Flash Flood Pilot Project

Elite Water Rescue Prevention Consultants

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ABSTRACT

The implementation of a statewide GIS for Low Water Crossings (LWCs) and Swift Water Rescues (SWRs) to identify high risk areas will provide the International Flash Flood Laboratory (IFFL), the Texas Flash Flood Coalition (TFFC), the Texas Department of Health Services and other Texas agencies with a better understanding of the relationship between the number and locations of these sites and present spatial resources that can be used to prevent future deaths and injuries related to flash floods. Elite Water Rescue Prevention Consultants created this GIS containing both documented and potential LWC sites as well as SWRs reported in 2007. While it has been an exercise in patience as information was converted from raw information into spatial data and more than three dozen legal entities in Texas were contacted personally to request both LWC and cost information, the foundation EWRP Consultants has built is essential for achieving a way to answer the questions surrounding the fact of Texas' anomalously high number of flood-related fatalities. As part of the process, EWRP Consultants did research in order to elucidate the concept of a Flash Flood Alley. In none of the literature were specific boundaries defined, so EWRP Consultants set the precedent by proposing a forty-four county area of Central Texas along the Balcones Escarpment. Now that these elements are in the GIS, spatial and temporal correlations can be made and more complex analysis can be done to build upon this foundation by further elucidating connections and clarifying spatial relationships needed by the TFFC.

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1. INTRODUCTION

1.1 SUMMARY

In the United States, Texas has suffered more than twice the number of flash flood fatalities than the second-ranking state. A major contributor to Texas' dubious ranking is the fact that it is home to one of the largest road systems in the nation, with numerous Low Water Crossings (LWCs) responsible for the majority of flash flood fatalities. The implementation of a statewide GIS for LWCs and Swift Water Rescues (SWRs) to identify high risk areas will provide the International Flash Flood Laboratory (IFFL), the Texas Flash Flood Coalition (TFFC), the Texas Department of Health Services and other Texas agencies with a better understanding of the relationship between the number and locations of these sites and present spatial resources that can be used to prevent future deaths and injuries related to flash floods.

1.2 PURPOSE

Currently, no known database exists containing LWCs in Texas, and the SWR records are little more than lists of incidences. Elite Water Rescue Prevention Consultants (EWRP Consultants) has created a GIS containing both documented and potential LWC sites as well as SWRs reported in 2007. While it has been an exercise in patience as information was converted from raw information into spatial data, the foundation EWRP Consultants has built is essential for achieving a way to answer the questions surrounding the fact of Texas' anomalously high number of flood-related fatalities. Now that these elements are in the GIS, spatial and temporal correlations can be made and more complex analysis can be done to build upon this foundation by further elucidating connections and clarifying spatial relationships needed by the IFFL and the TFFC.

1.3 SCOPE

The SWR data that the EWRP Consultants used to create the GIS is from 2007. The TFFC shared research by Hatim Sharif which classifies Texas counties by aggregate number of flash flood-related fatalities, shown in Figures 1-3. EWRP Consultants entered SWR and LWC data for the forty-four counties within the proposed Flash Flood Alley, regardless of designation by fatality, shown in Figure 4. The LWC analysis covers all the counties in the proposed Flash Flood Alley for which FEMA floodplains are available.

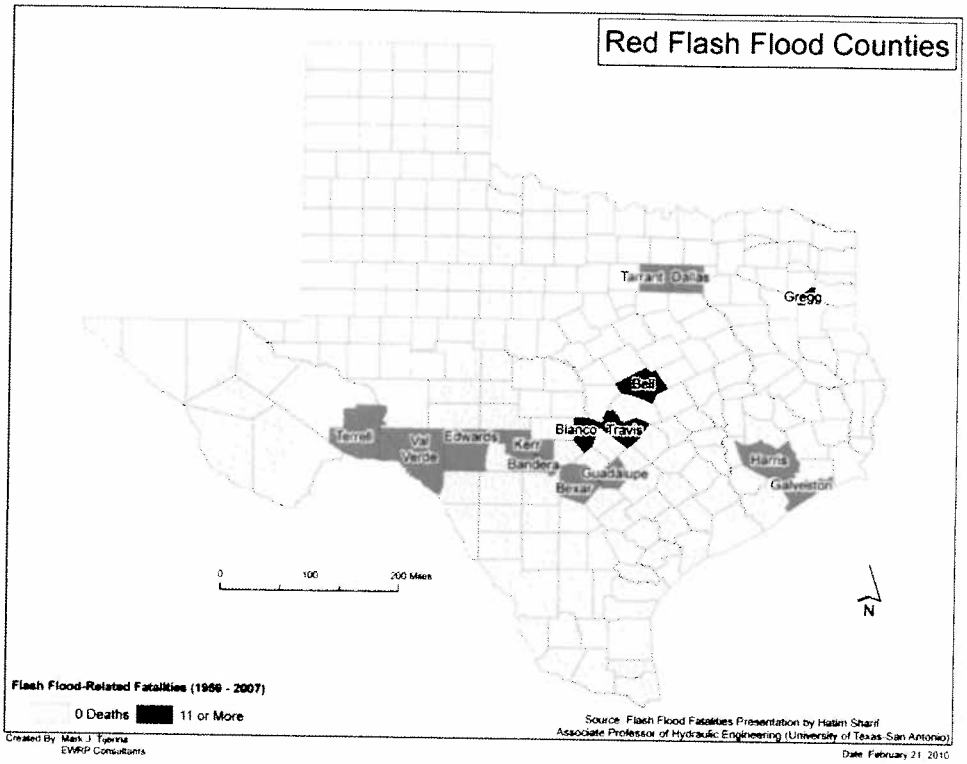

Figure 1. Red counties; 11 or more deaths.

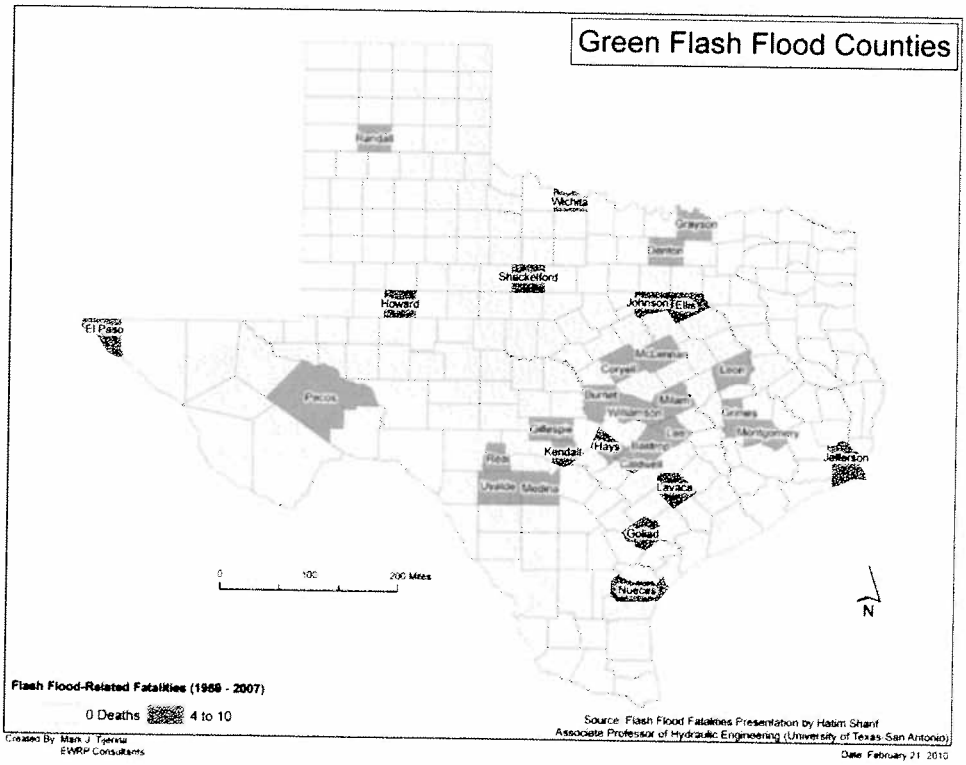

Figure 2. Green counties; 4-10 deaths.

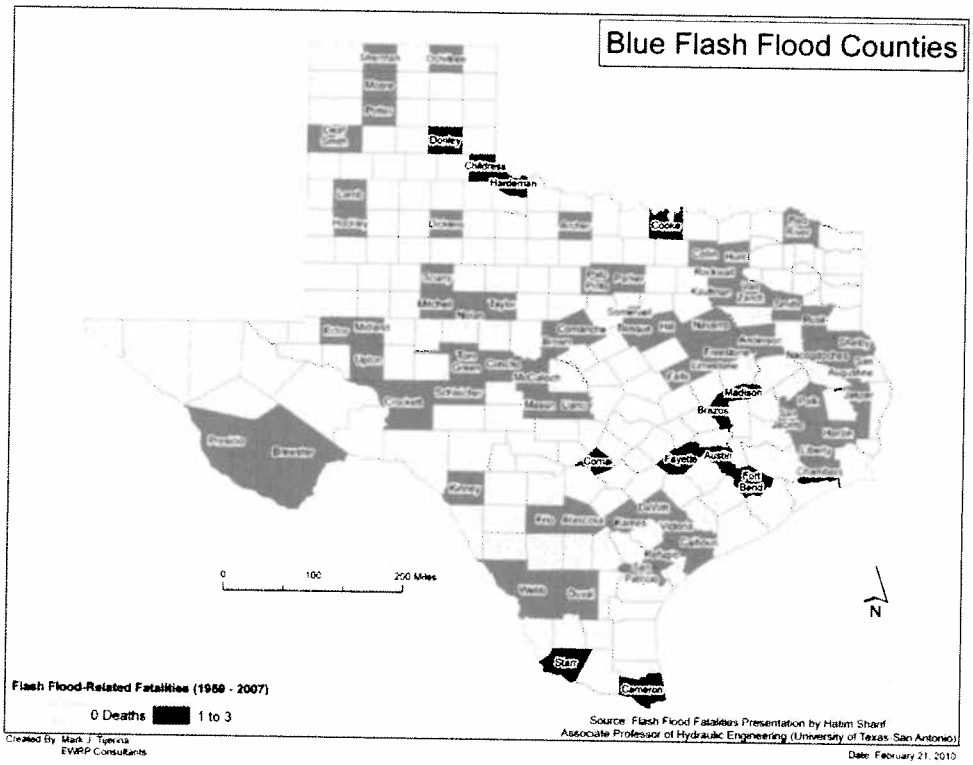

Figure 3. Blue counties; 1-3 deaths.

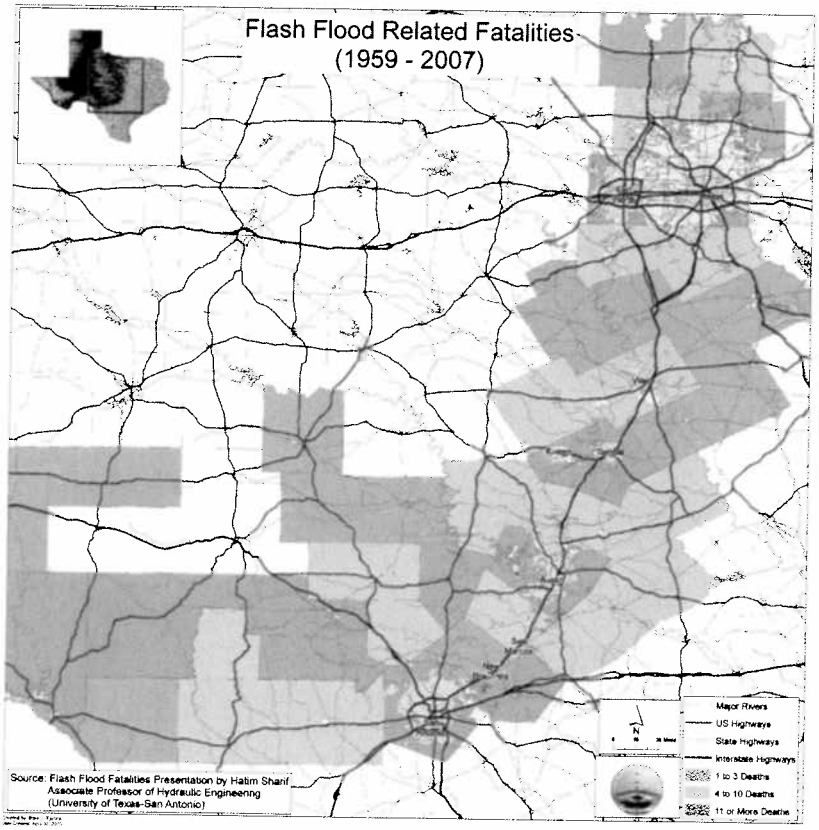

Figure 4. Proposed flash flood alley counties.

