









Resilient De Soto:

Flood Hazard Mitigation Plan - Appendices

May 31, 2023

City of De Soto

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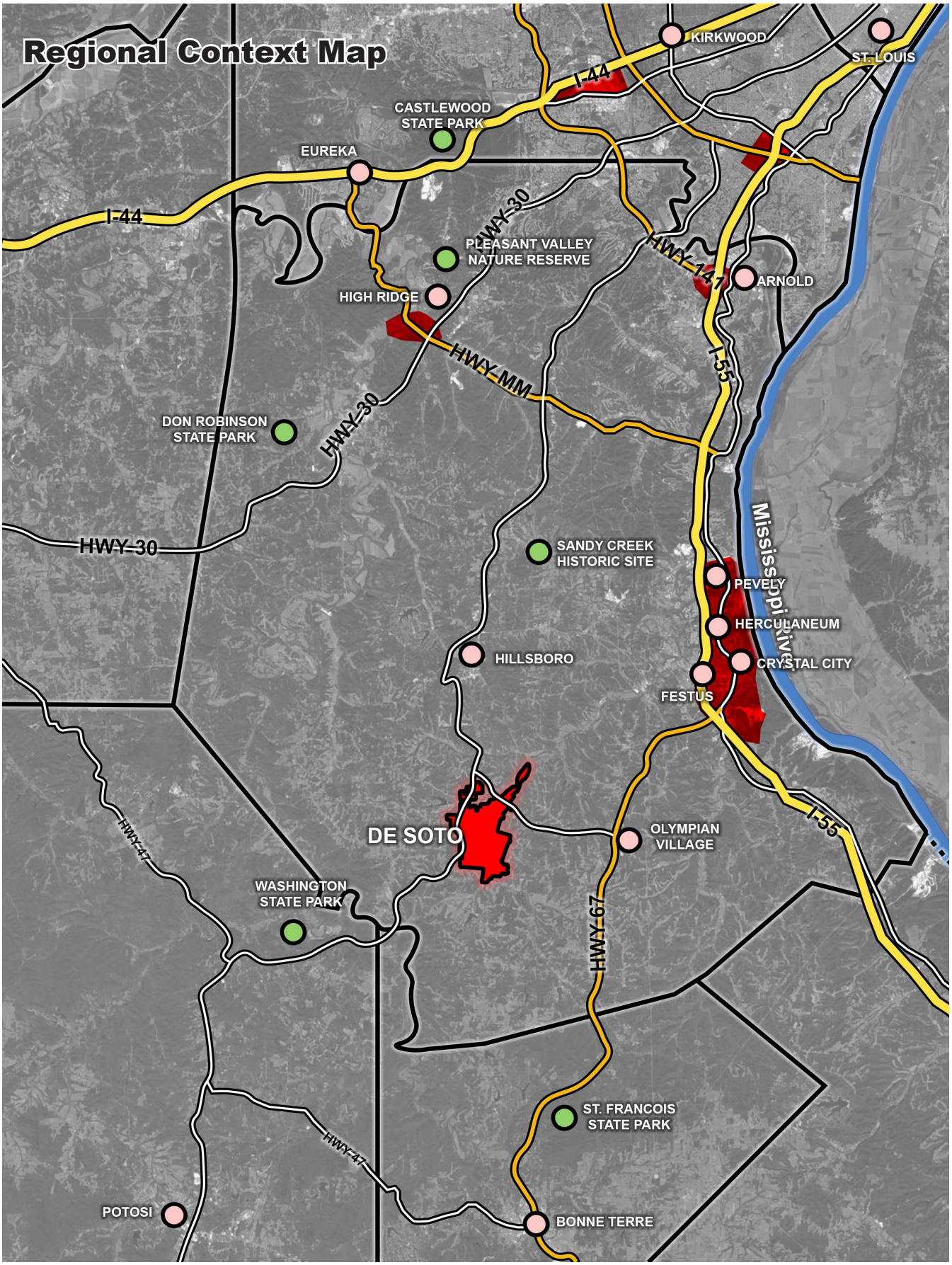
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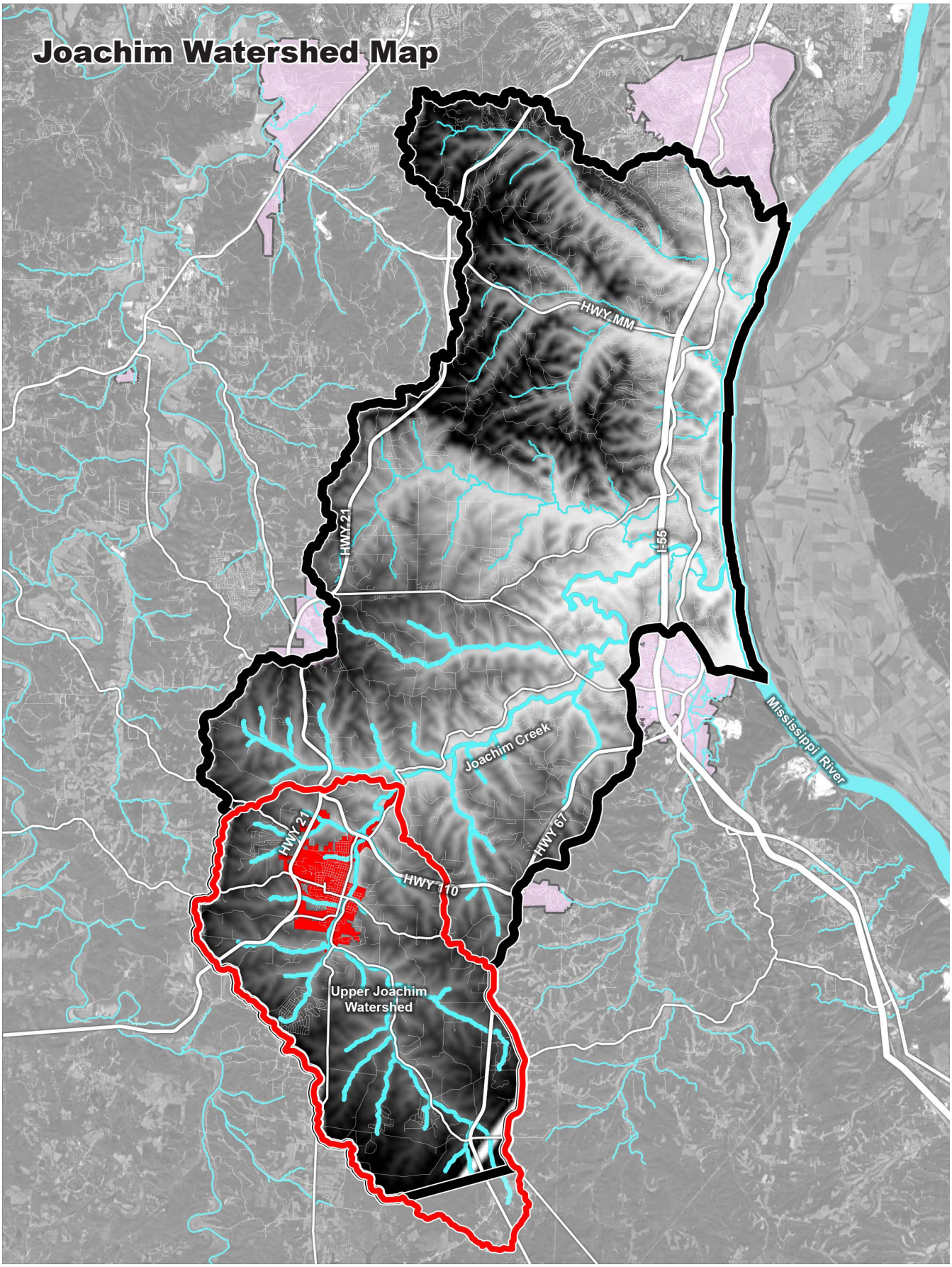


