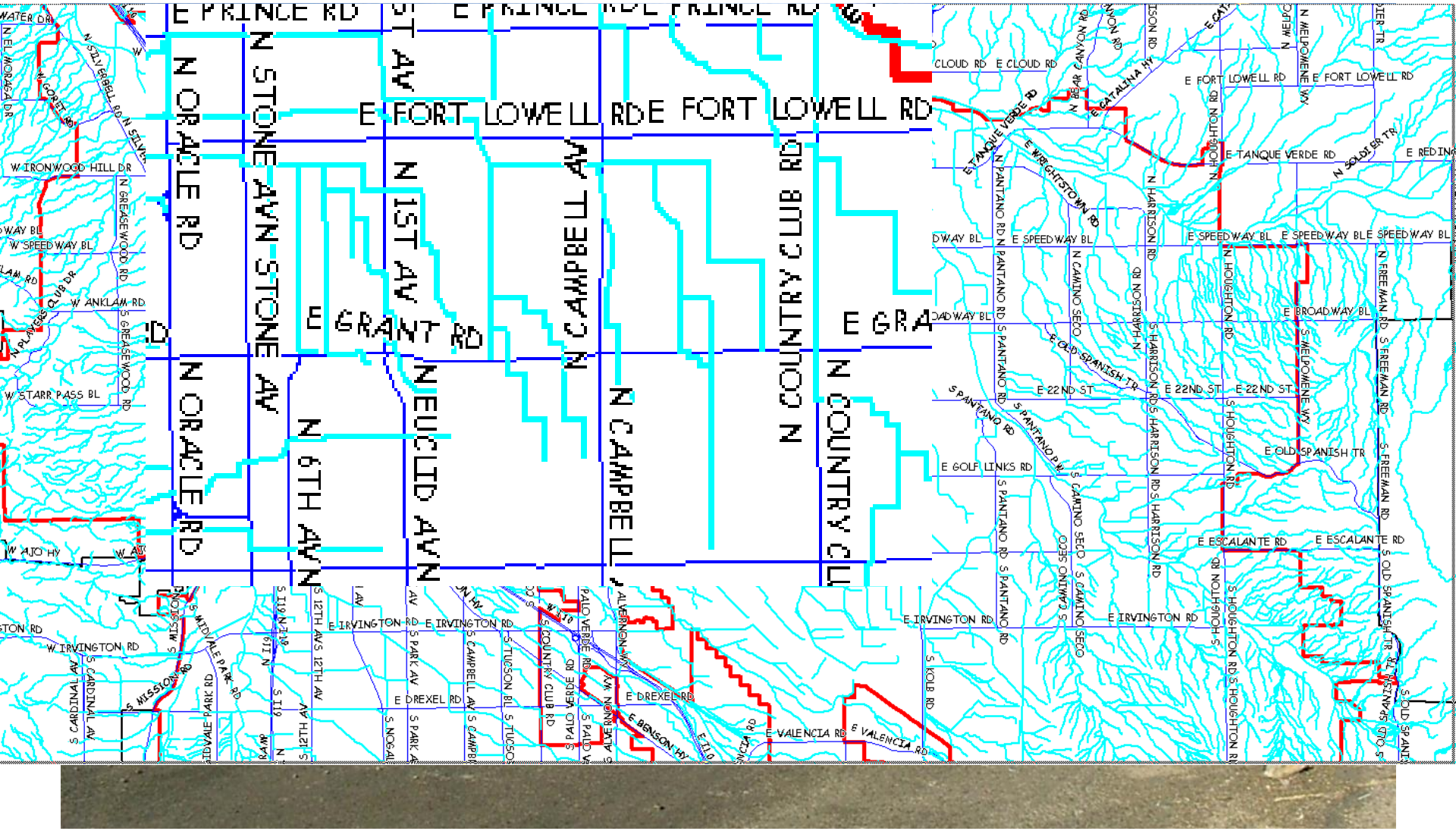


p = .001

Alternate route

- "Don't know another possible route" a stronger influence for crossers (p = .001)
- Rank among situational factors:
  - 3rd for women
  - 6th for men

Alternate route?



Whose rationality?

- “What poor street construction!”
- “Frustrated that we do not have a better drainage system.”
- “Why can’t something be done to prevent this from happening – drains under road – clean washes of debris?”

Implications and recommendations

- Education is working, but information is not always sufficient for decision making
- More devices that signal current danger
- Alternate route maps or signs could help motorists avoid flooded streets
- Where possible, create alternate routes!

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