2. LITERATURE REVIEW

2.1 RELATED RESEARCH

In the spring of 2009, Native Earth Consulting used "a Geographic Information System (GIS) to identify and analyze the spatial distributions of historically-recorded flood and flash flood events resulting in fatalities in Texas." http://geosites.evans.txstate.edu/g4427/2009/S09/nec/ This was the first application of GIS by Texas State University students to the problem of flash flooding in Texas. They used data from the Spatial Hazard Events and Losses Database (SHELDUS) and the National Climatic Data Center (NCDC) to do their research and analysis. They found that although the number of flood events doubled in the last twenty years, the number of flash flood-related fatalities barely increased at all. They also found that "most flood fatalities are vehicle related, representing 76.92% or 80 deaths." http://geosites.evans.txstate.edu/g4427/2009/S09/nec/
After study of the demographic variables reported in their data, Native Earth Consulting identified males under twenty and over sixty years of age as the highest risk for being involved in flash flood related vehicular water crossing incidents "located in areas of higher population growth and elevation changes in the Central Texas region." http://geosites.evans.txstate.edu/g4427/2009/S09/nec/

At the same time that Native Earth Consulting were doing their research , the IFFL was established to focus efforts of understanding and educating about ways to reduce flash flood-related injuries and fatalities in Texas. The International Flash Flood Laboratory was founded by Eve Gruntfest, Pamela S. Showalter, and Isabelle Ruin. They operate on the web in the only world-wide laboratory in current existence for this purpose:

> The IFFL's mission is to address the "end-to-end-to-end" process of flash flooding by working closely with local/regional/state authorities (e.g., city employees/road departments, the Lower Colorado River Authority, emergency operations centers), academics (physical and social scientists), members of the private sector (e.g., television/radio stations, forecasters/meteorologists, hydrologic equipment developers), and the general public. http://www.geo.txstate.edu/lovell/IFFL.html

The research done by Native Earth Consulting and Elite Water Rescue Prevention Consultants has been valuable to the IFFL, and future student groups will be able to use this foundation to further the goals of the Laboratory and benefit Texas communities.

2.2 CONCEPTS

2.2.1 Low Water Crossing

According to Gerald M. Dworkin of Lifesaving Resources, Inc.:

> Where a road, without a bridge, dips across a normally dry creek bed or drainage area. Motorists who attempt to cross these flooded low-water crossings are putting themselves, their vehicles, and any other occupants of their vehicles at deadly risk. http://www.lifesaving.com/issues/articles/18low_water_crossing.html

2.2.2 Swift Water Rescue

According to the Texas Engineering Extension Service:

> The purpose of the Swiftwater Rescue - Operations course is to provide first responders with the necessary knowledge, skills and abilities to perform defensive life saving operations in swiftwater conditions. First responders completing this course will be prepared to work as a part of a team to respond to rescue situations involving floods and swift moving water.
> http://www.teex.com/USAR/documents/Swiftwater%20Rescue%20Operations%20-%20Program%20of%20Instruction.pdf

2.2.3 Flash Flood Alley

According to the Flood Safety Education Project:

> Central Texas has been identified as the most flash-flood prone area in the United States by the National Weather Service.
> http://www.floodsafety.com/texas/texasfactoids.htm

According to Disaster Ready Austin (OEM), these are the reasons for Austin's inclusion In Flash Flood Alley. Similar conditions also apply to other areas in Flash Flood Alley:

> – Unique Geographic and Atmospheric Conditions
> The combination of these factors cause the large, violent storms here in "Flash Flood Alley":
> . Big sources of moisture from both the Gulf of Mexico and the Pacific Ocean;
> . The jet stream that crosses the state from the Rocky Mountains;
> . Closeness to the unstable West Texas "dry line" separating the dry desert air from the moist Gulf air;
> . An uplift created along the Balcones Escarpment that runs across Central Texas;
> . Storms northwest of us on the Edwards Plateau send flood waters downstream into Austin area creeks and rivers.
> . Limestone and thin soils do not absorb much rain water.
> . Violent weather creates cell storms that release heavy rains in any size area from a small neighborhood to a whole region. When a cell storm pours, it causes instant "flash flooding", making it almost impossible to predict in advance where flooding will occur.
> – Creeks
> Urban and rural creeks run through all areas of Austin creating the beautiful greenbelt and parks system. Unfortunately, this means we live in and near their floodplains. A floodplain is the land area these bodies of water will spill over into when it rains heavily. We can't control a floodplain-- nature wins eventually.
> – Colorado River
> The Colorado River bisects the city, and a series of dams provides us with the Highland Lakes and Town Lake for recreation, drinking water and power. As with creeks, many people have built in the floodplain of the river. The dams along the river do not prevent flooding, but can help reduce the intensity of the flow of floodwaters. The Colorado River crosses the entire state of Texas, so flooding in any area of the river's watershed may affect Austin as well as many communities upstream and downstream of us. The Lower Colorado River Authority (LCRA) regulates the dams in the Austin area.
> – Urban Flooding
> Developed areas cannot absorb as much rainfall as a natural area. Water runoff in urban

areas is faster and there is much more of it, creating very dangerous conditions for people, especially drivers. Also, drainage systems can be overwhelmed, causing flooding in areas outside of floodplains.

– Hurricanes & Tropical Storms

Even deep in the heart of Texas, we are vulnerable to the effects of a dying hurricane or tropical storm traveling inland. Remember the devastation Tropical Storm Allison left in Houston in 2001? That could have easily happened in Austin! Emergency resources could be impacted if families from the coast evacuated to Austin and then the storm hit Austin.

http://www.barrypopik.com/index.php/new_york_city/entry/flash_flood_alley/

2.3 GIS AS A TOOL

The ability of GIS to map data and do analysis can be very powerful. Native Earth Consulting and EWRP Consultants have begun to establish the foundation for this analysis to be possible in Texas, but there is much development to be done. For example, GIS users in the mountainous regions of the western United States have answered the challenge of severe flash flooding in narrow canyons and dry washes with very sophisticated models that could be adapted here.

> The NWS Colorado Basin RFC has developed a set of GIS-based Flash Flood Potential (FFP) indicators for several WSR-88D radar umbrellas in the Western United States, including for those within the NWS Salt Lake City WFO (SLC) County Warning Area (CWA). A variety of static GIS raster data layers that include information about basin terrain features, vegetation, forest cover, land use (specifically for urbanization effects), and soil characteristics have been created to produce ten discrete levels corresponding to increased risk of flash flooding. The newly classified layers are weighted and combined, resulting in a static set of flash flood indicators that describe an area's relative potential for flash flooding. Although currently available on a hardware platform separate from the operational workstation platform used to run FFMP, forecasters at SLC have benefited from this additional information in the flash flood warning decision making process for the past two flash flood seasons.
>
> http://ams.confex.com/ams/Annual2005/techprogram/paper_86939.htm

It is possible that the Texas Hill Country elevation ranges are not high enough for this model to be applied directly, but the concepts are innovative and future flash flood research should do a careful study of their methodology to optimize the ability of GIS to contribute to the reduction of flash flood-related injuries and deaths in Texas.

3. DATA

3.1 SWIFT WATER RESCUES

The data utilized during the course of this project was collected from a variety of sources. The primary Excel spreadsheet, which listed all of the Swift Water Rescues, was obtained from the FEMA's National Fire Incident Reporting System. Much of the data that needed to be used for locating SWRs on the map was available for each individual county and came from Texas

Natural Resource Information System (TNRIS), including Texas transportation networks, FEMA floodplains and Strat Map Contours. Detailed hydrography data was available from Environmental Systems Research Institute (ESRI).

3.2 LOW WATER CROSSINGS

EWRP Consultants successfully gathered data from four legal entities in Texas. Hays County and Burleson Fire Department provided shapefiles for LWCs in those areas. Marble Falls Fire Department sent a map and Killeen Fire Department sent a list showing LWCs for which EWRP Consultants used the same process and tools described above for SWRs to create shapefiles.

3.3 BREAKDOWN OF DATA USED

- SWR Excel Table:
  - State Fire Marshall's Office
  - FEMA's National Fire Incident Reporting System
- Priority County Designations by Flash Flood-Related Fatalities:
  - Created by Hatim Sharif of UTSA, using:
    - National Climatic Data Center (NCDC) Storm Data
    - Spatial Hazard Event and Loss Database (SHELDUS)
    - Texas Department of State Health Services (DSHS)
- LWC Data:
  - Shapefile of LWCs from Hays County
  - Shapefile of LWCs from Burleson Fire Department
  - Map and list of LWCs from Marble Falls Fire Department
  - List of LWCs from Killeen Fire Department
- Supporting Shapefiles:
  - TNRIS:
    - Transportation by county
    - Floodplains by county
    - Strat Map Contours by quadrangle
  - ESRI:
    - Hydrology for North America, clipped to Texas

4. METHODS

4.1 SWIFT WATER RESCUES

EWRP Consultants split up 767 recorded SWRs from forty-four counties identified as the proposed Flash Flood Alley. The goal was for each record in the excel table to become a point in the GIS based on the address and directions given in the reports written by fire departments that were used to create the table. The base map used to place the points in the correct locations was made up of an ESRI hydrography layer, county TNRIS transportation layers, TNRIS Strat Map Contour lines and the Arc Server world road map. Selecting the road name given in the excel description by attribute from the TNRIS transportation layer was adequate for many records, but most required reference to Yahoo maps and many had to be tried with alternate spelling. Many numbered roads reported as "FM" or "Hwy" were eventually located using an entirely different prefix. Some records were made easier to locate by the directions field from the excel table, which helped to zero in on the area of the SWR. Once the target road had been identified, the next step was using reasonable judgment to place the SWR point at the most likely area of the road for the SWR to have occurred. Using the ESRI hydrography and the TNRIS Strat Map Contour lines, EWRPC chose the segment of roads with the lowest elevation for the placement of the SWR points. Unfortunately, insufficient information was provided for some records and these were marked as "Unable to Locate."

4.2 LOW WATER CROSSINGS PROVIDED BY LEGAL ENTITIES

EWRPC successfully gathered data from four legal entities in Texas. Hays County and Burleson Fire Department provided shapefiles for LWCs in those areas. Marble Falls Fire Department sent a map and Killeen Fire Department sent a list showing LWCs for which EWRP Consultants used the same process and tools described above for SWRs to create shapefiles.

4.3 POTENTIAL LOW WATER CROSSINGS IDENTIFIED BY GIS ANALYSIS

EWRP Consultants first observed the relationship of existing LWCs to Federal Emergency Management Agency (FEMA) floodplain zones. The majority of these crossings fell within one of the three zones defined by FEMA. These zones include 100-year floodplain with base flood elevation (BFE), 100-year floodplain without (BFE) and the 500-year floodplain. BFE is the calculated level to which floodwater is expected to rise during base flooding. Once this was established, EWRP Consultants pinpointed each road/floodplain intersection location for each of the obtained LWCs datasets by using the intersect lines function found in the Hawth Tool. The Hawth Tool is a third party extension created by Spatial Ecology. This process laid out where possible LWC locations can and will occur. The processes are shown below in the Flow Chart in Figure 5.