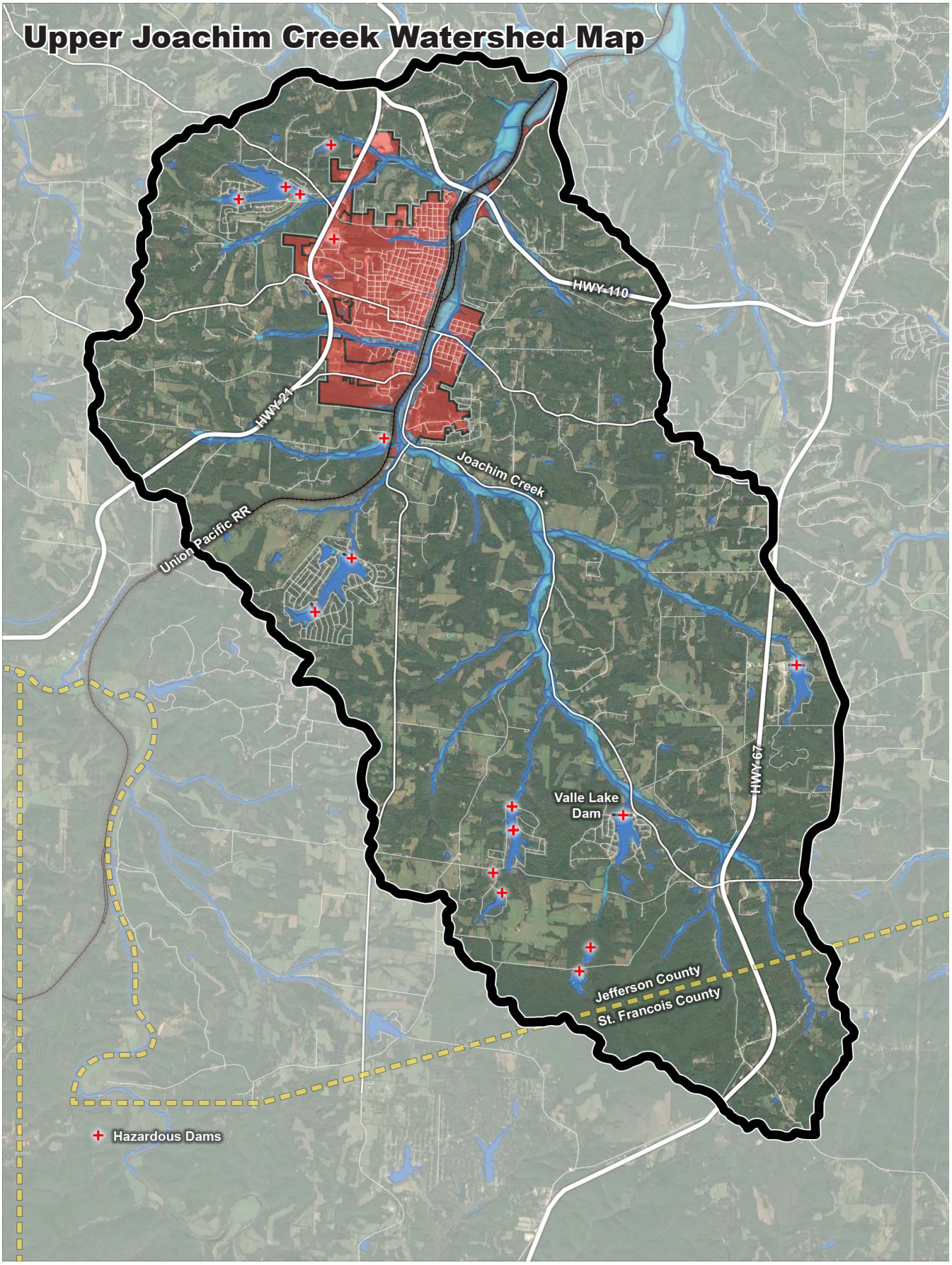


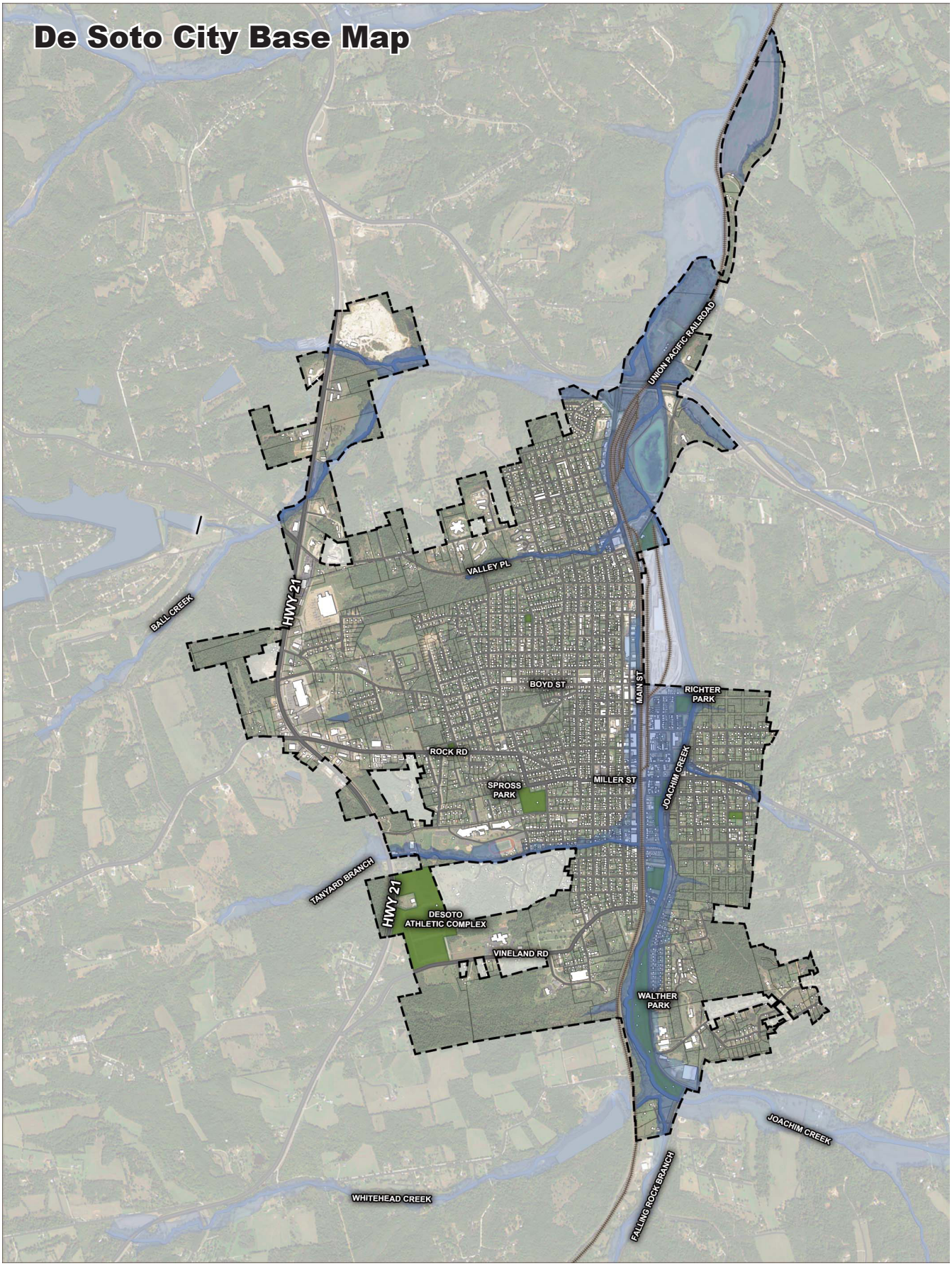
A

Base Maps


Regional Context Map
KIRKWOOD
ST. LOUIS
I-44
CASTLEWOOD STATE PARK
EUREKA
I-44
HWY-30
PLEASANT VALLEY NATURE RESERVE
HWY-141
ARNOLD
HIGH RIDGE
HWY-MM
I-55
DON ROBINSON STATE PARK
HWY-30
HWY-30
SANDY CREEK HISTORIC SITE
Mississippi River
PEVELY
HERCULANEUM
HILLSBORO
CRYSTAL CITY
FESTUS
DE SOTO
OLYMPIAN VILLAGE
I-55
HWY-47
WASHINGTON STATE PARK
HWY-67
ST. FRANCOIS STATE PARK
HWY-47
POTOSI
BONNE TERRE


Joachim Watershed Map
HWY MM
HWY 21
I-55
Mississippi River
Joachim Creek
HWY 67
HWY 21
HWY 110
Upper Joachim Watershed


Upper Joachim Creek Watershed Map
HWY-110
HWY-21
Joachim Creek
Union Pacific RR
Valle Lake
Dam
HWY-67
Jefferson County
St. Francois County
Hazardous Dams


De Soto City Base Map
UNION PACIFIC RAILROAD
VALLEY PL
HWY 21
BALL CREEK
BOYD ST
MAIN ST
RICHTER PARK
ROCK RD
SPROSS PARK
MILLER ST
JOACHIM CREEK
TANYARD BRANCH
HWY 21
DESOTO ATHLETIC COMPLEX
VINELAND RD
WALTHER PARK
JOACHIM CREEK
WHITEHEAD CREEK
FALLING ROCK BRANCH





B

City Wide Assessment



CITY OF DE SOTO

COMMUNITY DEVELOPMENT BLOCK GRANT MITIGATION PLANNING PROJECT

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COMPREHENSIVE CITY WIDE ASSESSMENT

FEBRUARY 2023

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Flood Resiliency Plan

THE CITY OF DE SOTO, MO

De Soto Mitigation Planning Project

Table of Contents:

Comprehensive City Wide Assessment

- Executive Summary
- Existing Plan Reviews
- De Soto Regional Context
- De Soto City Profile
- Natural Resources + Features
- Built Feature Characteristics
- City Economic Overview
- Key Conclusions Summary



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Mitigation Planning Project

Executive Summary

The De Soto Comprehensive City Wide Assessment Report is a collection of data gathered from all previous plans and studies developed for the city; interviews conducted with stakeholders; county and city information; consultant led research; site surveys; government mapping tools; and analysis. The purpose of this report is to provide a baseline understanding of the existing conditions of the City of De Soto and Upper Joachim Creek Watershed before beginning the planning and development phases of the Flood Resiliency Plan. It is a living breathing document to be continually referenced at all stages of planning and is meant as a future resource for the city. It will be included as an appendix to the final resiliency plan developed through this process.

This document contains a dedicated review of all past plans and studies and analyses the demographics, economics, built features, and natural features of the City of De Soto and The Upper Joachim Creek Watershed. It summarizes the key understandings the team has come to acknowledge as significant factors in the success of the plan and the key issues and ideas that the city and county face with flood resiliency today. The analysis suggests that the collaborative planning process will require a series of well targeted and planned strategies to mitigate the long term impact of flooding in De Soto. There is not a single cure all solution that can be developed given the conditions and underlying factors of the flood problems. The are a number of contributing factors to the flooding issue that must be dealt with at the county, state, and city levels requiring multi-jurisdictional collaboration and explorations of the problem. The overall plan will aim to lay the foundations for these partnerships as well as emergency response, outreach and education, housing, buyouts, and environmental initiatives based on this report and collaboration with citizens, city, county, and state officials.



EXISTING PLAN REVIEW

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COMPREHENSIVE CITY WIDE ASSESSMENT

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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Reviewed Plans:

- St. Louis Regional Hazard Mitigation Plan
- Upper Joachim Creek Floodplain Management Plan
- Two Dimensional Hydraulic Analysis of Joachim Creek
- De Soto Emergency Action and Evacuation Plan
- Jefferson County Master Plan
- Jefferson County Roadway Master Plan
- Jefferson County Road Safety Plan
- Route 21 Corridor Plan
- Historic Downtown : Nature Based + Green Infrastructure Flood Resiliency Framework Plan



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

St. Louis Regional Hazard Mitigation Plan

- Jefferson County mitigations programs include floodplain management regulations and participation in the National Flood Insurance Program (NFIP).
- Floodplain management ordinance restricts avoidable increases in flood height or velocity and protect individuals from buying land unsuited for the intended use due to a flood hazard.
- Jefferson County Hazard Summary:
  - Overall high risk for Flood (Riverine & Flash)
  - From 2005 to 2018: 4 deaths, an estimated $31.3 million in damages, and 16 events
  - These damages are the second highest in the St. Louis region (behind St. Louis County which had $235 Million in damages)
- 1975 to 2017 Jefferson County has the most presidentially-declared, flooding related disasters of all counties in Missouri – SEMA HMP



St. Louis Regional Hazard Mitigation Plan 2020 – 2025

Approved October 9, 2020

Prepared for the counties of Franklin, Jefferson, St. Charles, and St. Louis and the City of St. Louis

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

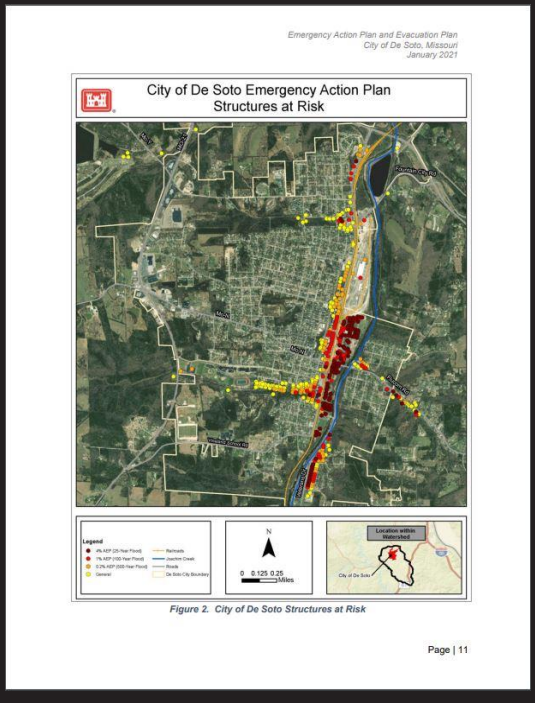
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

De Soto Emergency Action & Evacuation Plan

- In conjunction with the Army Corps of Engineers The City of De Soto prepared an Emergency Action and Evacuation Plan.
- The plan identifies the infrastructure risks faced by the City of De Soto including: road flooding, structures, and critical rescue and response facilities.
- Based on the assessment of risks in the city several recommendations to mitigate risk were made including but not limited to:
  - 1. The city should formalize and plan that involves using private property for emergency access or flood fighting which can be done by entering a memorandum with the private landowner.
  - 2. Conduct regular inventory of flood fighting equipment, resources, and materials.
  - 3. Host annual training for emergency response for both the emergency personnel, volunteers, and the public.
  - 4. Conduct a yearly table top scenario based exercise to ensure the dedicated emergency personnel know and understand their roles during an emergency event.
  - 5. Apply and provide resources for sandbagging to create temporary flood walls and reduce the impact of flooding on properties.
  - 6. Add another gauge further upstream.
- Through a scenario based exercise the plan indicates that the city capacity to respond to a flood emergency is capped at gauge level 13'.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

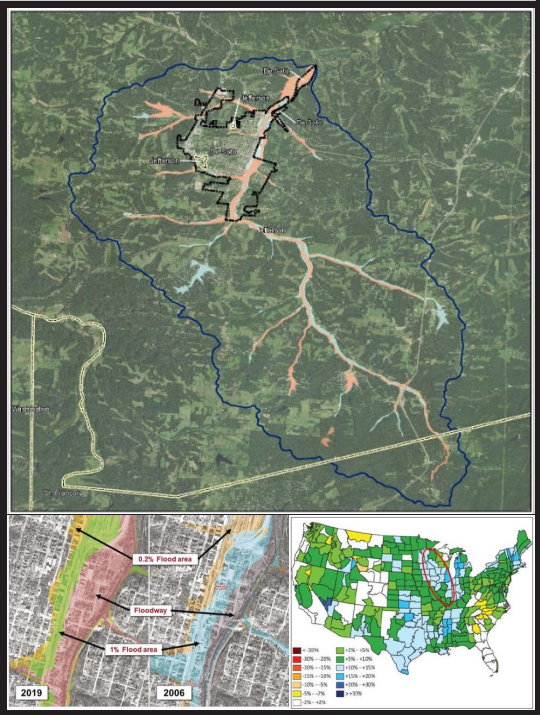
Existing Plan Review

Upper Joachim Creek Floodplain Management Plan

- Drafted in 2019 by The ARMY Corps of Engineers Silver Jacket Program.
- FMP focuses on the 1% ACE event
- US Army Corp of Engineers – St. Louis District (USACE) performed analysis using the National Nonstructural Committee's assessment of 10 representative structures within De Soto and Jefferson County.
- The findings were applied to all the structures in the 1% ACE flood event.
- USACE performed hydraulic modeling of sediment deposit removal in seven specific locations within the creek.
- Flood depths and the rate of flood-waters inundating the community have increased overtime.
- The City has experienced 5 flood events in the last 4 years.
- De Soto Rural Fire Station #1 (located in floodway) and Public Library (located in floodplain).
- Study assumes no substantial growth will occur in the Upper Joachim Creek Watershed in the near future.
- Study considered a hypothetical 10% increase in 1% ACE flow (runoff), to determine potential future conditions.