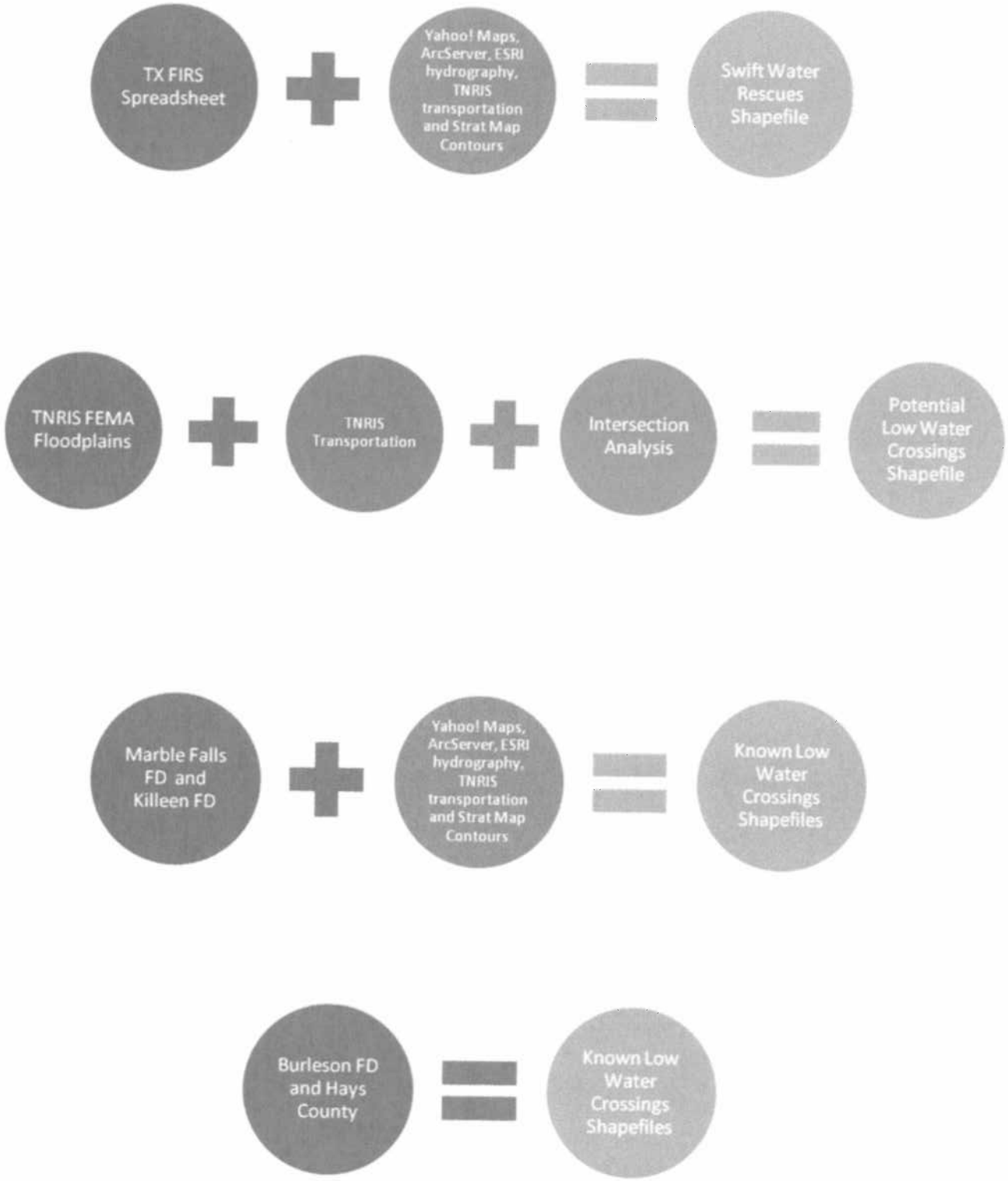

Figure 5. Procedural Flow Chart.

5. RESULTS

5.1 SWIFT WATER RESCUES

EWRPC has implemented a statewide GIS for SWRs and LWCs. This new GIS will provide information to local governments and independent companies to help them better understand LWCs and how they interact with SWRs. EWRP Consultants spent many hours analyzing the Swift Water Rescue street locations reported and determining the best position on the map to place these occurrences. This took careful consideration of the spatial relationship between the roads, the elevation and the location of the nearest body of water. As one would expect, the relationship remained consistent throughout the state, with the Swift Water Rescue occurring within a close proximity to the nearest river. There were a small number of outliers: SWRs that seemed to have occurred in an area where there is no body of water within miles. This is most likely due to the fact that drainage occurs in places other than established streambeds during short term high volume precipitation events. It will also be helpful to the IFFL and the TFFC for future researchers to perform complex analysis and clarify spatial relationships. EWRPC Consultants created a shapefile containing 675 of the 767 SWRs in the forty-four counties identified as the proposed Flash Flood Alley. This is an 88% completion rate and provides the IFFL and the TFFC with tangible spatial data to work with in the future. Maps showing the visual results of the work done by ERWP Consultants can be viewed in Appendix 3. A KML file is available for viewing the SWR locations on the EWRP Consultants website.

5.2 LOW WATER CROSSINGS

The potential LWC areas targeted by the intersection analysis done by EWRP Consultants is a great starting place for comparing these hazardous areas to actual rescue sites documented across the state. That EWRP Consultants successfully obtained known LWC data from four different legal entities shows the potential for future researchers to collect more of the same. The more known LWC locations that can be gathered, the more the intersection model can be improved and refined to better predict LWCs in areas where no concrete data is available. The inclusion of maps on the EWRP Consultants website not only provides users with a visual representation of the existing Low Water Crossings and Swift Water Rescues within the state of Texas, but allows users to see how the two are related to each other. In the future, much spatial data could be added into this GIS in the continued effort to clarify safety procedures and educate communities across the state. Maps showing the visual results of the work done by ERWP Consultants can be viewed in Appendix 3.

5.3 COST ANALYSIS

In addition to all of the geographic information EWRP Consultants created, they also received important "cost" information from various fire departments around the state. Marble Falls FD, Killeen FD, Burleson FD and Austin FD provided EWRPC with valuable information regarding the cost of the average Swift Water Rescue. The costs ranged from as low as $450 per hour all the way up to $3,500 per hour depending on the complexity of the rescue. There are three divisions of cost identified by the cooperating FDs. Equipment may include wetsuits, rope

and three to four boats. Labor is defined loosely as the cost of no less than ten personnel for x hours in addition to the cost of technical training. Transportation costs include the purchase of vehicles, gasoline, maintenance and wear and tear on the vehicles.

6. DISCUSSION

6.1 IMPLICATIONS

The creation of a flash flood GIS for the IFFL and the TFFC paves the way for research on flash flood phenomena in Texas. The work done by EWRP Consultants rendered conclusions based on the analysis performed, identified problems, pitfalls and limitations with the analytical approach, and enabled them to recognize potential improvements to future data analysis. Upcoming researchers will be able to analyze the relationship between levels of precipitation, LWCs and SWRs and establish the spatial and temporal relationships therein. Through the examination of demographic data for the spatial locations of SWRs, researchers will be able to identify high risk populations and make recommendations for the prevention of future SWRs. Ultimately, the GIS created by EWRP Consultants will facilitate the development of real world solutions through network analysis to determine alternate routes to avoid LWCs and make them available to Texas drivers via signage and mobile communication devices in multiple languages.

6.2 SWIFT WATER RESCUES

Mapping SWRs was a very detail-oriented task, but now that the process has begun, the work can continue more smoothly by those who follow in EWRP Consultants' footsteps. One way to improve the variety of spatial analysis potential would be to include a number of attributes from the TXFIRS database that were not present in the excel table received by EWRP Consultants. Inclusion of the details defined below would provide new dimensions for future research:

6.2.1 TXFIRS Attributes Recommended for Inclusion

ACTIONS TAKEN

Definition

The duties performed at the incident scene by the responding fire department personnel.

Purpose

These data elements, together with Incident Type, enable a fire department to document the breadth of activities and the resources required by the responding fire department to effectively handle the incident. This information also provides some indication of the specific types of services provided by the fire department.

RESOURCES

Definition

The total complement of fire department personnel and apparatus (suppression, EMS, other)

that responded to the incident. This includes all fire and EMS personnel assigned to the incident
whether they arrived at the scene or were canceled before arrival.
Purpose
This information is used to determine actual personnel and apparatus requirements for different
types of incidents and for different levels of incident severity. This data element may be examined with respect to casualties and damage estimates.

ESTIMATED DOLLAR LOSSES AND VALUES
Definition
Estimates of the total property and contents dollar loss and the pre-incident value of the property and contents. An estimate of the property and contents dollar loss is required for all fires where the value is known.
Losses: Rough estimation of the total loss to the structure and contents, in terms of the cost of replacement in like kind and quantity. This estimation of the fire loss includes contents damaged by fire, smoke, water, and overhaul. This does not include indirect loss, such as business interruption.
Pre-incident Value: Estimation of the replacement cost of the structure and contents.
Purpose
Collecting property and contents losses illustrates the magnitude of the fire problem, provides an additional indicator of the incident severity, and can be used to evaluate progress in fire protection. This information can help local communities, states, and the country determine the amount of money that should be spent on fire protection.
Estimated property and contents losses are also crucial for identifying types of situations where high monetary losses are common. This information helps target fire prevention programs. Loss estimates also can be used to evaluate the cost effectiveness of various equipment and fire protection practices. Pre-incident values help delimit the magnitude of the potential fire problem by providing a basis for comparison.

These are just a few fields in the TXFIRS database reports that would have offered more analysis potential had they been included into the excel file prepared for EWRP Consultants.

6.2.2 Related Research

According to Gerald M. Dworkin of Lifesaving Resources, Inc.:

> We are appalled at the recent television advertising for the Land Rover Discovery, Ford Explorer, and Isuzu Sport Utility Vehicles. Their advertising campaign demonstrates these particular vehicles driving through low-water crossing areas which promotes the idea that their vehicles can handle just about anything mother nature throws at them. It is our opinion that this advertising is misleading and dangerous as it presents a false sense of security to any 4 x 4 vehicle operators giving the impression that low-water crossing warnings can be ignored because their vehicles, particularly the Land Rover Discovery, Ford Explorer, and Isuzu Sport Utility Vehicles can handle any situation. http://www.lifesaving.com/issues/articles/18low_water_crossing.html

This situation is inexcusable and should be brought to the attention of policy makers. Paradigms held by those who endorse this type of advertising are not only oblivious to the efforts of organizations such as the IFFL, but actually work against their goals.

6.3 LOW WATER CROSSINGS

The next step in further developing LWC analysis is by improving the accuracy of the floodplain and road intersection analysis. The development of an extensive road and intermittent stream datasets with attributes defining road elevation and type of road such as culvert or bridge would be useful. Elevation of the roads would allow use of a Digital Elevation Model to further analyze terrain elevation and its correlation to road elevation with major weather events. The location of road culverts, low laying roads, and bridged roads would also contribute to the efficiency of LWC analysis. Knowing how each type is susceptible to flooding would greater narrow down focus areas for flooding. A comprehensive intermittent stream dataset would not only identify these streams but it would identify areas of interest in occurrences of flooding. The combination of these improvements would allow more accurate identification of LWCs. Although time-consuming and manpower-heavy, field work can identify road elevation in areas of suspected LWCs. This process can provide that vital attribute to road datasets. Another realistic way to gather accurate LWC locations is to continue the communication efforts led by EWRP Consultants by calling and emailing local fire departments, water districts and municipalities and asking them to contribute to the flash flood-related injury and death prevention effort by sharing whatever LWC data they may have compiled for their areas.

7. CONCLUSION

EWRP Consultants has established a GIS for LWCs and 2007 SWRs that is the foundation for the research and spatial analysis that the IFFL, the TFFC and other Texas agencies desire to carry out with the intention of reducing the number of flash flood-related injuries and deaths in the state of Texas. Although time only allowed SWRs in the forty-four counties in the proposed Flash Flood Alley to be completed, the precedent has been set and the ball is in motion. The procedure developed for mapping SWRs is an efficient and viable one, and EWRP Consultants recommend its use in the future to map SWRs reported in other years. Targeting potential LWC areas by the intersection method using ArcGIS is a reasonable way to begin to represent these areas in a digital world, and there is room for future researchers to refine the model and eliminate false positives. As this foundation grows and the database becomes more complete, a wealth of information is there for the taking using the powerful tool of GIS.