Climate Change

- increase in annual precipitation of 5% to 10%, change per century (1895 to 2009).
- Study considered a hypothetical 10% increase in 1% ACE flow (runoff), to determine potential future conditions.
- Average Depth of Flooding in majority of De Soto increased by approx. 1 foot.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

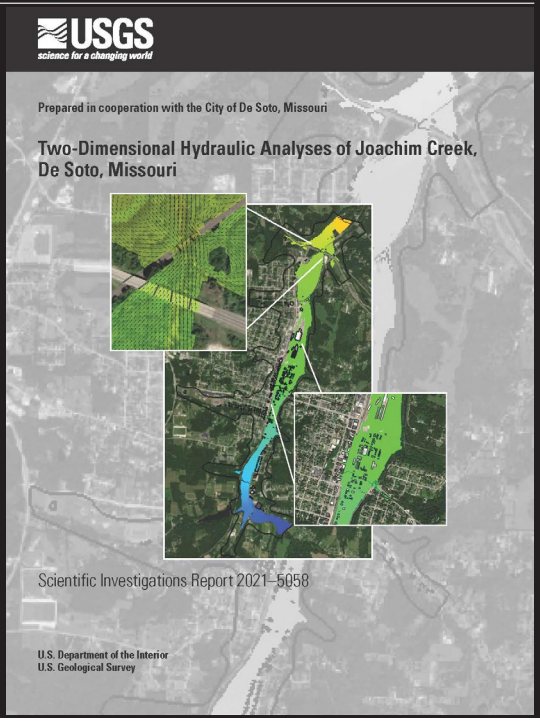
Existing Plan Review

2-Dimensional Hydraulic Analysis of Joachim Creek

- Water-surface profiles and map products were developed for selected regulatory flows for a 6.7-mile reach of Joachim Creek, De Soto, MO.
- *Water-surface elevations and inundation extents* of generated profiles and maps *were substantially lower than* similar products produced for the *2019 flood-insurance study*. The differences in water-surface elevations can be attributed to differences in input stream flows and hydraulic simulation techniques.

The Study Area:

- Drainage area upstream from stream gauge at De Soto is 42.4 mi^2
- Drainage area at the downstream extent of the study area reach is 60.8 mi^2.
- The Joachim Creek Basin is in the Ozark Plateau physiographic region.
- Land Slopes in the basin are generally 3 to 10 percent with local relief of 300 to 400 feet.
- The primary land cover of the study basin is:
  - 69.8% forest
  - 17.3% pasture and grasslands
  - 7.3% open/barren land
  - Less than 5% classified as low- to high-intensity development.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

2-Dimensional Hydraulic Analysis of Joachim Creek

Challenges

- Limited De Soto stream gauge data available
- "The generated profiles and maps products from this study are subject to some uncertainty as a result of the modeling process…These equations are based on historical observed data and are subject to uncertainty because additional peak-flow record, climate trends, and changes in land-cover conditions can affect results." – page 13
- "Additional areas may be flooded as a result of unanticipated changes to streambed elevations or roughness, backwater into tributaries along the reach, or backwater from localized debris or ice jams." – Page 14
- "The accuracy of the floodwater extent portrayed on these maps also will vary with the accuracy of the DEM used to simulate the land surface." – page 14

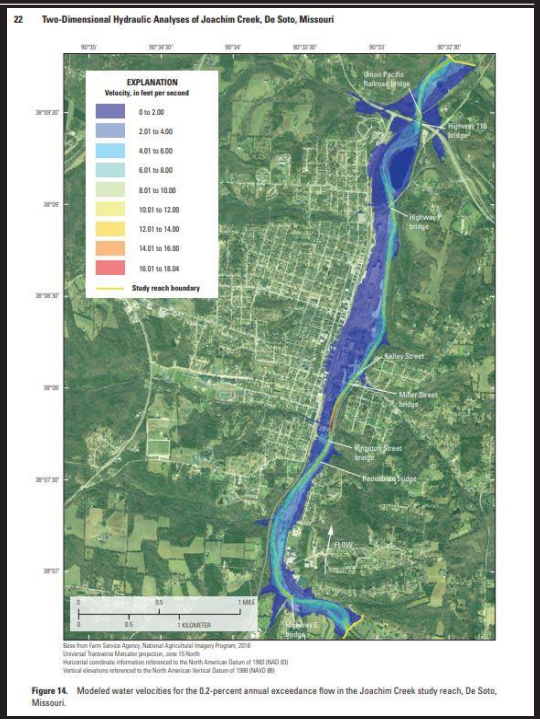


Figure 14. Modeled water velocities for the 0.2-percent annual exceedance flow in the Joachim Creek study reach, De Soto, Missouri.

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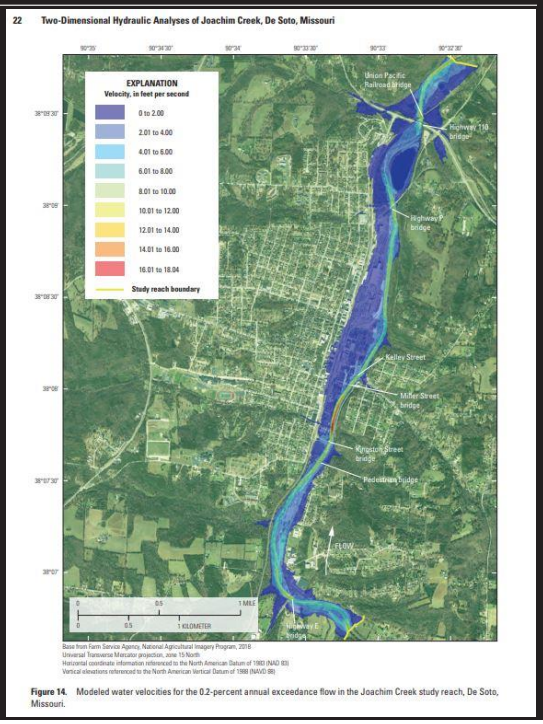
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

2-Dimensional Hydraulic Analysis of Joachim Creek

Significant Findings:

- The water depth and floodplain width of Joachim Creek due to major flood events are significantly less, and the downstream surface slope is significantly steeper than those described in the 2019 FEMA report. The reduction in depth ranged from approximately 3.5 feet near the Highway E bridge to 10 feet at the Highway 110 bridge for the .2% AEP flood.
- The model provides a new and improved basis for determining the extent of the floodway and floodplain in De Soto for various annual exceedance probability floods.
- The model would be a useful tool to explore the impacts upon flooding of various suggested modifications to the area, such as debris removal, bridge/highway elevation, or berm construction.



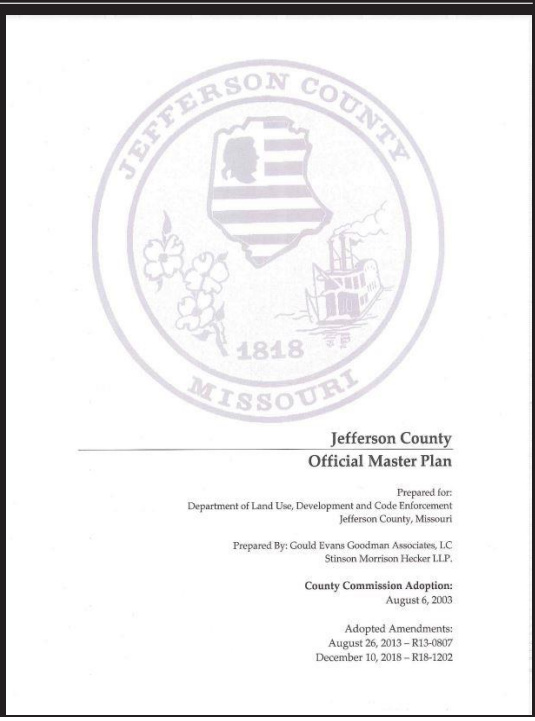
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Jefferson County Master Plan

- Prepared in 2003 by Gould Evans Goodman Associates
- Establishes 5 goals for the growth and development of Jefferson County:
  - Quality Growth and development focused on providing amenities and conserving the environment and natural resources of the county.
  - Economic Development to attract jobs and quality developments to the county.
  - Infrastructure and Transportation to adequately serve existing communities and desired development.
  - Environment and Open Space to ensure environmentally sensitive development and promote the conservation of air, water, and other natural resources while maintain the counties unique character.
  - Education and communication to establish public awareness and a high level of communication regarding planning and development issues.



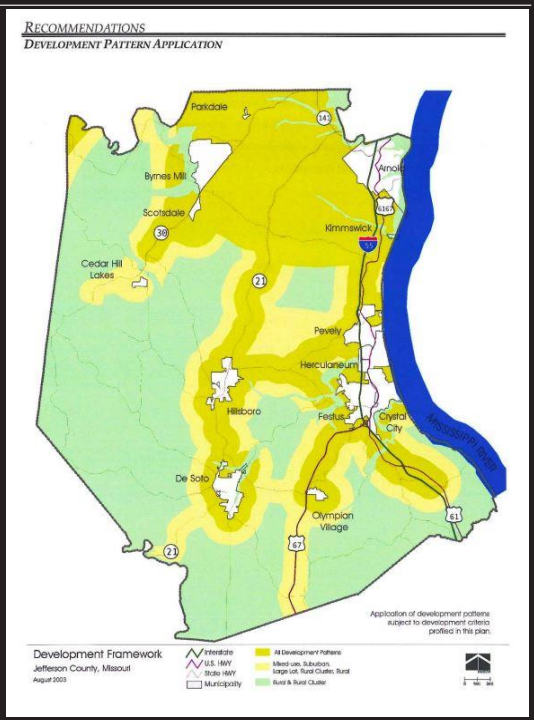
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Jefferson County Master Plan

- Prepared in 2003 by Gould Evans Goodman Associates
- Establishes 5 goals for the growth and development of Jefferson County.
- Developed three growth scenarios for the county. The preferred scenario focused on growth along existing major corridors south of Highway MM and growth around municipalities in relation to the St. Louis metropolitan area north of Highway MM.
    - De Soto's primary impact area is the highway 21 and 110 corridors.
- Desire from the public to preserve the character of the Southern and Western parts of the county.
- County growth is supplemented by development patterns ranging from dense mixed uses to rural large lot developments.
- The plan encourages mitigating the impacts of growth and development on environmental features but does not address mitigating environmental hazards.



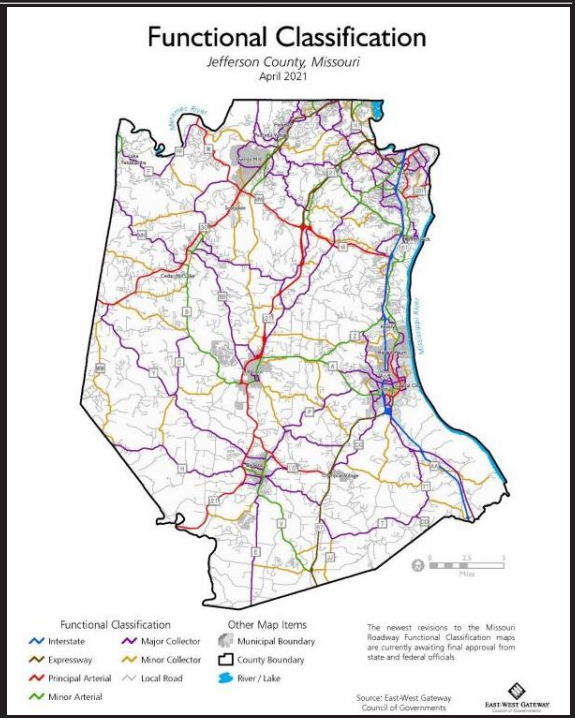
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Jefferson County Roadway Master Plan

- Goals of the County Roadway Master Plan:
    - Create a current and updated road classification system, which will also provide more detailed requirements for development.
    - Provide roadways that possess the appropriate level of service, allow for additional capacity, have reasonable travel speeds, are convenient for motorists, and are safe for all users.
    - Create a road system that will accommodate and attract the residential, commercial, and industrial growth the County desires.
    - Create a priority system showing the primary and secondary growth areas and forecast where the growth in the County will take place.
    - Inform people about our current and future roadway projects.
    - HWY 110 and HWY 21 are the major connectors to De Soto and are classified as principal arterials.



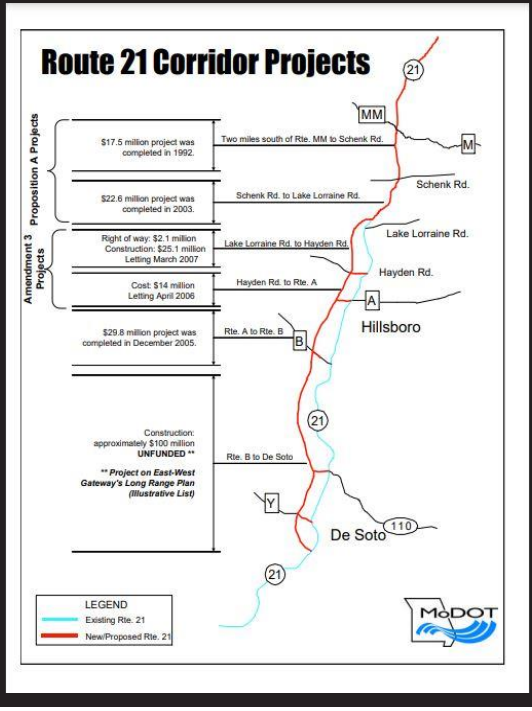
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Route 21 Corridor Plan

- Improvements of Rt 21 from Rt B to De Soto is on the regions long range plan of highway projects.
- The first five phases of construction along Rt 21 from HWY MM to Hillsboro are complete.
- The rest of the improvement on Route 21 from Hillsboro to De Soto are still awaiting funding and are not complete.
- Expanding and improving the quality of the road network in De Soto would provide better access between the city and the HWY MM Corridor.