8. REFERENCES CITED

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APPENDIX 3: MAPS

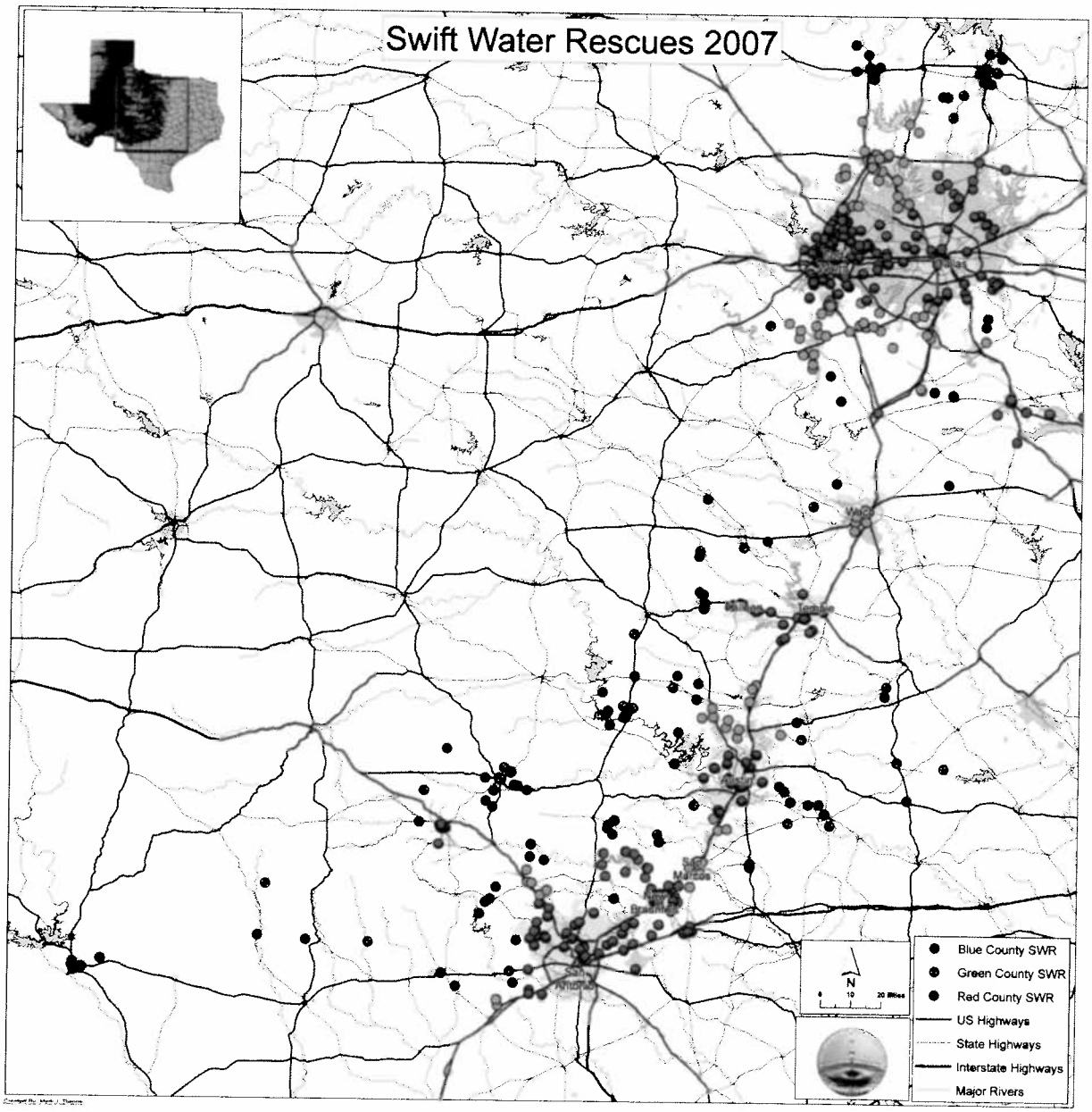

Figure 6. Swift water rescues 2007.

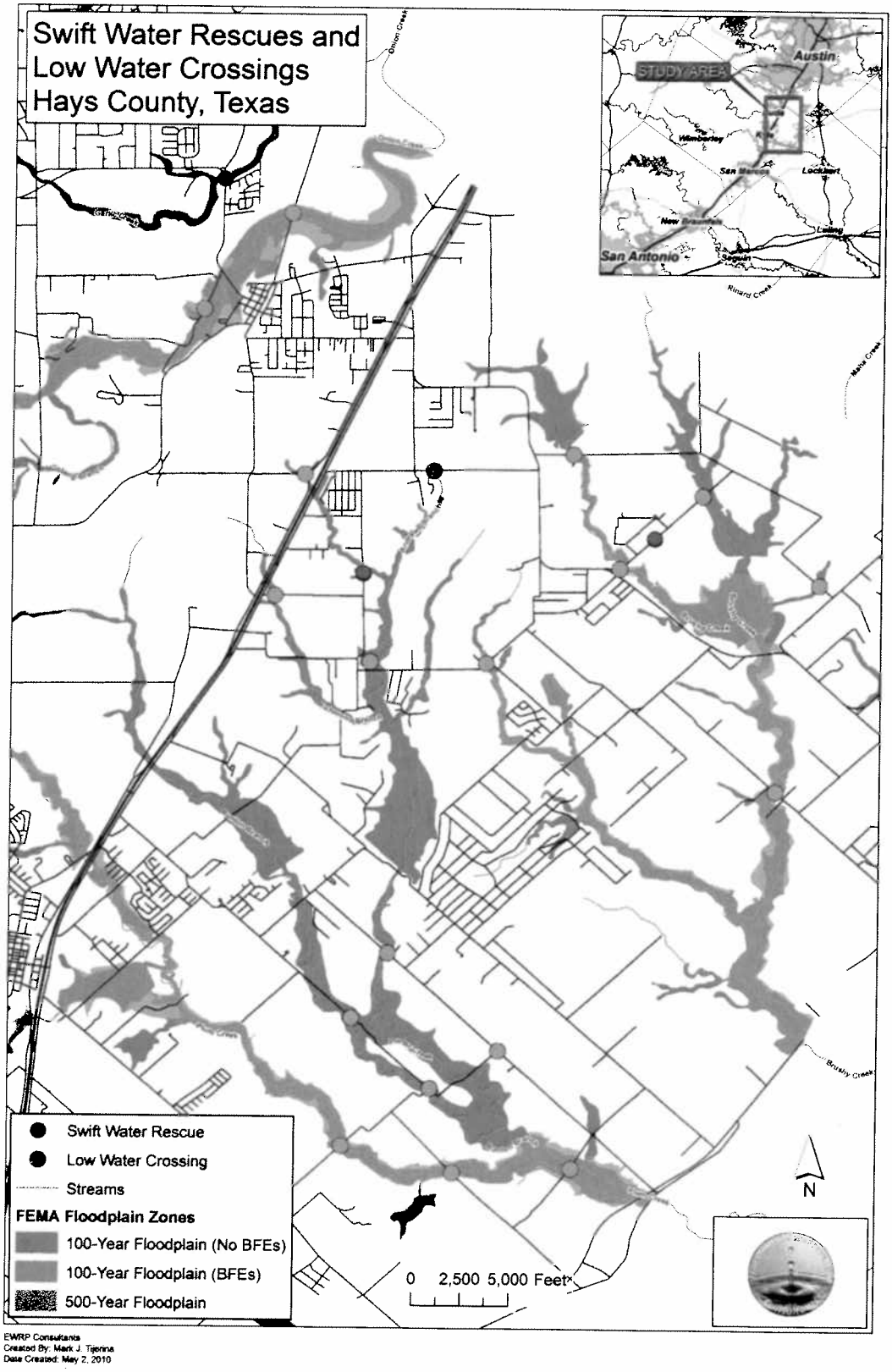
Swift Water Rescues and
Low Water Crossings
Hays County, Texas
STUDY AREA
Austin
San Antonio
Swift Water Rescue
Low Water Crossing
Streams
FEMA Floodplain Zones
100-Year Floodplain (No BFEs)
100-Year Floodplain (BFEs)
500-Year Floodplain
0 2,500 5,000 Feet
N
EWRP Consultants
Created By: Mark J. Tijerina
Date Created: May 2, 2010

Figure 7. Swift water rescues and low water crossings in Hays County, Texas.

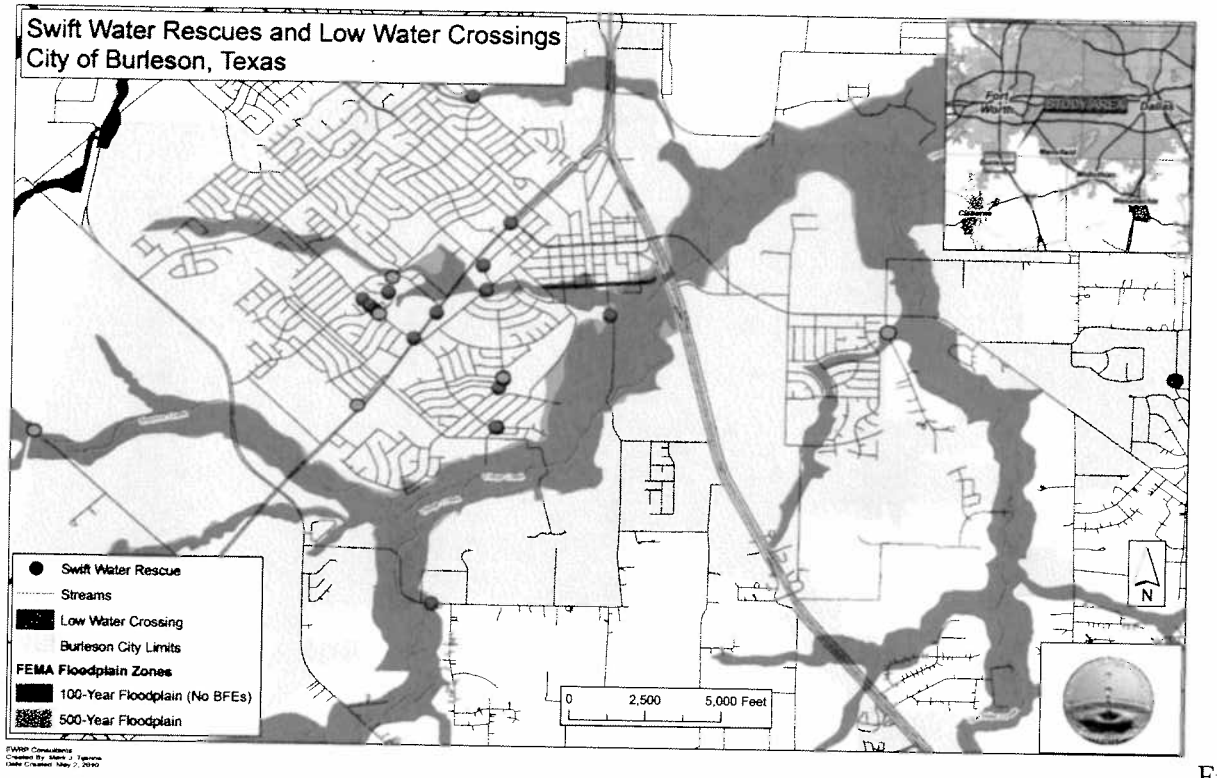

Figure 8. Swift water rescues and low water crossings in Burleson, Texas.

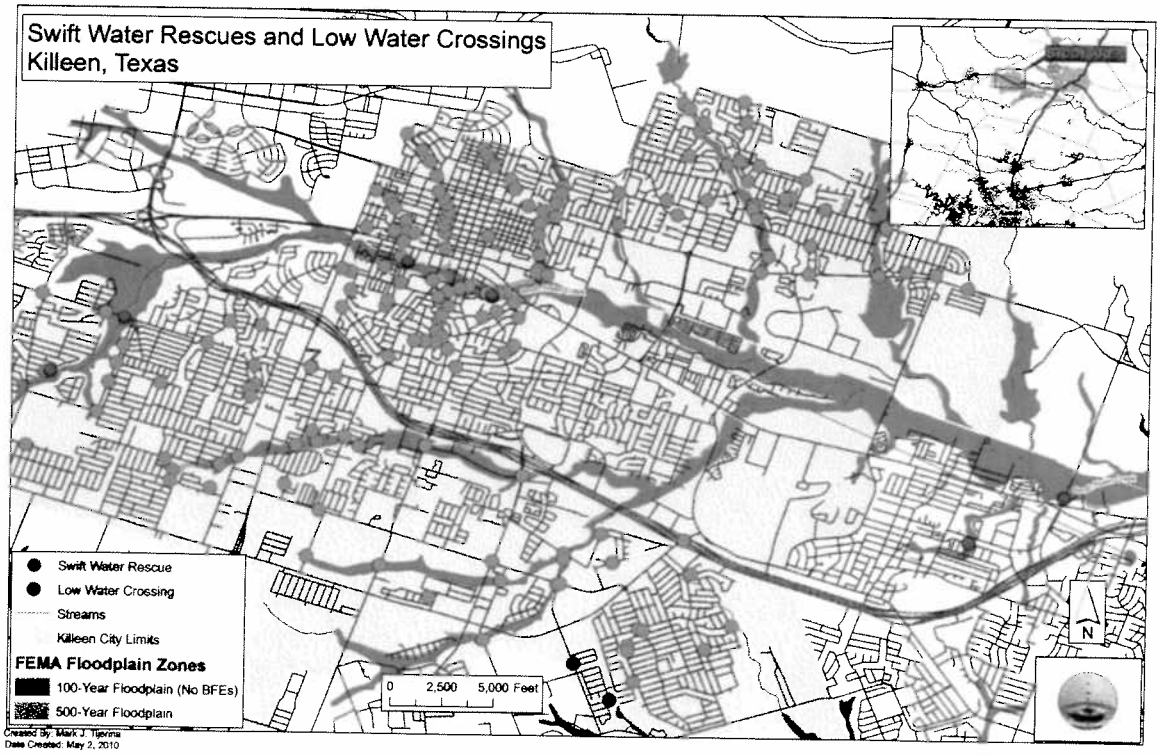

Figure 9. Swift water rescues and low water crossings in Killeen, Texas.