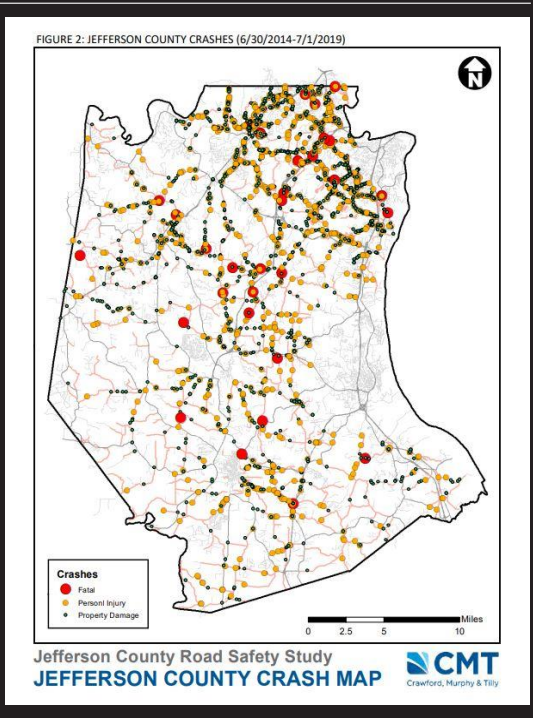
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Jefferson County Road Safety Plan

- Prepared in 2021 by Crawford, Murphy, and Tilly
- The major focus of roadway safety projects are located on the northern half of the county in proximity to the Metropolitan St. Louis Area.
- Many of the roadways in De Soto are city owned and are not planned for by Jefferson County services. HWY 21 and 110 are MODOT owned and operated.
- The plan lays out traffic calming and safety strategies and initiatives for signage, road hazard mitigation, and road development.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

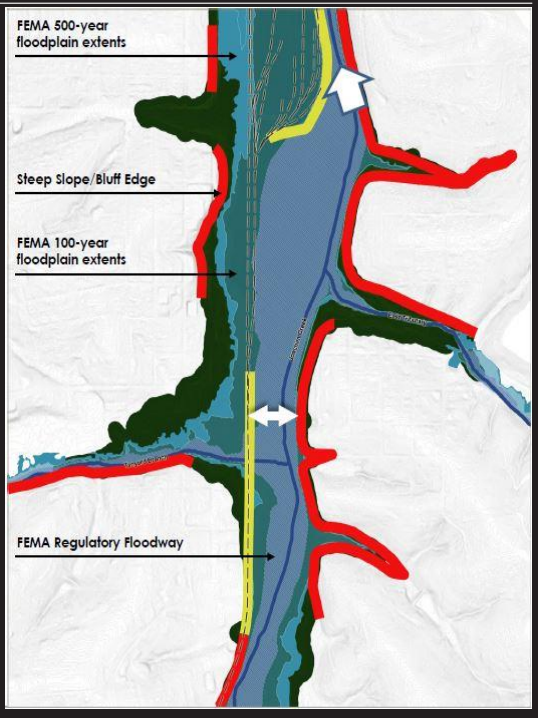
Existing Plan Review

Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan

- Developed in 2021 by H3 Studio in partnership with the Citizens Committee for Flood Relief and The City of De Soto.

- The plan lays out 12 Green Infrastructure Goals for the city:
  - Reduce the Potential Risk of Loss of Life
  - Design for Future Climate Trends
  - Hold Back Water
  - Protect Historic Commercial Main Street and Union Pacific
  - Develop the Floodplain as an amenity for the De Soto Community
  - Relocate, Strengthen, and Re-Design Urban Infrastructure
  - Improve Floodplain Management
  - Develop and Implement Watershed Plan and Policies
  - Update Building Codes
  - Utilize Natural Resources and Agriculture
  - Relocate People at Risk
  - Design Using Data

- Using these goals the plan develops three distinct alternatives as strategies for development of sites around the flood plain.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan

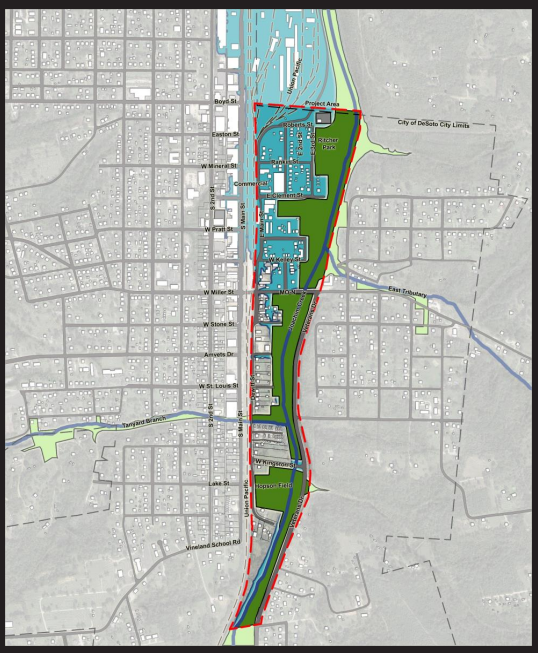
- **Strategy Alternative 1: Thicken and Connect**

  - Acquire vacant land adjacent to Joachim Creek and tributaries to thicken it and create floodable open space and improve conveyance.

  - Modify and clean up creek banks and streams in strategic locations to increase flood capacity and conveyance.

  - Address localized problems through small scale improvement projects and storm water sewer overflows by upgrading capacity and directing runoff.

- Strategy Alternative 2: Pools and Places
- Strategy Alternative 3: Flood Park and Main Street



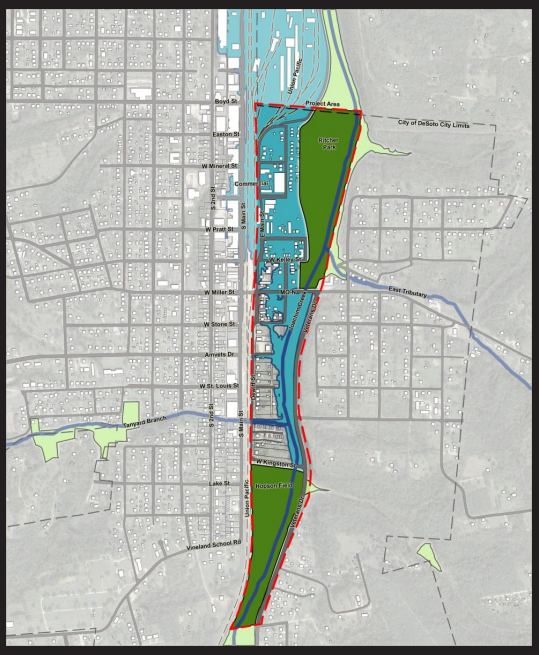
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan

- Strategy Alternative 1: Thicken and Connect
- **Strategy Alternative 2: Pools and Places**
  - Create detention areas or "Pools" to hold flood water when inundated leveraging low lying areas, public parks, and areas upstream.
  - Commit to buy outs of vacant and residentially occupied land and relocate infrastructure.
  - Reduce Storm Sewer overflows by upgrading capacity and directing runoff to detention pools upland.
- Strategy Alternative 3: Flood Park and Main Street



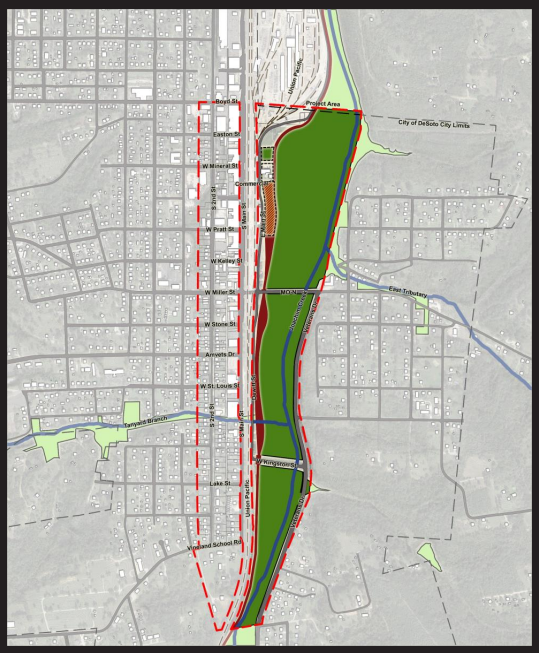
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Existing Plan Review

Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan

- Strategy Alternative 1: Thicken and Connect
- Strategy Alternative 2: Pools and Places
- **Strategy Alternative 3: Flood Park and Main Street**
  - Provides the highest level of public safety by transforming the low lying flood way into a flood park that includes a levee to protect the railroad property and Historic Main Street while creating a regionally unique asset for De Soto to draw visitors.
  - The levee will hold back the Joachim Creek from flooding Main Street and the Railroad , however storm sewer infrastructure and retention areas must be upgraded to handle the upland runoff.





DE SOTO REGIONAL CONTEXT

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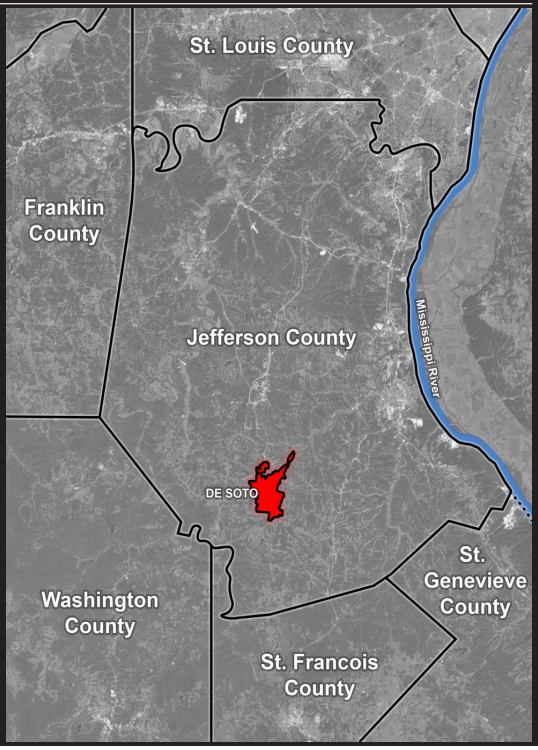
COMPREHENSIVE CITY WIDE ASSESSMENT

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De Soto Regional Context

Location:

- De Soto is located in Southern Jefferson County, MO.
- It is a rural area with sporadic development and a population of 6,435 people (2021).
- De Soto is the third (3) largest city in Jefferson County by population.



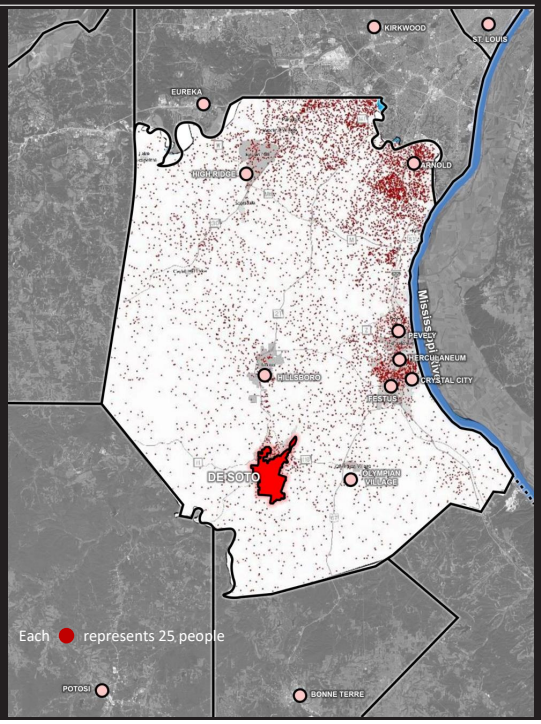
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Activity Centers and Density:

- Most area competitors in Jefferson county are located along the Mississippi river and at the edges of the St. Louis Metropolitan area.
- These settlements are consistent with the highest areas of growth presented in the 2003 Master Plan and have the highest population densities of the county.
- Some of the largest and most prominent employment, education, and retail centers in the area include: Arnold, MO; Festus, MO; and St. Louis, MO.



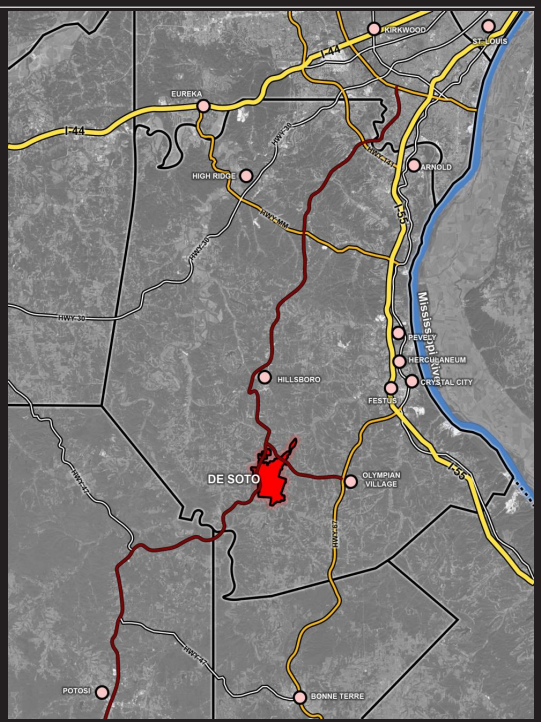
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Connectivity:

- The largest and most developed centers in Jefferson County developed along the Mississippi River and interstate 55 corridors.
- Highways 21 and 110 are the primary roadways into De Soto. They have no direct connection to Interstate 55 which is the primary north-south transportation route in Jefferson county.
- Highway 21, De Soto's major commercial corridor connects to three major St. Louis Ring Roads: Highway MM (connects to I-44), Highway 141, and I-270 in South St. Louis County.
    - Highway 21 is part of a redevelopment plan that will enhance access to the City of De Soto.
- De Soto is only a 20 minute drive from Festus, MO; a 30 minute drive from Arnold, MO and 50 minute drive from St. Louis, MO.



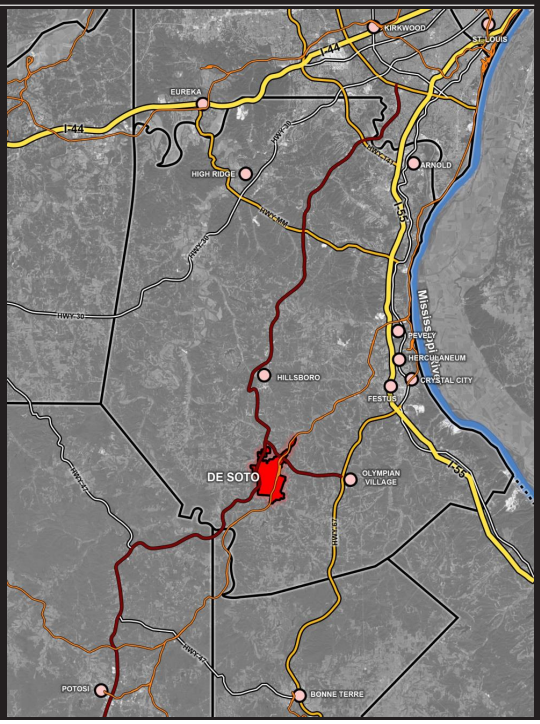
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Connectivity:

- The largest and most developed centers in Jefferson County developed along the Mississippi River and interstate 55 corridors.
- Highways 21 and 110 are the primary roadways into De Soto. They have no direct connection to Interstate 55 which is the primary north-south transportation route in Jefferson county.
- Highway 21, De Soto's major commercial corridor connects to three major St. Louis Ring Roads: Highway MM (connects to I-44), Highway 141, and I-270 in South St. Louis County.
    - Highway 21 is part of a redevelopment plan that will enhance access to the City of De Soto.
- De Soto is only a 20 minute drive from Festus, MO; a 30 minute drive from Arnold, MO and 50 minute drive from St. Louis, MO.
- De Soto is regionally connected via the Union Pacific Railroad housing an important railyard and repair shop in Downtown De Soto.
    - The railroad does not actively provide passenger ride services though citizens and city leaders continue advocating their installment.



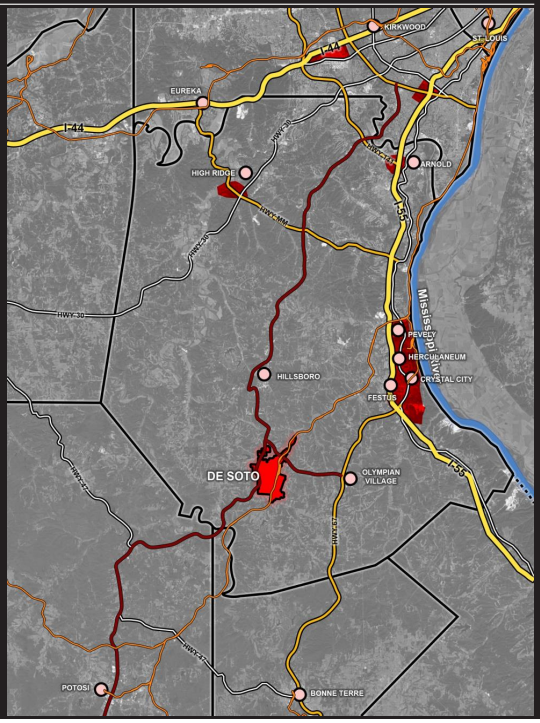
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Regional Employment:

- The rail, interstate, and highway access makes De Soto a key regional bedroom community to major regional employers.
- On average citizens of Jefferson County will commute 31 minutes to work with less than 2% having super commutes greater than 90 minutes.
- A commute from De Soto to regional employment centers in Pevely, Herculaneum, Crystal City, Arnold, and Festus would only take between 20 – 30 minutes.
- The counties largest employment industries include:
    - Healthcare and Social Assistance (14%)
    - Manufacturing (12%)
    - Retail Trade (11.5%)
    - Construction (10.5%)
- Significant employment and retail centers can be found in Festus, Arnold, St. Louis, and off major interchanges along I-55 and I-44.



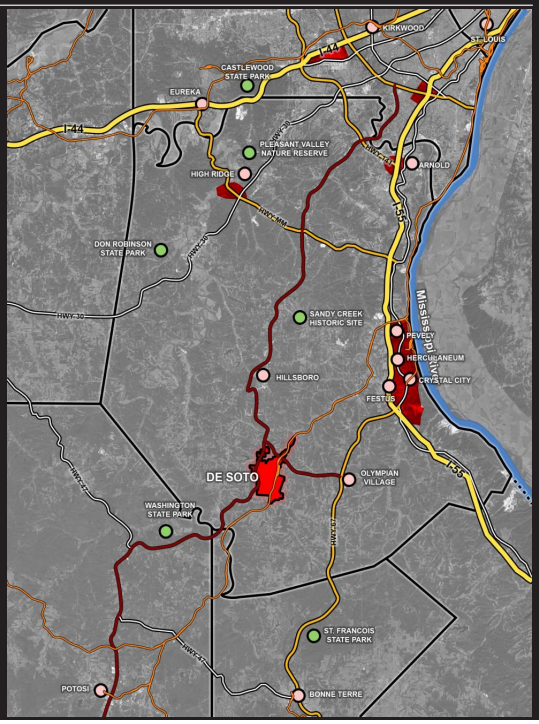
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Recreation:

- De Soto is within 10 miles of major recreational destination amenities including Washington State park, St. Francois State Park, and Sandy Creek Historic Site.
- These sites are easily accessible via Highway 21, Highway 110, and Highway 67.
- No regional trail networks run through or near De Soto.



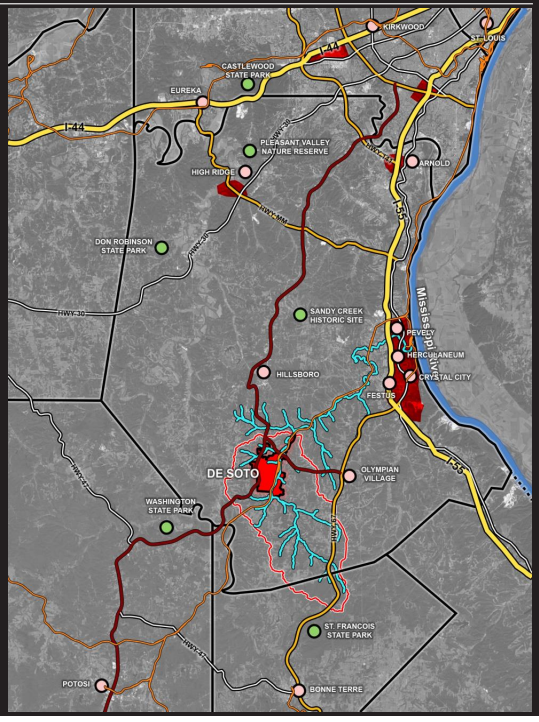
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Regional Context

Landscape:

- De Soto lies in the Upper Joachim Creek Watershed which is primarily in Jefferson County and partly in St. Francois County.
- The Joachim Creek is the watershed primary waterway and runs adjacent to Main Street in Downtown De Soto.
- De Soto is the only incorporated city in the watershed.



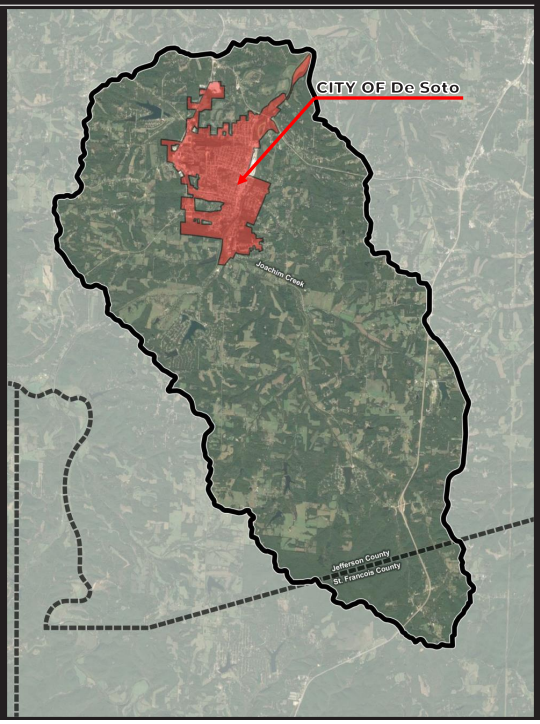
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Watershed Overview:

- The Upper Joachim Watershed is in the Southwestern portion of Jefferson County partially located in St. Francois County at its southern point.
- The Upper Joachim Watershed has a drainage area of 39,150 acres.
- 1,642 acres of the Watershed are FEMA flood hazard areas. (5% of area)
- The primary land cover of the study basin is:
  - 69.8% forest
  - 17.3% pasture and grasslands
  - 7.3% open/barren land
  - Less than 5% classified as low- to high-intensity development.
- De Soto is located in the Northern Upper Joachim Watershed and is the only incorporated city in the Watershed.



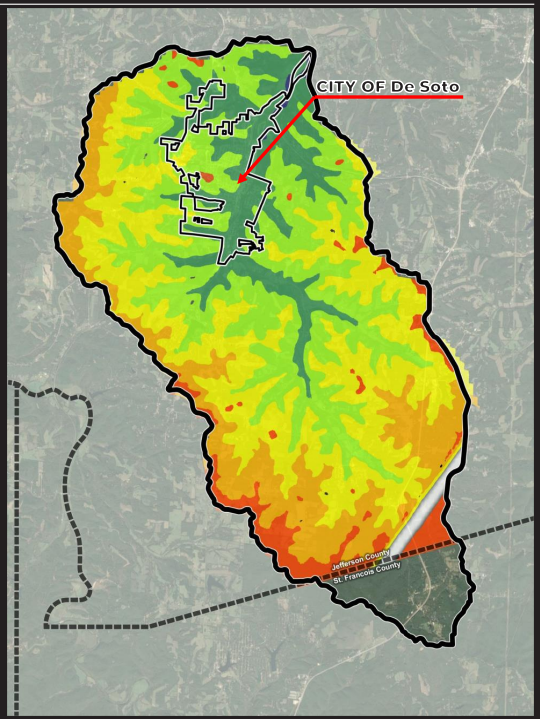
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Landform

- The land is composed of a series of small valleys tucked between bluffs.
- Its highest elevations are south and west of the City of De Soto.



Data acquired Desoto GIS Information & DNR Geostrat

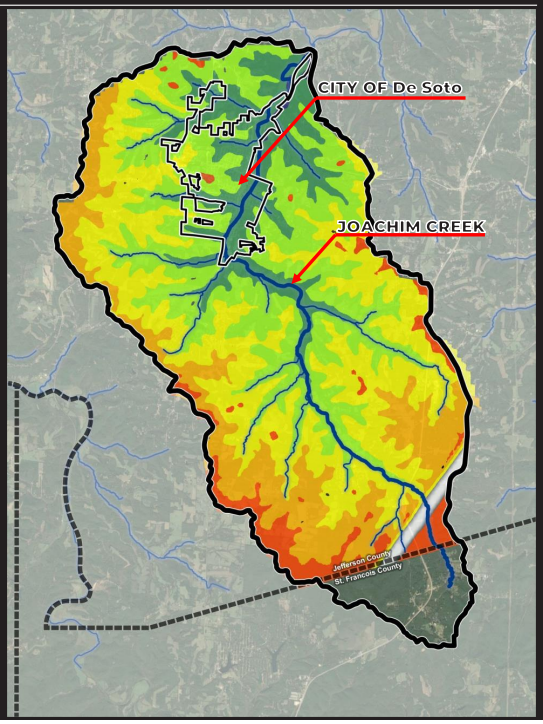
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Landform

- The land is composed of a series of small valleys tucked between bluffs.
- Its highest elevations are south and west of the City of De Soto.
- The Joachim Creek is the main water source running through the watershed and right through the middle of De Soto which is located downstream on the creek.
- There are an additional 19 tributary creeks and streams that flow into the Joachim as it flows down the watershed.