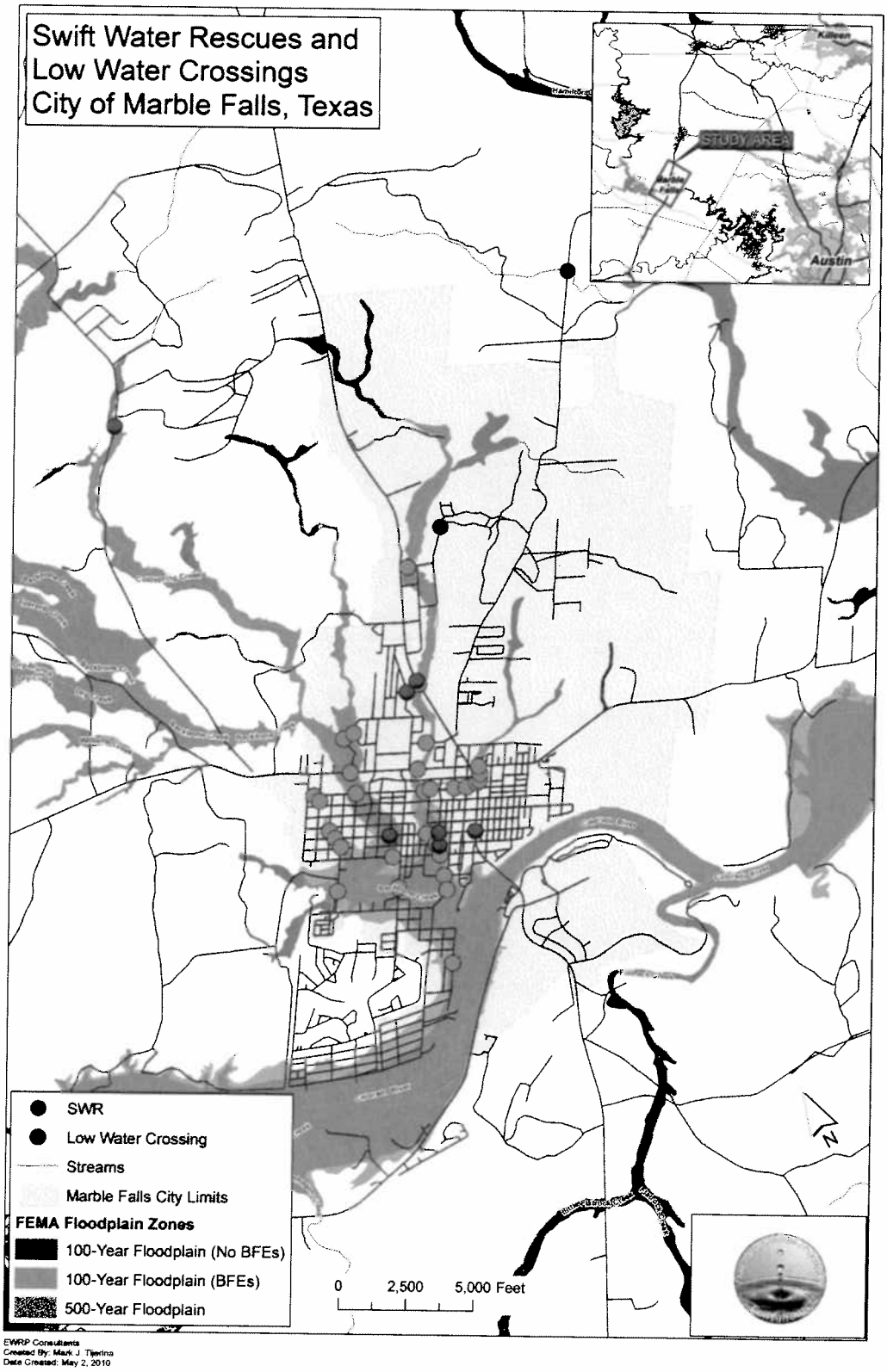

Figure 10. Swift water rescues and low water crossings in Marble Falls, Texas.

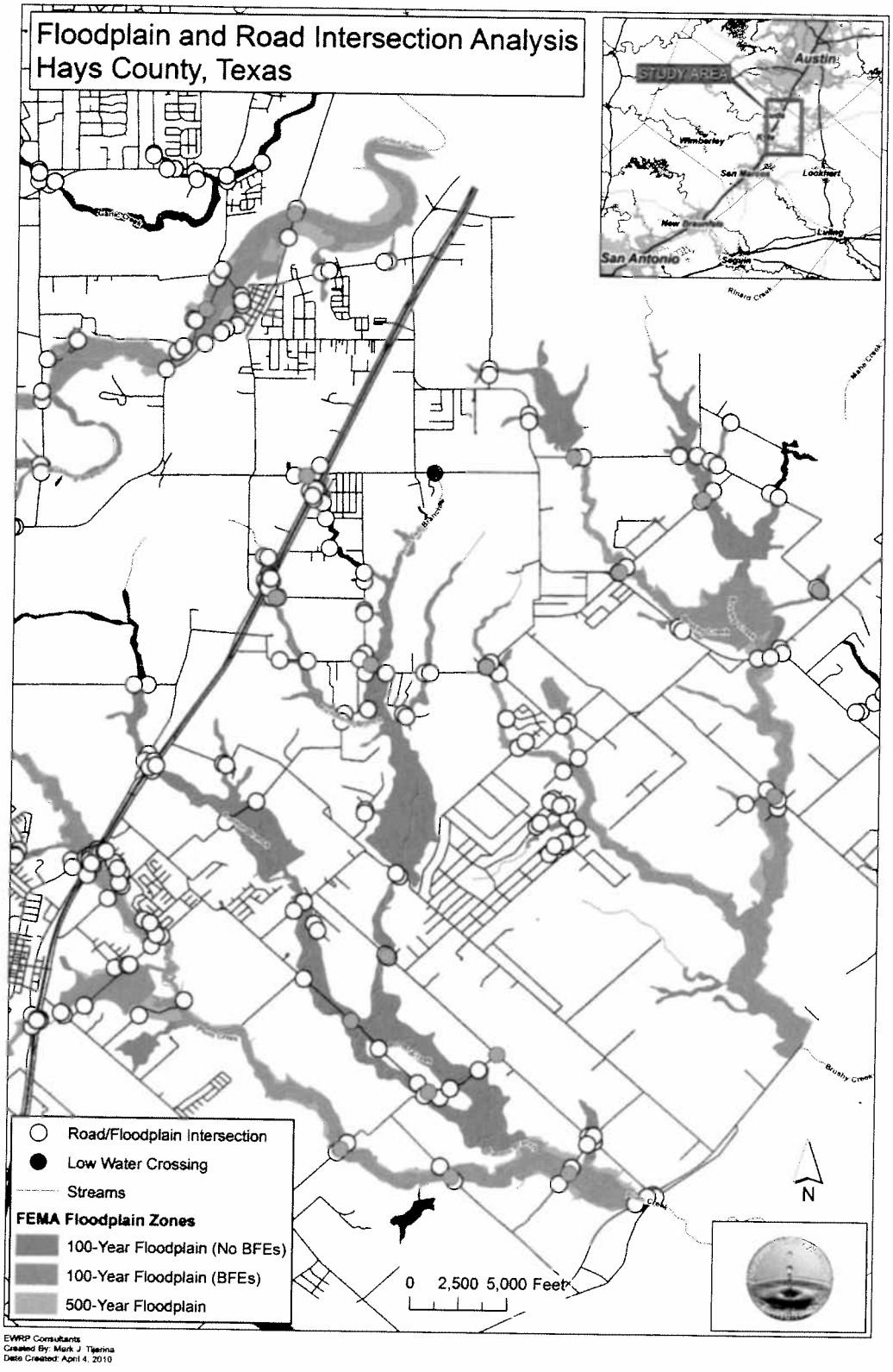

Figure 11. Known and potential low water crossings in Hays County, Texas.

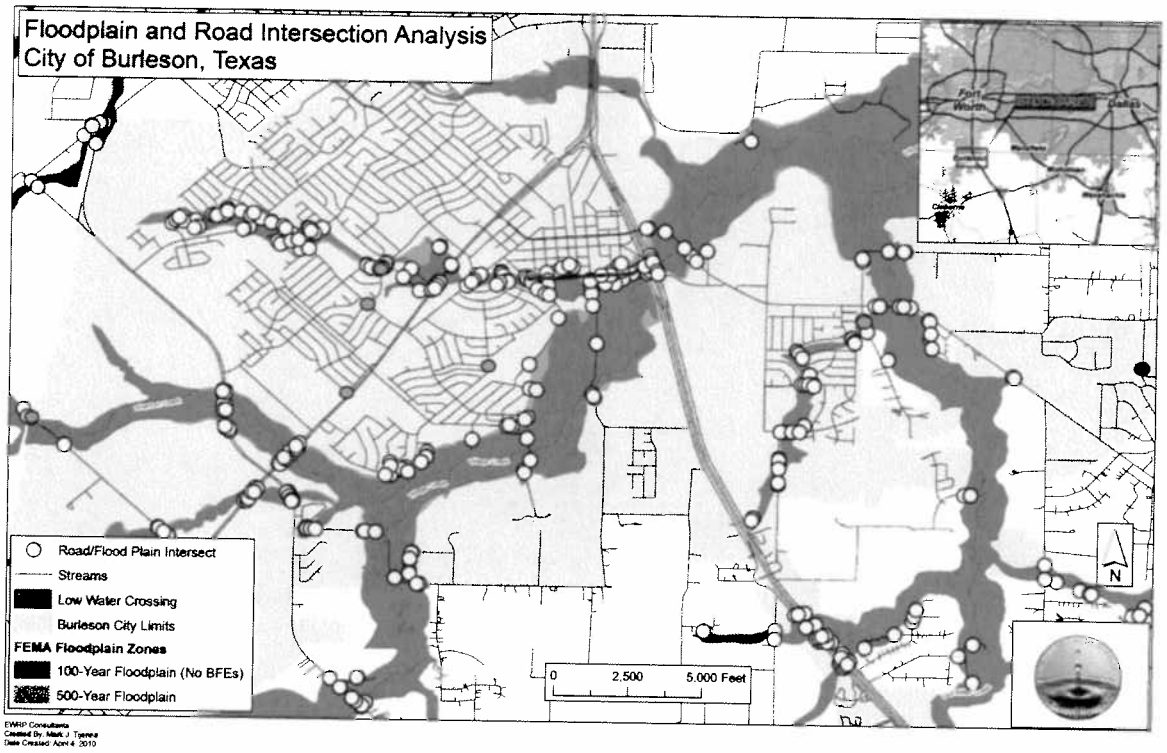

Figure 12. Known and potential low water crossings in Burleson, Texas.