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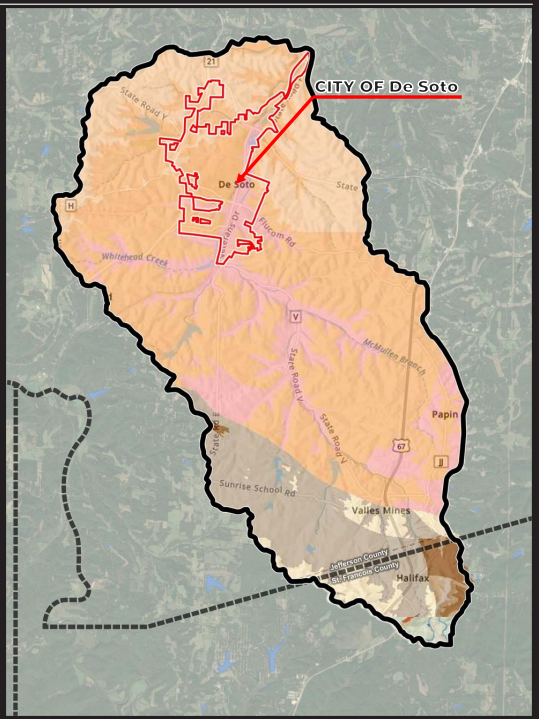
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Landform + Geomorphology:

- The land is composed of a series of small valleys tucked between bluffs.
- Its highest elevations are south and west of the City of De Soto.
- The Joachim Creek is the main water source running through the watershed and right through the middle of De Soto which is located downstream on the creek.
- There are an additional 19 tributary creeks and streams that flow into the Joachim as it flows down the watershed.
- The watershed is generally rocky with a bedrock layer at an average depth of 25' below the surface.
- 6 different rock types can be identified in the Upper Joachim Creek Watershed:



- Jefferson City, Cotter, Dolomite
- Cambrian, Potosi, Dolomite
- Ordovician, Roubidoux
- Cambrian, Eminence Dolomite
- Ordovician, Cotter, Dolomite
- Cambrian, Celd, Davis Formation

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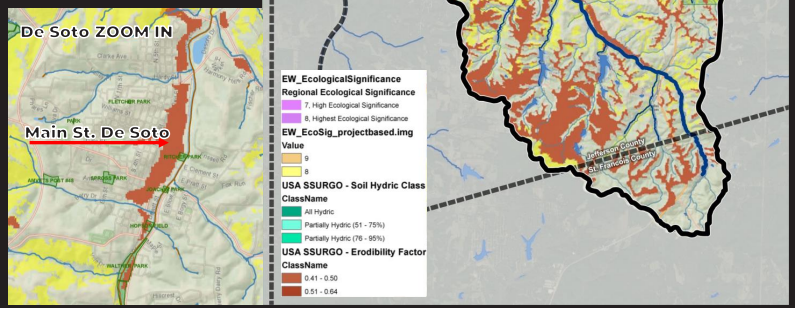
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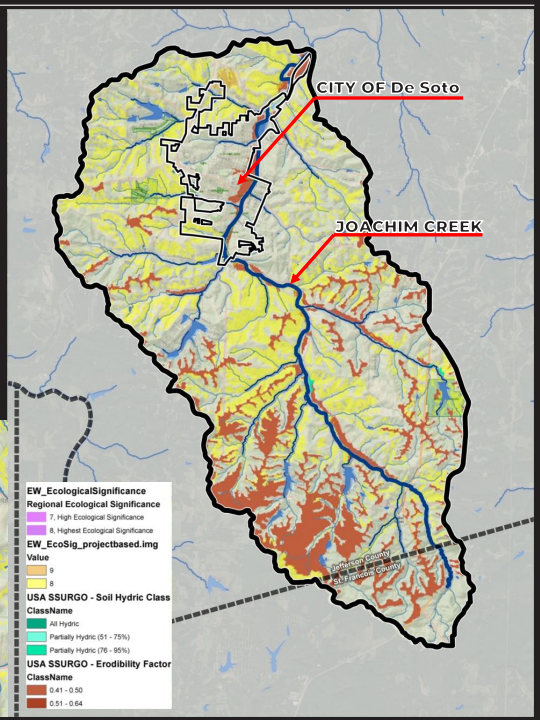
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Landform + Geomorphology:

- The streams and creeks flow along a rocky highly erodible ground surface in Jefferson County and De Soto.
- Since the bedrock is approximately 25' below the surface digging and dredging for detention ponds and other mitigation strategies on the Joachim is challenging.
- The high erodibility factor along the edges of the creek as it flows downstream and into De Soto increases the likelihood of unwanted sediment and debris in the water.
- Main St. De Soto is highly susceptible to erosion.





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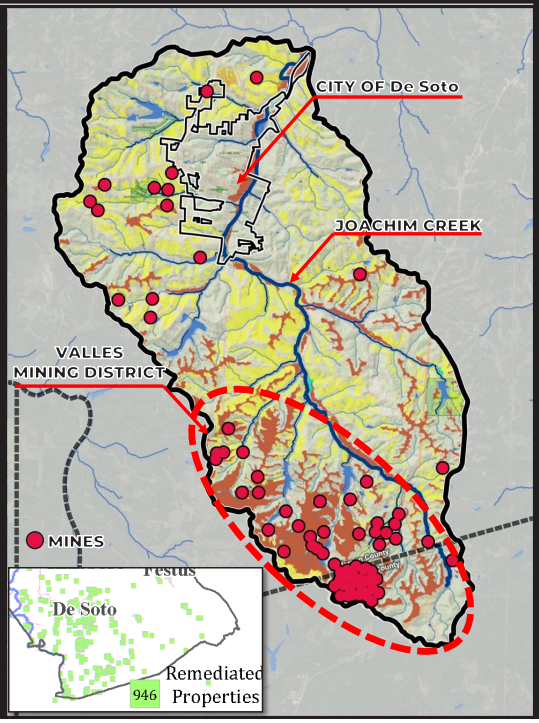
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Landform + Geomorphology + Historic Mining:

- The soil and rock conditions have historically made the region a rich mining area but has led to area contamination.
- Valle Mining Company is one of the older mines in Jefferson county, founded in 1749 (4000+ acre property). Frumet Mines, which was situated seven miles west of De Soto produced large amounts of lead and zinc. Other mines located and worked in the county were the Mammoth Mines and Lee mines in the De Soto area.
- Mining has contributed to increased contamination but remediation efforts have been taking place since 2007 with over 3000 properties tested and 946 having been cleaned up.
  - Currently the Department of Natural Resources Impaired Waters and TMDL Mapping viewer shows no signs of water quality impairments in the Joachim Creek.
- Missouri Geological Survey Data does not indicate any sinkhole danger, but indicates 5 caves south of De Soto within the Watershed.



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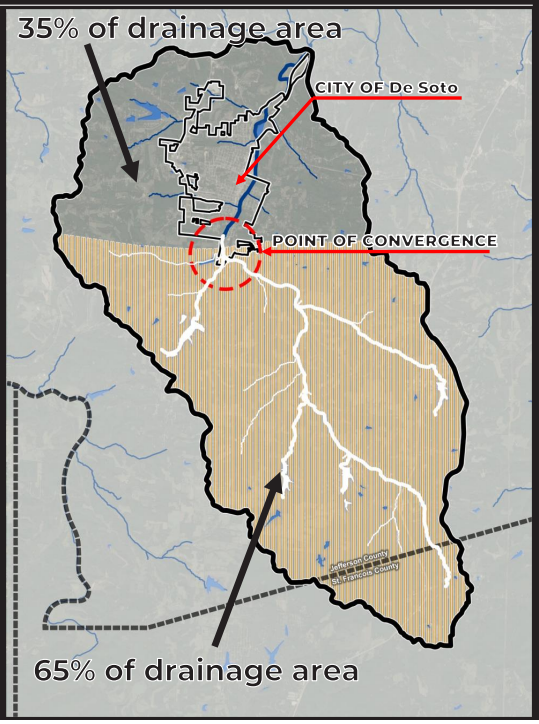
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Hydrology:

- The Joachim Creek is the primary waterway through the watershed and traverses East De Soto along Main St and the Union Pacific Railroad.
- 20 streams flow through the watershed intensifying the effects of flash flooding events.
  - Thirteen (13) of these streams, ***65% of the watershed drainage area***, enter the Joachim before reaching the city of De Soto
  - Seven (7) additional streams, ***35% of the watershed drainage area***, flow through the city of De Soto and into the Joachim Creek exiting the city at the north.



Data acquired Desoto GIS Information & DNR Geostrat

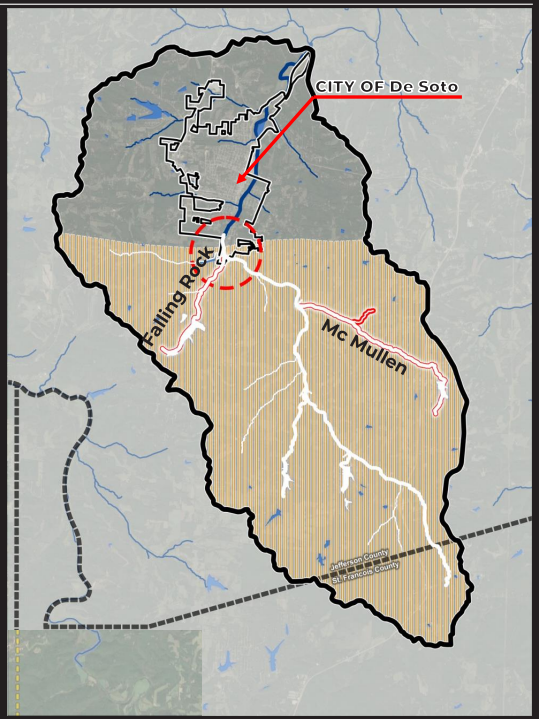
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Hydrology:

- The Joachim Creek is the primary waterway through the watershed and traverses East De Soto along Main St and the Union Pacific Railroad.
- 13 tributary streams flow into the Joachim Creek within the watershed intensifying the effects of flash flooding events.
  - Nine (9) of these streams, ***65% of the watershed drainage area***, enters the Joachim before reaching the city of De Soto
  - Five (5) additional streams, ***35% of the watershed drainage area***, flow through the city of De Soto and into the Joachim Creek.
- The Falling Rock Branch and Mc Mullen Branch are considered gaining streams meaning they are susceptible to ground water intensifying flood effects.



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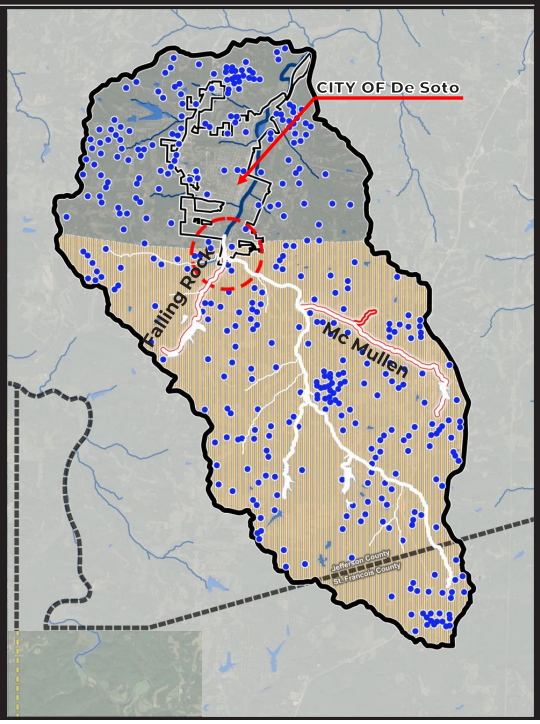
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Hydrology + Water Wells:

- The Joachim Creek is the primary waterway through the watershed and traverses East De Soto along Main St and the Union Pacific Railroad.
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- The Falling Rock Branch and Mc Mullen Branch are considered gaining streams meaning they are susceptible to ground water intensifying flood effects.
- Hundred's of underground wells exist throughout the watershed.



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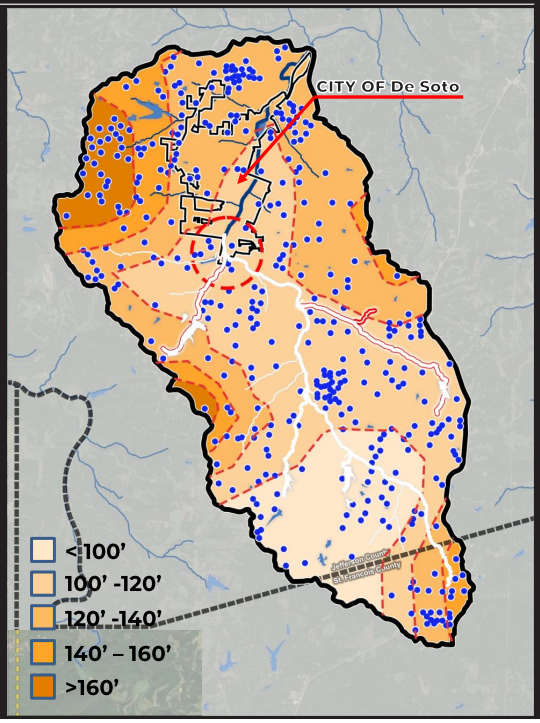
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Hydrology + Water Wells + Water Table:

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  - Five (5) additional streams, ***35% of the watershed drainage area***, flow through the city of De Soto and into the Joachim Creek.
- The Falling Rock Branch and Mc Mullen Branch are considered gaining streams meaning they are susceptible to ground water intensifying flood effects.
- Hundred's of underground wells exist throughout the watershed.
  - Many of the wells and underground water sources lie at shallow depth from the surface, primarily at the high bluffs where the Joachim Creek, and several tributaries originate.
    - At De Soto underground water lies 110' -120' below the surface.



Data acquired Desoto GIS Information & DNR Geostrat

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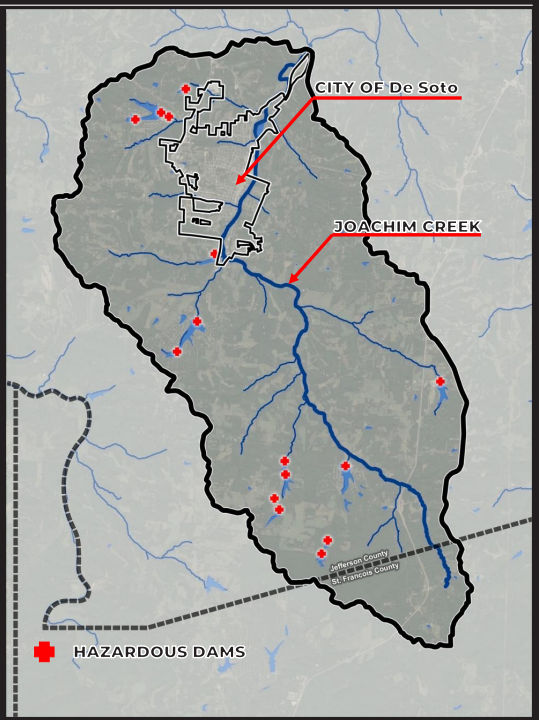
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Critical Watershed Infrastructure Dams:

- There are 15 classified hazardous dams in the Upper Joachim Creek Watershed , 8 of which are unregulated and could cause significant loss of life/damages should they fail during a high precipitation event.
  - 7 of these dams are regulated by federal and state authorities:
    - Lake Briarwood Dam
    - Spring Lake Dam
    - Summer Set Lake Dam
    - Winter Haven Lake Dam
    - Sunrise Lake Upper Dam
    - Sunrise Lake Big Dam
    - Valle Lake Dam
  - There are 8 dams which are un-regulated:
    - Siesta Lake Dam
    - Spring Lake Dam
    - Fisherman's Lake Dam
    - Lembeck Lake Dam
    - Clear Lake Dam
    - Little Lake Dam
    - Lower Valle Mines Dam
    - Upper Valle Mines Dam

Data acquired Desoto GIS Information & US ARMY Corps of Engineers Plan (2019)



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

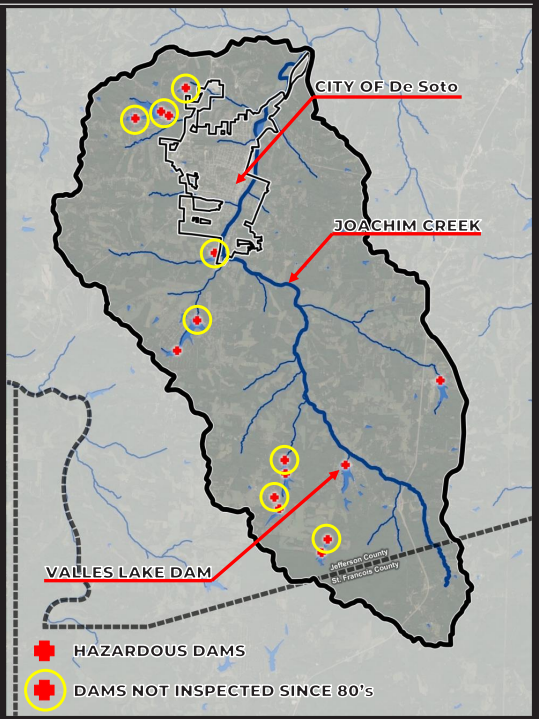
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- Valle Lake Dam is a state regulated dam, hazard class 2. Valle Lake is the largest lake that drains in the Joachim. This dam has limited flood storage function and is susceptible to overtopping during heavy precipitation events.
- According to US Army Corps of Engineers Data - 9 of the hazardous dams were last inspected between 1978-1981 (Yellow circles on map)

Dam Name	NID ID (MO)	River	Year Completed	State Regulated	Owner Name	Height (ft)	Storage (acre-ft)	Type	Purpose	Hazard Potential	EAP	Last Inspection
Clear Lake Dam	30437	TR to Joachim Creek	1961	No	Sunrise Lakes Assodation	34	236	Earth	Recreation	High	Not Required	5/7/1981
Dierberg Lake Dam	30441	TR to McMullen Branch	1968	No	WM C DIERBERG	26	56	Earth	Flood Control	High	Not Required	-
Fisherman's Lake Dam	31035	TR to Ball Branch	1970	No	Briarwood Development CO	34	236	Earth	Recreation	High	Not Required	8/2/1978
Lake Kearbey Dam	11099	TR to Sugar Creek	-	No	Dave Kearney	25	54	Earth	Recreation	High	Not Required	9/9/1980
Lake Briarwood Dam	30400	Ball Branch	1970	Yes	Schmitt	65	1840	Earth	Recreation	High	Yes	3/10/2016
Lembeck Lake Dam	30369	Whitehead Creek	1958	No	DR, Chang K. Yang	26	348	Earth	Recreation	High	Not Required	3/5/1981
Little Lake Dam	30496	TR to Joachim Creek	1961	No	Sunrise Lakes Assodation	32	88	Earth	Recreation	High	Not Required	5/8/1981
Lower Valle Mines Dam	30439	TR to Joachim Creek	1952	No	Valle Mining Company	22	82	Earth	Other	High	Not Required	8/15/1980
Lucas Lake Dam	30454	TR to Joachim Creek	1960	No	Edwin+Thelma Lucas	25	94	Earth	Flood Control	High	Not Required	-
Rustic Hills Resort Lake Dam	30458	TR to Joachim Creek	1957	No	Rustic Hills Resort LTD	28	90	Earth	Recreation	High	Not Required	-
Siesta Lake Dam	31199	TR to Fritz Creek	1957	No	Joe+Rebecca Merten	30	160	Earth	Recreation	High	Not Required	3/4/1981
Spring Lake Dam	31193	TR-Falling Rock Branch	1976	Yes	Summerset POA	42	178	Earth	Recreation	High	Yes	7/27/2016
Spring Lake Dam (2)	30401	TR Ball Branch	1970	No	Briarwood Development CO	20	64	Earth	Recreation	High	Not Required	8/2/1978
Summer Set Lake Dam	30459	Falling Rock Branch	1974	Yes	Summer Set POA	63	3750	Earth	Recreation	High	Yes	7/26/2016
Sunrise Big Lake Dam	30457	TR to Joachim Creek	1961	Yes	Sunrise Lakes Assodation	38	168	Earth	Recreation	High	Yes	1/17/2017
Sunrise Lake Upper Dam	31190	TR to Joachim Creek	1961	Yes	Sunrise Lakes Trustees	37	360	Earth	Recreation	High	Yes	10/31/2017
Upper Valle Mines Dam	30370	TR to Joachim Creek	1958	No	Valle Mining Company	34	291	Other	Tailings	High	Not Required	8/15/1980
Valle Lake Dam	30438	Fletcher Branch	1955	Yes	Valle Lake Prop Own Assn	39	800	Earth	Recreation	High	Yes	10/3/2017
Winter Haven Lake Dam	31192	Falling Rock Branch	1978	Yes	Summerset POA	49	301	Earth	Recreation	High	Yes	7/26/2016

Data acquired Desoto GIS Information & US ARMY Corps of Engineers Plan (2019)



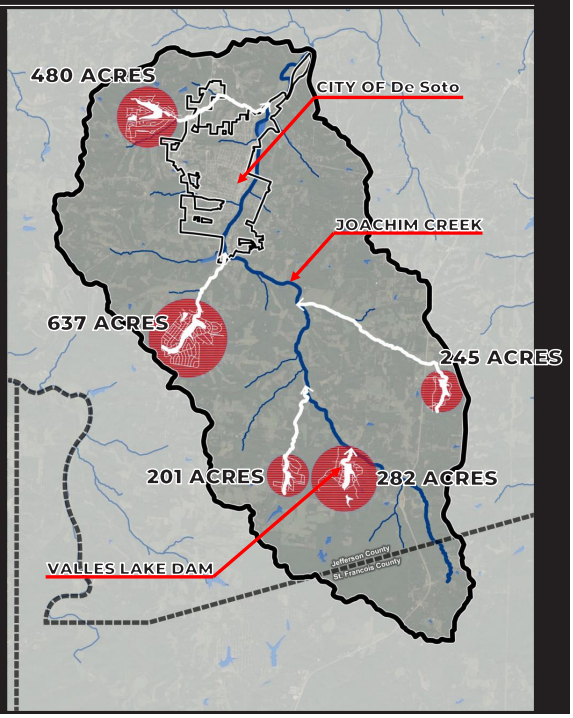
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Critical Watershed Infrastructure Dams + Development:

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- Valle Lake Dam is a state regulated dam, hazard class 2. Valle Lake is the largest lake that drains in the Joachim. This dam has limited flood storage function and is susceptible to overtopping during heavy precipitation events.
- According to US Army Corps of Engineers Data - 9 of the hazardous dams were last inspected between 1978-1981 (Yellow circles on map)
- 5 of the lakes developed along these dams are home to 4 large subdivisions and 1 resort style hotel. (1,365 acres of upstream development.)
- The Fletcher, McMullen, Falling Rock, and 2A tributaries (marked in white) have an increased impact on the Joachim Creek due to subdivision runoff and low capacity of the lakes they service.



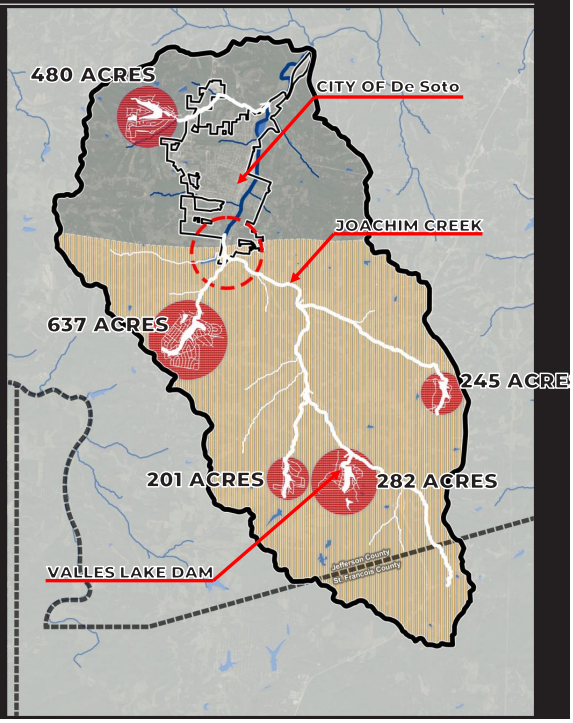
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THE CITY OF DE SOTO, MO

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- 5 of the lakes developed along these dams are home to 4 large subdivisions and 1 resort style hotel. (1,365 acres of upstream development.)
- The Fletcher, McMullen, Falling Rock, and 2A tributaries (marked in white) have an increased impact on the Joachim Creek due to subdivision runoff and low capacity of the lakes they service.
- In addition to the 65% of the watershed, De Soto is challenged by additional pressure from upstream lake, dam, and subdivision developments.



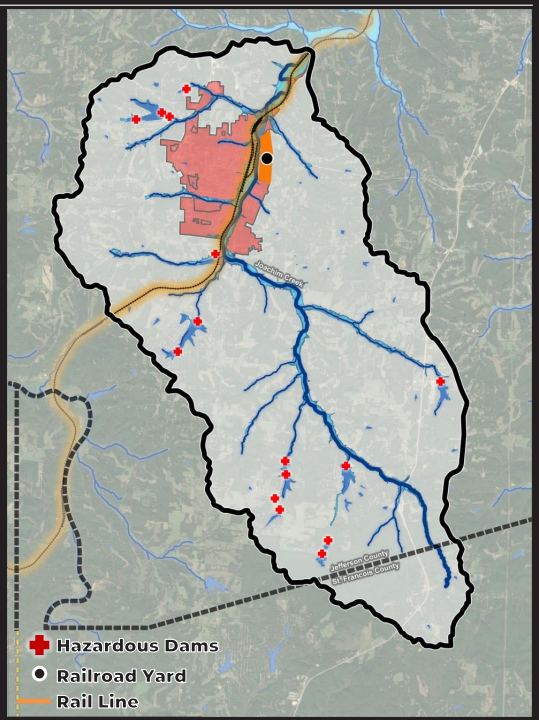
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Critical Infrastructure Railroad:

- The Union Pacific Railroad runs parallel to Main Street De Soto and The Joachim Creek but lies outside of city limits in Jefferson County.
- Union Pacific E Road which fronts the Joachim creek was built up to create a levee and avoid effects of the flood plain causing water displacement which directly affects Main Street and the land west of the railroad.
- In 2015, it was discovered that The Union Pacific Railroad exceeded allowable runoff levels into the Joachim Creek increasing contamination.
    - The company was ordered to aid in remediation and implement their Stormwater Pollution Prevention Plan which requires them to treat all runoff before allowing it to run into the Joachim Creek.