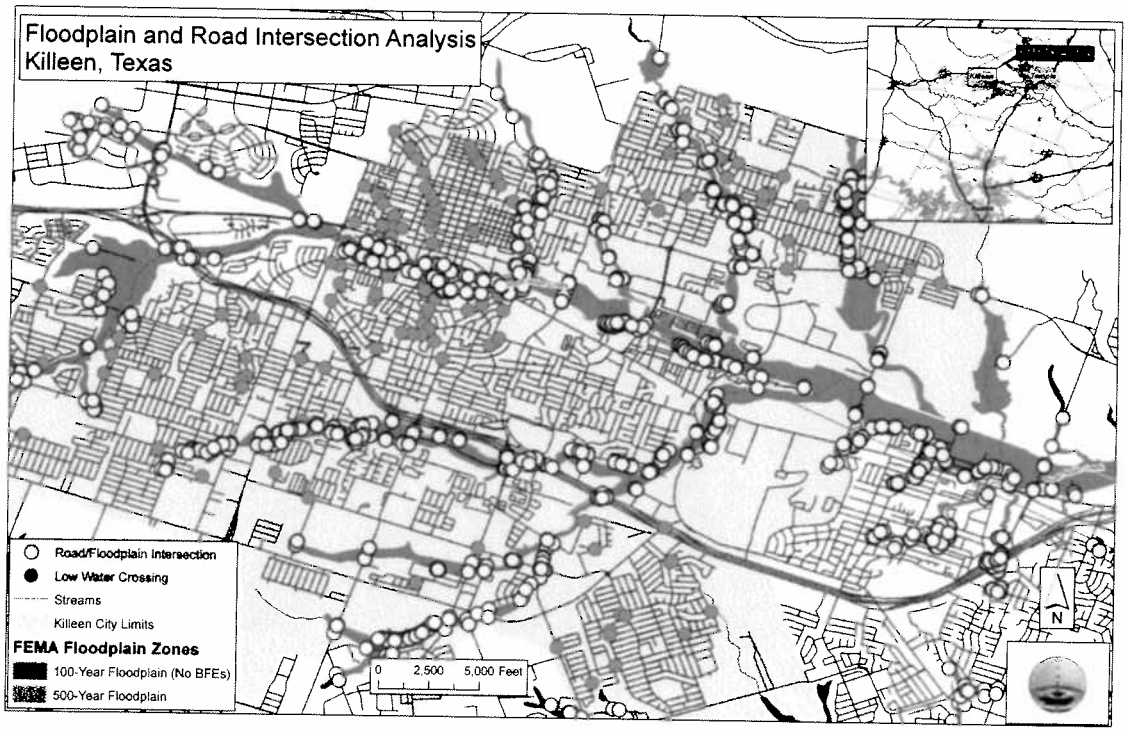

Figure 13. Known and potential low water crossings in Killeen, Texas.

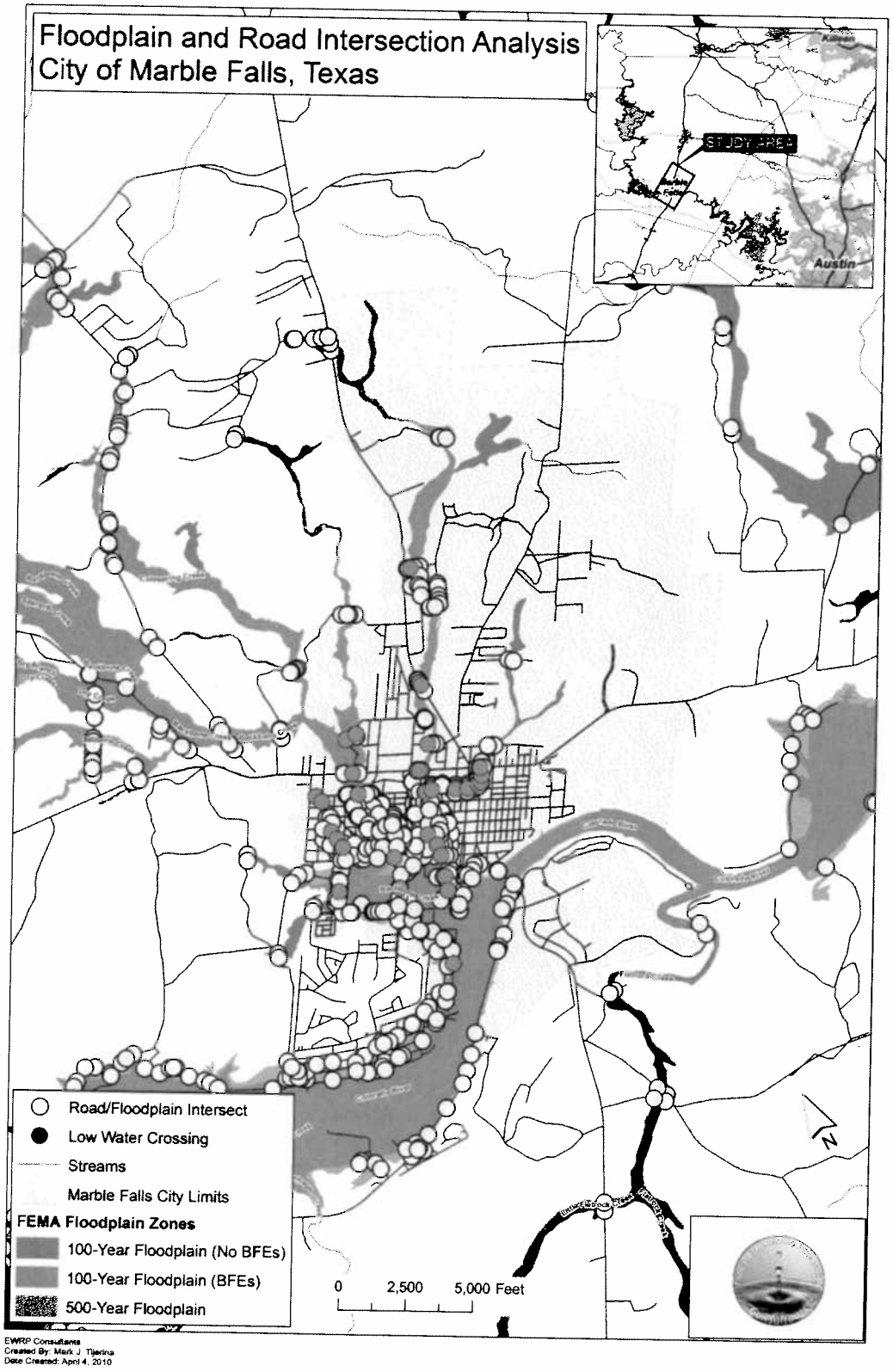

Figure 14. Known and potential low water crossings in Marble Falls, Texas.

APPENDIX 2. Metadata

A1.1 SWIFT WATER RESCUES METADATA

Identification_Information:
Citation:
Citation_Information:
Originator: Sarah Eason.
Publication_Date: May 5, 2010.
Title: SESWR.
Description:
Abstract:
Swift Water Rescues reported by Texas Fire Departments
in 2007.
Purpose: Spatially represent Swift Water Rescues in Texas.
Supplemental_Information:
Counties: Bexar, Blanco, Burleson, Guadalupe, Travis,
Val Verde, Uvalde, Medina, Real, Bandera, Kerr,
Gillespie, Llano, Kendall, Grayson, Lee, Caldwell,
Cooke, McLennan, Collin, Tarrant, Denton, Hays,
Johnson, Comal, Bastrop, Williamson, Milam, Bell,
Coryell, Limestone, Hill, Navarro, Ellis and Dallas.
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Points located based on street and directions fields from
fire department reports.
Logical_Consistency_Report:
TNRIS Strat Map Contours used to locate lowest elevation
on street.
Completeness_Report: 92 records out of 767 left out of database; unable to locate.
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Snapped to TNRIS Transportation.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: TXFIRS
Publication_Date: Excel file gathered by Dr. Lu accessed February, 2010.
Online_Linkage:
TXFIRS website:
http://www.tdi.state.tx.us/FIRE/fmtexfir.html
Reference PDF:

http://www.nfirs.fema.gov/documentation/reference/NFIRS_Complete_Reference_Guide_2008.pdf

Type_of_Source_Media: Excel file.
Source_Time_Period_of_Content:
Time_Period_Information:
Multiple_Dates/Times:
Range_of_Dates/Times:
Beginning_Date: January 1, 2007.
Ending_Date: December 31, 2007.
Source_Currentness_Reference: The dates of the Swift Water Rescues in 2007 are current.
Spatial_Data_Organization_Information:
Indirect_Spatial_Reference:
Bounding coordinates
Horizontal
In decimal degrees
West: -100.908425
East: -96.115581
North: 33.761809
South: 29.207848
In projected or local coordinates
Left: -100.908425
Right: -96.115581
Top: 33.761809
Bottom: 29.207848
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type:
675 points.
Feature class: SDTS feature type, feature count
SESWR: Entity point, 675
ESRI feature type: Simple
Geometry type: Point
Topology: FALSE
Feature count: 675
Spatial Index: TRUE
Linear referencing: FALSE
Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Geographic:
Latitude_Resolution: 0.000000.
Longitude_Resolution: 0.000000.
Geographic_Coordinate_Units: Decimal degrees.

Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983.

Ellipsoid_Name: Geodetic Reference System 80.
Semi-major_Axis: 6378137.000000.
Denominator_of_Flattening_Ratio: 298.257222
Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: Point feature.
Entity_Type_Definition:
Swift Water Rescue Locations in 2007 in
Texas counties:
Bexar, Blanco, Burleson, Guadalupe, Travis, Val Verde,
Uvalde, Medina, Real, Bandera, Kerr,
Gillespie, Llano, Kendall, Grayson, Lee, Caldwell,
Cooke, McLennan, Collin.

Entity_Type_Definition_Source: TXFIRS.
Attribute:
Attribute_Definition:
FID
Alias: FID
Data type: OID
Width: 4
Precision: 0
Scale: 0
Definition:
Internal feature number.
Definition Source:
ESRI
Feature Identification Number
Definition
ID number assigned by ArcGIS as unique identifier;
starts with zero instead of one.
Purpose
Unique identifier.
Attribute:
Attribute_Definition:
Shape
Alias: Shape
Data type: Geometry
Width: 0
Precision: 0
Scale: 0
Definition:
Feature geometry.
Definition Source:
ESRI

Shape
Definition
ArcGIS defined feature type.
Purpose
To designate feature type for reference.
Attribute:
Attribute_Definition:
Id
Alias: Id
Data type: Number
Width: 6
This field created by ArcGIS is extraneous.
Attribute:
Attribute_Definition:
INCIDENTID
Alias: INCIDENTID
Data type: String
Width: 50.
Incident Number
Definition
The month, day, and year of the incident. This date is when the alarm was received by the fire
department and must be the same as the date for the alarm time.
Purpose
In conjunction with other required Section A fields, this element uniquely identifies each incident.
Entry
Enter the month, day, and year (mm/dd/yyyy) that the initial incident alarm was received by the department. It must be entered for each incident.
. The Incident Date is the same as the Alarm date (Block E1), except if the incident is an exposure and the exposure occurs on a subsequent day.
Attribute:
Attribute_Definition:
COMMENTS
Alias: COMMENTS
Data type: String
Width: 50
Comments
Definition
Field created by Sarah Eason to record notes.
Purpose
To identify any discrepancies
or modifications made when locating streets on map.
Attribute:
Attribute_Definition:
INCIDENT_1

Alias: INCIDENT_1
Data type: String
Width: 254
Field created by joining point shapefile to excel table.
Attribute:
Attribute_Definition:
County
Alias: County
Data type: String
Width: 254
County in which the Fire Department that responed is located.
Attribute:
Attribute_Definition:
FDID
Alias: FDID
Data type: String
Width: 254
Fire Department Identification
Definition
A unique five-character identifier assigned by the state to identify a particular fire department within the state. This identifier may also identify the county, fire district, or other jurisdiction in which the fire department is located. Many states use the two left-most digits to identify the particular department within a jurisdiction. All five spaces in this field must be occupied by numerals or alphanumeric characters. If the FDID is less than five characters, use leading zeros.
Purpose
The FDID number is used to identify incident data that have been collected and reported by individual departments. Feedback on local or regional incident experience can then be prepared and sent to individual agencies or specific fire departments.
Attribute:
Attribute_Definition:
IN_DATE
Alias: IN_DATE
Data type: Number
Width: 16
Number of decimals: 6
Incident Date
Definition
The month, day, and year of the incident. This date is when the alarm was received by the fire department and must be the same as the date for the alarm time.
Purpose

In conjunction with other required Section A fields, this element uniquely identifies each incident.
Entry
Enter the month, day, and year (mm/dd/yyyy) that the initial incident alarm was received by the department. It must be entered for each incident.
. The Incident Date is the same as the Alarm date (Block E1), except if the incident is an exposure and the exposure occurs on a subsequent day.
Attribute:
Attribute_Definition:
IN_STATION
Alias: IN_STATION
Data type: String
Width: 254
Station
Definition
The number or identifier of a particular fire station within a fire department. This is a local option.
Purpose
The station number provides a means of tracking incident data that have been collected and reported by individual stations. Specific feedback on incident experience can then be prepared
and sent to individual stations. The station number is also useful for analyzing different levels
of activity within a fire department.
Attribute:
Attribute_Definition:
IN_NUM
Alias: IN_NUM
Data type: String
Width: 254
Incident Number
Definition
A unique number assigned to an incident.
. The Incident Number is a sequential number and is numeric only; it is not an incident identification number.
Purpose
In conjunction with other required Section A fields, this element uniquely identifies each incident.
Entry
Enter the number assigned to the incident. The number may be assigned at the local, county, or district level, depending on policies. It may be necessary to obtain this number from an alarm or dispatch center. It must be unique for each incident on a given day.
Attribute:
Attribute_Definition:
IN_EXPOSUR
Alias: IN_EXPOSUR

Data type: Number
Width: 16
Number of decimals: 6
Exposure Number
Definition
Exposure is defined as a fire resulting from another fire outside that building, structure, or vehicle, or a fire that extends to an outside property from a building, structure, or vehicle. For example, if the building fire ignites a truck parked outside, the truck fire is an exposure fire. . In the case of buildings with internal fire separations, treat the fire spread from one separation to another as an exposure. Treating multiple ownership of property within a building (e.g., condominiums) as exposures, unless separated by fire-rated compartments, is discouraged.
Purpose
Although the Incident Number permits all properties involved in a fire incident to be related together, the Exposure number identifies each separate property type involved in the fire. This makes it possible to capture the specific details of the fire in each exposure and to relate allthe exposures to the basic incident, if necessary. The Exposure Number, in conjunction with other required Section A fields, uniquely identifies each incident itemized in Section C.
When a fire involves more than one building, each building fire should be considered a separate fire, with the ignition for all but the original building fire classified as exposure fires.
Attribute:
Attribute_Definition:
IN_CENSUST
Alias: IN_CENSUST
Data type: String
Width: 254
Census Tract
Definition
The census tract number is a six-digit number assigned by the U.S. Census Bureau that identifies an area of land within the United States. Not all jurisdictions have census tract numbers.
Purpose
This element provides a means to cross-reference geographic and population information that is available from the U.S. Census Bureau to incident data for comparative analysis.
Attribute:
Attribute_Definition:
IN_NUMORMI
Alias: IN_NUMORMI
Data type: String
Width: 254
Number/Milepost

Definition
The number or milepost of the specific location where the incident occurred.
Purpose
This field further refines the incident address.
Attribute:
Attribute_Definition:
IN_PREFIX
Alias: IN_PREFIX
Data type: String
Width: 254
Street Prefix
Definition
The directional descriptor appearing before a street or highway name.
Purpose
This field further refines the incident address.
Attribute:
Attribute_Definition:
IN_STREETH
Alias: IN_STREETH
Data type: String
Width: 254
Street or Highway Name
Definition
The street or highway name where the incident occurred.
Purpose
This field further refines the incident address. This information can also be useful for identifying
local problems, such as checking for multiple incidents at the same address and checking ZIP codes or Census Tract entries.
Attribute:
Attribute_Definition:
IN_STREETT
Alias: IN_STREETT
Data type: String
Width: 254
Street Type
Definition
The street type descriptor appearing after a street or highway name.
Purpose
This field further refines the incident address.
Attribute:
Attribute_Definition:
IN_SUFFIX
Alias: IN_SUFFIX
Data type: String
Width: 254

Street Suffix
Definition
The directional descriptor appearing after a street or highway name.
Purpose
This field further refines the incident address.
Attribute:
Attribute_Definition:
IN_APT
Alias: IN_APT
Data type: String
Width: 254
Apartment, Suite, or Room
Definition
The number of the specific apartment, suite, or room where the incident occurred.
Purpose
This field further refines the incident address. This number is part of the address information
when the incident occurs within an apartment, suite, or identifiable room or area generally rented or leased.
Attribute:
Attribute_Definition:
IN_CITY
Alias: IN_CITY
Data type: String
Width: 254
City
Definition
The city where the incident occurred. If the incident occurred in an unincorporated area, use the city found in the mailing address for the incident location.
Purpose
This field further refines the incident address.
Attribute:
Attribute_Definition:
IN_STATE
Alias: IN_STATE
Data type: String
Width: 254
State
The state where the incident occurred.
Purpose
This field further refines the incident address, and it provides a means of linking incident data
to other geographic and population factors for comparative analysis at the state level.
Attribute:
Attribute_Definition:
IN_ZIP

Alias: IN_ZIP
Data type: String
Width: 254
ZIP Code
Definition
The numerical code assigned by the U.S. Postal Service to all U.S. jurisdictions.
Purpose
This field completes the information for identifying the exact incident address, and it provides
a means of linking fire incident data to other geographic and population factors for comparative
analysis at the local and regional levels.
Attribute:
Attribute_Definition:
IN_DIRECTI
Alias: IN_DIRECTI
Data type: String
Width: 254
Cross Street, Directions or U. S. National Grid
Definition
The nearest cross street to the incident address or directions from a recognized landmark or
the second street name of an intersection if Directions is selected as the Location Type. If U.S.
National Grid is selected as the Location Type, enter the USNG address (a geospatial address
based on universally defined coordinate and grid systems and a common frame of reference
across multiple jurisdictions easily extended world-wide). Using an alpha-numeric referencethat overlays the UTM (q.v.) coordinate system, USNG spatial addresses break down into
three parts: Grid Zone Designation, for a world-wide unique address; 100,000-meter Square
Identification, for regional areas; Grid Coordinates, for local areas.
Purpose
This element helps determine the exact location of the incident. This information may also be
useful for identifying local problems, such as checking for multiple incidents at the same
location.
Attribute:
Attribute_Definition:
IN_TYPE
Alias: IN_TYPE
Data type: String
Width: 254
Incident Type
. Incident Type was known as Type of Situation Found in NFIRS 4.1.
Definition
This is the actual situation that emergency personnel found on the scene when they arrived.

These codes include the entire spectrum of fire department activities from fires to EMS to public service.

. The type of incident reported here is not always the same as the incident type initially dispatched.

Purpose

This critical information identifies the various types of incidents to which the fire department

responds and allows the fire department to document the full range of incidents it handles.This information can be used to analyze the frequency of different types of incidents, provide

insight on fire and other incident problems, and identify training needs.

. This element determines which modules will subsequently be completed.

Attribute:

Attribute_Definition:

Inc_Type

Alias: Inc_Type

Data type: String

Width: 254

INCIDENT TYPE CODES

Water and ice-related rescue

363 Swift-water rescue. Includes flash flood conditions.

Attribute:

Attribute_Definition:

IN_MUTUALA

Alias: IN_MUTUALA

Data type: String

Width: 254

AID GIVEN OR RECEIVED CODES

1 Mutual aid received from an outside fire service entity upon request from the initial responding department.

2 Automatic aid received. Includes a department receiving aid from an outside fire service entity that was dispatched automatically based on a prior agreement between two jurisdictions.

3 Mutual aid given to an outside fire service entity on request of the outside entity.

4 Automatic aid given. Includes departments automatically dispatched to give aid to an outside

fire service entity based on a prior agreement between two jurisdictions.

5 Other aid given. Includes a fire department responding to another jurisdiction or locale that

has no fire department.

N No aid given or received.

Attribute:

Attribute_Definition:

Mut_Aid

Alias: Mut_Aid

Data type: String

Width: 254
Aid Given or Received
Definition
Aid given or received, either automatically (i.e., prearranged) or mutually for a specific incident.
These actions are defined as:
Aid Received (automatic or mutual): A fire department handles an incident within its jurisdiction with additional manpower or equipment from one or more fire departments outside its jurisdiction. Aid received can be either mutual or automatic aid.
Aid Given (automatic or mutual): A fire department responds into another fire department's jurisdiction to provide assistance at an incident or to cover a vacated station while the receiving fire department is busy at an incident. Aid received can be either mutual or automatic aid.
Other Aid Given: A fire department covers and responds to another jurisdiction or locale that has no fire department.
No Aid: A fire department handles an incident within its jurisdiction without help from adjacent or outside fire departments.
Purpose
Aid information can be used to study response levels necessary to control various fire and emergency situations. It can be used to determine the adequacy of resources at the local level and the need for adjusting cooperative agreements. The Aid Given or Received entry serves as data control to ensure that the same incident is not counted more than once while still giving credit for activity performed by outside departments.
Attribute:
Attribute_Definition:
IN_ALARMDA
Alias: IN_ALARMDA
Data type: Number
Width: 16
Number of decimals: 6
Dates and Times
All dates and time are entered as numerals. For time of day, the 24-hour clock is used. (Midnight is 0000.)
Alarm Time
Definition
The actual month, day, year, and time of day (hour, minute, and (optional in on-line entry) seconds) when the alarm was received by the fire department. This is not an elapsed time. . The Alarm time is the same as the Incident Date (Section A), except if the incident is an exposure and the exposure occurs on a subsequent day.
Purpose
Alarm time is important for three reasons: (1) as a legal requirement for recording the precise time notification was made of the incident, (2) as information for determining the frequency

of particular types of incidents by time period, and (3) as the starting time to determine the length of time taken to arrive at an incident and the total amount of time spent on the incident scene.

. For all automated systems, NFIRS supports the collection of all times in seconds in addition to hours and minutes, although it is not required. Collection of seconds is usually used by fire departments using computer-aided dispatch.

Attribute:

Attribute_Definition:

IN_ARRIVAL

Alias: IN_ARRIVAL

Data type: Number

Width: 16

Number of decimals: 6

Arrival Time

Definition

The actual month, day, year, and time of day when the first responding unit arrived at the incident scene. This is not an elapsed time.

Purpose

This element reflects the time spent traveling to the scene of the incident. This information can be useful to fire department management in determining (1) the actual time spent at an incident and (2) any delay between alarm and arrival.

Attribute:

Attribute_Definition:

IN_CONTROL

Alias: IN_CONTROL

Data type: String

Width: 254

Controlled Time

Definition

The actual month, day, year, and time of day when the fire is brought under control or the incident is stabilized and does not require additional emergency resources. "Controlled" is the time when the incident commander determines that the fire will not escape from its containment perimeter.

. This is a required field for wildland fires.

Purpose

The time spent stabilizing a fire provides fire department management with the information needed to analyze the duration patterns of different types of fires. This can assist in determining service demand and costs for resource allocation.

Attribute:

Attribute_Definition:

IN_LASTUNI
Alias: IN_LASTUNI
Data type: String
Width: 254
Last Unit Cleared Time
Definition
The actual month, day, year, and time of day when the last unit cleared the incident scene. This is not an elapsed time.
Purpose
Combined with the previously recorded times, this element is valuable to fire department management in determining the actual time spent at an incident.

Attribute:
Attribute_Definition:
IN_SHIFT
Alias: IN_SHIFT
Data type: String
Width: 254
Shift and Alarms
Shift or Platoon
Definition
Identifies the on-duty shift or platoon that responded to the incident. This applies only to fire departments with organized work force arrangements.
Purpose
Recording the shift that responded to an incident assists fire departments in determining workload balances and staffing requirements. This is a local option.

Attribute:
Attribute_Definition:
IN_ALARMS
Alias: IN_ALARMS
Data type: String
Width: 254
Alarms
Definition
The actual number of alarms transmitted for the incident. The definition of an alarm is determined at the local level.
Purpose
The number of alarms is one method of measuring incident severity. Knowing the number of alarms can be useful for local analysis of resource requirements. The number of alarms also may be related to mutual aid support. This is a local option.

Attribute:
Attribute_Definition:
IN_DISTRIC
Alias: IN_DISTRIC

Data type: String
Width: 254
District
Definition
An area identified by the fire department that is useful for administrative purposes.
Purpose
Fire departments can develop their own method of locating the frequency and severity of incidents
by district. District numbers may identify specific townships, contract service areas, political wards, station response areas, inspection or administrative districts, or any other boundary a department may wish to use. This data element can be a powerful tool for local use. This is a local option.
Attribute:
Attribute_Definition:
FF_Deaths
Alias: FF_Deaths
Data type: String
Width: 254
Casualties
Definition
A person injured or killed either as a result of the incident or during the mitigation of the incident.
An injury is physical damage to a person that requires either (1) treatment by a practitioner of medicine within 1 year of the incident, or (2) at least 1 day of restricted activity immediately following the incident. Deaths also include people who die within 1 year because
of injuries sustained from the incident.
. Either the None box is checked or marked or the number of casualties is entered.
Civilians include emergency personnel who are not members of the fire department, such as police officers or utility workers.
Purpose
This information can be correlated with occupancy type, structural conditions, and other data
to help understand how to reduce future fire injuries and deaths. Furthermore, this information
can be used to reduce firefighter injuries and deaths through better equipment, training, and physical conditioning.
Fire Service Deaths: Enter the number of fire service personnel from your department who died in connection with this incident regardless of incident type. A Fire Service Casualty
Module must be completed for each individual counted here.
Attribute:
Attribute_Definition:
Civ_Deaths
Alias: Civ_Deaths
Data type: String

Width: 254
Casualties
Definition
A person injured or killed either as a result of the incident or during the mitigation of the incident.
An injury is physical damage to a person that requires either (1) treatment by a practitioner of medicine within 1 year of the incident, or (2) at least 1 day of restricted activity immediately following the incident. Deaths also include people who die within 1 year because
of injuries sustained from the incident.
. Either the None box is checked or marked or the number of casualties is entered.
Civilians include emergency personnel who are not members of the fire department, such as police officers or utility workers.
Purpose
This information can be correlated with occupancy type, structural conditions, and other data
to help understand how to reduce future fire injuries and deaths. Furthermore, this information
can be used to reduce firefighter injuries and deaths through better equipment, training, and physical conditioning.
Civilian Deaths: Enter the number of civilians or non-fire department personnel who died in connection with this incident. Enter only fire-related deaths here. For HazMat deaths, enter the number in Section P of the HazMat Module when that optional module is selected by your state reporting authority. A Civilian Casualty Module must be completed for each individual counted here.
Attribute:
Attribute_Definition:
FF_Inj
Alias: FF_Inj
Data type: String
Width: 254
Casualties
Definition
A person injured or killed either as a result of the incident or during the mitigation of the incident.
An injury is physical damage to a person that requires either (1) treatment by a practitioner of medicine within 1 year of the incident, or (2) at least 1 day of restricted activity immediately following the incident. Deaths also include people who die within 1 year because
of injuries sustained from the incident.
. Either the None box is checked or marked or the number of casualties is entered.
Civilians include emergency personnel who are not members of the fire department, such as police officers or utility workers.
Purpose
This information can be correlated with occupancy type, structural conditions, and other data

to help understand how to reduce future fire injuries and deaths. Furthermore, this information
can be used to reduce firefighter injuries and deaths through better equipment, training, and physical conditioning.
Fire Service Injuries: Enter the number of fire service personnel from your department who were injured (but did not die) in connection with this incident regardless of incident type. A Fire Service Casualty Module must be completed for each individual counted here.
Attribute:
Attribute_Definition:
Civ_Inj
Alias: Civ_Inj
Data type: String
Width: 254
Casualties
Definition
A person injured or killed either as a result of the incident or during the mitigation of the incident.
An injury is physical damage to a person that requires either (1) treatment by a practitioner of medicine within 1 year of the incident, or (2) at least 1 day of restricted activity immediately following the incident. Deaths also include people who die within 1 year because
of injuries sustained from the incident.
. Either the None box is checked or marked or the number of casualties is entered.
Civilians include emergency personnel who are not members of the fire department, such as police officers or utility workers.
Purpose
This information can be correlated with occupancy type, structural conditions, and other data
to help understand how to reduce future fire injuries and deaths. Furthermore, this information
can be used to reduce firefighter injuries and deaths through better equipment, training, and physical conditioning.
Civilian Injuries: Enter the number of civilians or non-fire department personnel who were injured (but did not die) in connection with this incident. Enter only fire-related injuries
here. For HazMat injuries, enter the number in Section P of the HazMat Module when that optional module is selected by your state reporting authority. The Civilian Casualty Module must be completed for each individual counted here.
Overview_Description:
Entity_and_Attribute_Overview:
Records are incidences of Swift Water Rescues reported
in 2007 by Texas Fire Departments in the counties of
Bexar, Blanco, Burleson, Guadalupe, Travis, Val Verde,
Uvalde, Medina, Real, Bandera, Kerr, Gillespie, Llano,
Kendall, Grayson, Lee, Caldwell, Cooke, McLennan, Collin.

Although Alias, Data Type, Width, Number of Decimals,
Proper Name of Field, Definition and Purpose are entered
in the above
Detailed Description of Attribute Fields, for more information
please refer to the pdf below for attribute explanation:

http://www.nfirs.fema.gov/documentation/reference/NFIRS_Complete_Reference_Guide_2008.pdf

"Comments" field created by Sarah Eason to
identify any discrepancies or modifications made
when locating streets on map.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Dr. Pam Showalter
Contact_Organization:
International Flash Flood Laboratory and
Texas State University Program Faculty,
Department of Geography
Contact_Address:
Address: 139 Evans Liberal Arts
Address_Type: work.
City: San Marcos.
State_or_Province: Texas.
Postal_Code: 78666.
Country: USA.
Contact_Voice_Telephone: (512) 245-2170.
Contact_Electronic_Mail_Address: ps15@txstate.edu
Contact_Instructions: Dr. Pam Showalter has been given a CD containing the SESWR shapefile and is the official distributor.
Resource_Description: Shapefile on CD.
Distribution_Liability:
Points have been placed in the general area judged best
by comparing roads, streams and elevations.
In some cases, street names and directions are not clear and choices made
about placement are subjective.
As a result, if the SWR actually occured on a different segment of the road,
it is not the liabliity of myself, EWRPC, Dr. Showalter, or the IFFL.
Metadata_Reference_Information:
Metadata_Date: Wednesday, April 27, 2010.
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:

Contact_Person:
Sarah Eason
Mark Tijerina
JP Rodriguez
Cooper Sims
Contact_Organization: Texas State University students.
Contact_Organization_Primary:
Contact_Organization: International Flash Flood Laboratory.
Contact_Person: Dr. Pam Showalter.
Contact_Position: TX State Students.
Contact_Voice_Telephone: 512-638-7428.
Contact_Electronic_Mail_Address:
se1121@txstate.edu.
season717@gmail.com.
mt1246@txstate.edu.
jr1576@txstate.edu.
coop@txstate.edu.
Contact_Instructions:
Any questions reagrding this data can be directed to
the above email addresses.

A1.2 POTENTIAL LOW WATER CROSSINGS METADATA

Identification_Information:
Citation:
Citation_Information:
Originator: Mark J. Tijerina
Publication_Date: May 3, 2010
Title: Intersection_Analysis
Description:
Abstract:
Point Intersection of Federal Emergency Management Agency (FEMA) and Texas Natural Resources Inforamtion System (TNRIS)
for Texas
Purpose: Locate potential Low Water Crossings for Bell, Burnet, Hays, and Johnson Counties,
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: Points are located based on intersections of FEMA floodplain zones and TNRIS transportation datasets
Logical_Consistency_Report: The Hawth tool was used to pinpoint each intersection of floodplain and roads.
Completeness_Report: All points were processed through the Hawth Tool
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Each point was placed on road floodplain interecetion
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Hawth Tool by Spatial Ecology
Publication_Date: website accessed on April 4, 2010
Online_Linkage: http://www.spatialecology.com/htools/tooldesc.php
Type_of_Source_Media: Third party GIS spatial extension
Source_Time_Period_of_Content:
Source_Currentness_Reference: All points are current as of April 4, 2010
Spatial_Data_Organization_Information:
Indirect_Spatial_Reference:
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type:
14,668 points
Feature class: SDTS feature type, feature count
Intersection_Analysis: Entity point, 14,668
ESRI feature type: Simple
Geometry type: Point

Topology: FALSE
Feature count: 14,668
Spatial Index: TRUE
Linear referencing: FALSE
Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Geographic:
Latitude_Resolution: 0.00000
Longitude_Resolution: 0.000000
Geographic_Coordinate_Units: Decimal degrees
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983.
Ellipsoid_Name: Geodetic Reference System 80.
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222
Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: Point Feature
Entity_Type_Definition:
Potential Low Water Crossings in Texas
Counties: Bell, Burnet, Hays, Johnson
Entity_Type_Definition_Source: Hawth Tool
Attribute:
Attribute_Label: FID
Attribute_Definition:
FID
Alias: FID
Data Type: Object ID
Length: 4
Precision: 0
Scale: 0
Definition: ID number assigned by ArcGIS as unique identifier
Attribute_Label: Shape
Attribute_Definition:
Shape
Alias: Shape
Data Type: Point
Length: 0
Precision: 0
Scale: 0
Definition: Each Point represents an intersection of Roads and flooplains
Attribute_Label: ID
Attribute_Definition:
ID
Alias: id

Data Type: Long
Length: 6
Precision: 6
Scale: 0
Definition: This is a extraneous field created by ArcGIS
Attribute_Label: County_ID
Attribute_Definition:
County_ID
Alias: County_ID
Data Type: Long
Length: 6
Precision: 6
Scale: 0
Definition: This field was created to sort each of the four counties.
1 = Bell County
2 = Burnet
3 = Hays
4 = Johnson
Overview_Description:
Entity_and_Attribute_Overview: Each point represents the intersection of road/floodplain for Bell, Burnet, Hays, and Johnson Counties.
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Dr. Pam Showalter
Contact_Organization: International Flash Flood Laboratory and Texas State University Program Faculty, Department of Geography
Contact_Address:
Address_Type: 139 Evans Liberal Arts
Address: Work
City: San Marcos
State_or_Province: Texas
Postal_Code: 78666
Country: USA
Contact_Voice_Telephone: (512) 245-2170
Contact_Electronic_Mail_Address: ps15@txstate.edu
Contact_Instructions: Dr. Pam Showalter has been given a CD containing the SESWR shapefile and is the official distributor. Resource_Description: Shapefile on CD.
Distribution_Liability: Point were automatically placed by the Hawth tool based on intersecting point of roads and floodplains. As a result, is not the liabliity of myself, EWRPC, Dr. Showalter, or the IFFL.
Metadata_Reference_Information:
Metadata_Date: Tuesday, May 4, 2010
Metadata_Contact:
Contact_Information:

Contact_Person_Primary:
Contact_Person: Mark J. Tijerina
Contact_Organization: Texas State University student
Contact_Person: Dr. Pam Showalter
Contact_Organization: International Flash Flood Laboratory
Contact_Electronic_Mail_Address:
Mark J. Tijerina
mt1246@txstate.edu
mjttx11@gmail.com

Dr. Pam Showalter
ps15@txstate.edu
Contact_Instructions: I graduate May 14, 2010, any questions regarding this data can be directed to mjttx11@gmail.com

APPENDIX 3. CONTRIBUTION OF EACH TEAM MEMBER

Project Manager

Sarah Eason mapped 234 SWRs, 169 LWCs in Killeen and 30LWCs in Marble Falls. She wrote the metadata for her individual SWR shapefile as well as the merged SWR shapefile, showed the group how to write metadata, and allowed them to use hers as a template. In the final report, she wrote the Cover Page, Abstract, Table of Contents, Introduction, Literature Review, LWC Data, Breakdown of Data Used, SWR Methodology, Methodology for LWCs Provided by Legal Entities, Discussion of Implications, Discussion of SWRs, Conclusion and References. She co-wrote the SWR Data, Results and Flow Chart with Cooper Sims and co-wrote the Discussion of LWCs with Mark Tijerina. She prepared the Appendices and formatted the document. She created the poster and the final power point presentation.

Assistant Project Manager/ Web Master

J. P. Rodriguez mapped 148 SWRs. He wrote the metadata for his SWR shapefile. He created the EWRP Consultants logo and the EWRP Consultants Website.

GIS Analyst

Cooper Sims mapped 171 SWRs. He wrote the metadata for his SWR shapefile. In the final report, he created the Flow Chart and co-wrote the SWR Data and the Results with Sarah Eason.

GIS Analyst

Mark J. Tijerina mapped 105 SWRS. He researched and designed the intersection analysis method used for targeting potential LWCs. He wrote the metadata for the resulting shapefile. He created all the maps presented by EWRP Consultants and created the EWRP Consultants TRACS site. In the final report, he wrote the Cover Page, LWC Methodology and co-wrote the Discussion of LWCs with Sarah Eason. He edited and finalized the Flow Chart, the poster and the logo.