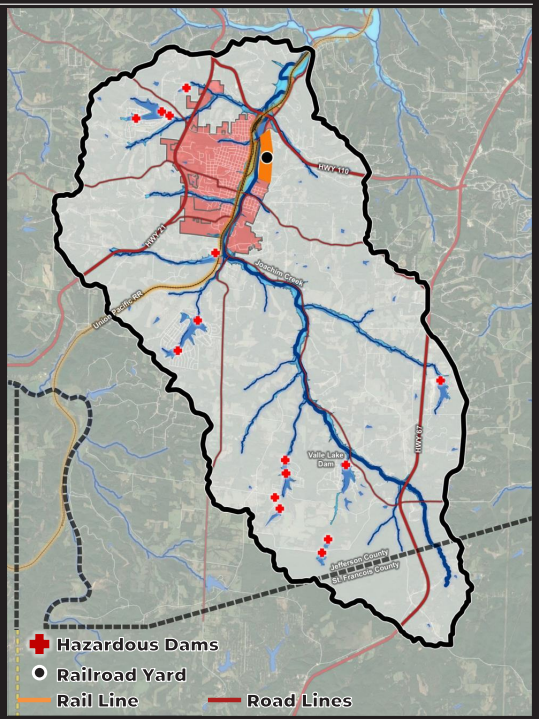
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Upper Joachim Watershed Context

Critical Infrastructure Railroad + Roads:

- Flooding directly affects several critical roads into De Soto including:
    - Highway N crossing over the Joachim Creek
    - Main Street De Soto
    - Highway E into Veterans Dr.
    - Fountain City Rd.
- Highways 21 and 110 are primarily spared by the floodplain which primarily affects city roads like Veterans Dr, Flucom Rd, and Main St.
- Redevelopment occurring on Highway 21 is applying pressure on the Tanyard Branch of the creek by way of runoff into the Joachim Creek.
- Flooding events limit access into De Soto through major East West City and regional connectors increasing response times to those in need.





De Soto CITY PROFILE

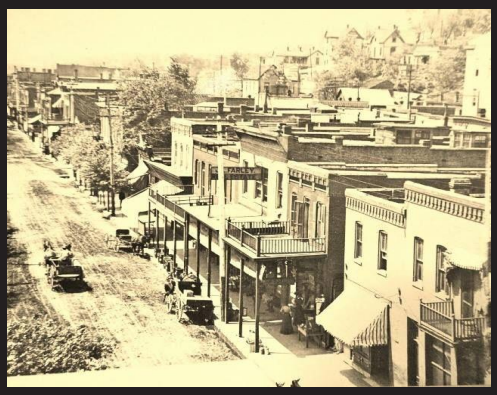
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COMPREHENSIVE CITY WIDE ASSESSMENT

De Soto City Profile

History:

- Founded in 1858 along the projected path of the incoming St. Louis Iron Mountain and Southern Railroad.
    - De Soto was once know as a fountain city due to its many fountains throughout the city that provided water from artesian wells.
- In 1859 town founders built the station depot and the railroad was constructed through De Soto.
- In 1860 The Arlington Hotel was constructed
- The late 19th century saw the development of a new depot, roundhouse, and locomotive shop; expanded city boundaries; several new area schools; larger scale homes; fairgrounds, opera house; business school; newspaper; hospital; saddle shop; mill; meat packing plant; and a few bridges crossing the Joachim creek.
    - Boyd and Main, the location of the Old Depot, was the commercial center of the city.





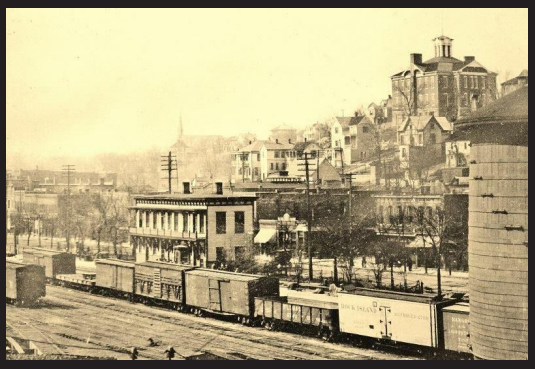
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

History:

- The early 1900's saw expansions to local education and recreation with the creation of the YMCA , Jefferson Theater, and Amory.
- In the 1920's a new post office was constructed provided free delivery of mail and a new high school was erected.
- In 1952 an American History class which began improvements to the town won a Union Electric Planned Progress Award.
- In 1954 and 1959 De Soto is featured as the image of the All American City.
- In the 1970's new highway 110 is dedicated expanding access Eastward toward Interstate 55.
- In 1980 De Soto is named the population center of the United States.
- In the 1990's De Soto amenities expand by widening and beautifying main street, adding a tree museum and gazebo to Walther Park, restoring Arlington Hotel, and moving the public library to S. Main St.





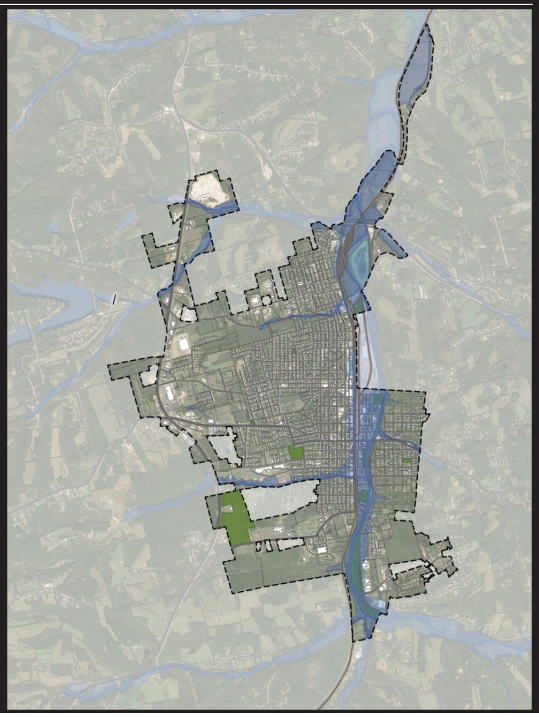
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

Overview:

- De Soto is the fourth (4) largest city in Jefferson County with a population of 6,435 people.
- Total land = 2,860 acres – 4.38 mi sq.
- De Soto has a median household income of $49,024 and a per capita income of $25,890.
- De Soto is the site of a major Union Pacific Railroad train car shop which is the company's largest repair shop and the city's largest employer.
- The city is built with 286' changes in elevation including a 50' increase along Main Street. It is the largest city in the creek watershed, downstream from significant and increasing development and historically prone to flooding in low areas.



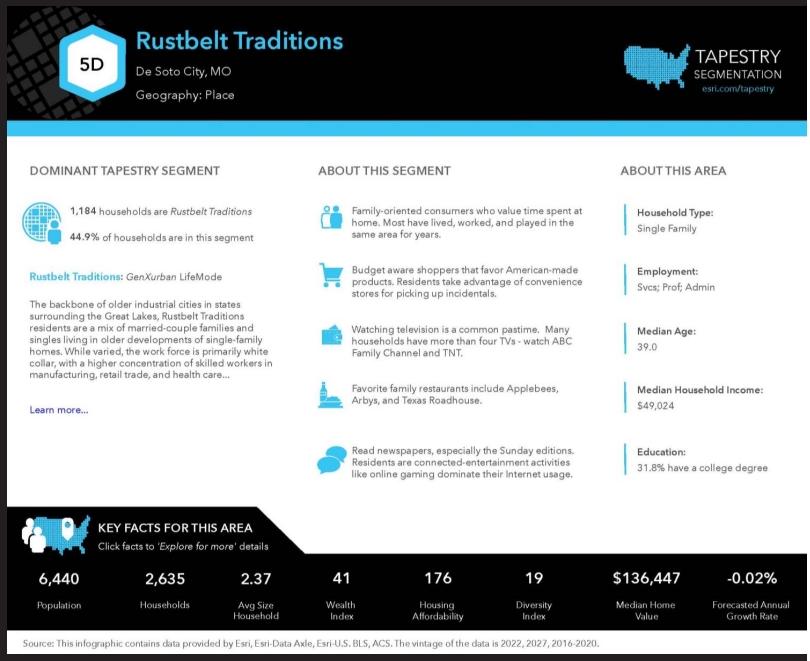
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

City Demographics:

- De Soto encompasses qualities of the Rustbelt Tradition Tapestry Segmentation.
- Of the 6,440 people reported to live in the City of De Soto:
  - 90.9% are identified ad white alone
  - 7% identify as two or more races
  - 1.4% identify as black or African American
  - <1% identify as Native American, Asian, Hispanic, or Latino
- In general De Soto is getting slightly older with a median age of 39 years old.
- 16.3% of the total population of De Soto (1,049 people) is considered to be in poverty. The most at risk group of poverty within city limits are females between 45-54.
- While 82% of De Soto citizens have earned a high school degree only 12% of people on De Soto maintain a higher education degree indicating a retention challenges.



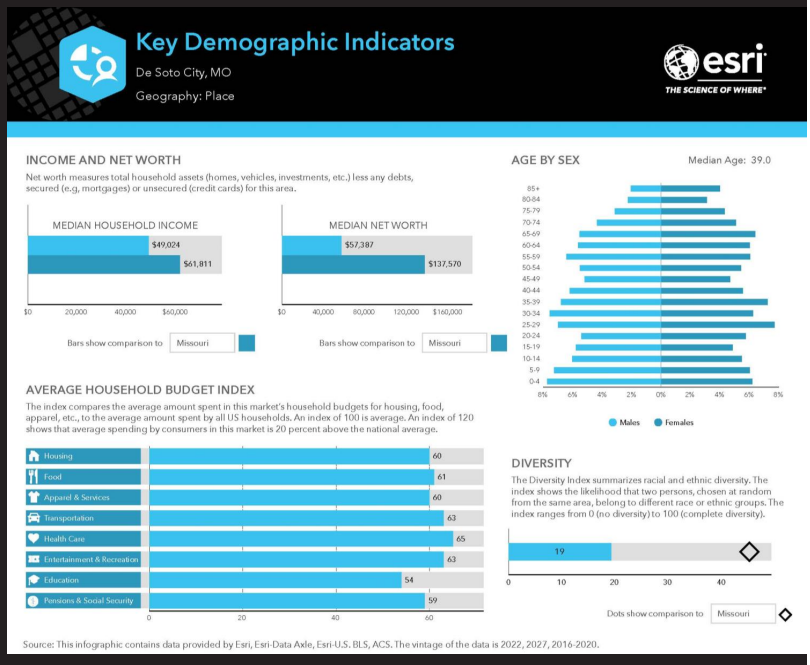
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

City Demographics:

- De Soto's Median Household income is $49,024.
- The average household spends the most money on health care, transportation, entertainment, and food.



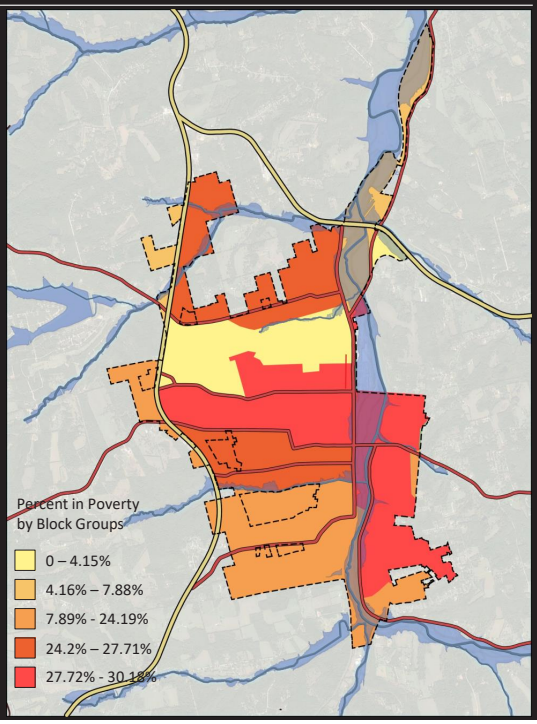
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

City Demographics:

- 51% of households in De Soto make less than $50,000/year and 23% sit below the poverty line.
    - 20% of these households make less than $10,000/year.
    - The most disadvantaged low income areas (in red) are along the Joachim Creek and its tributaries meaning they suffer adverse flood effects with limited recovery resources and capital.



H3 STUDIO

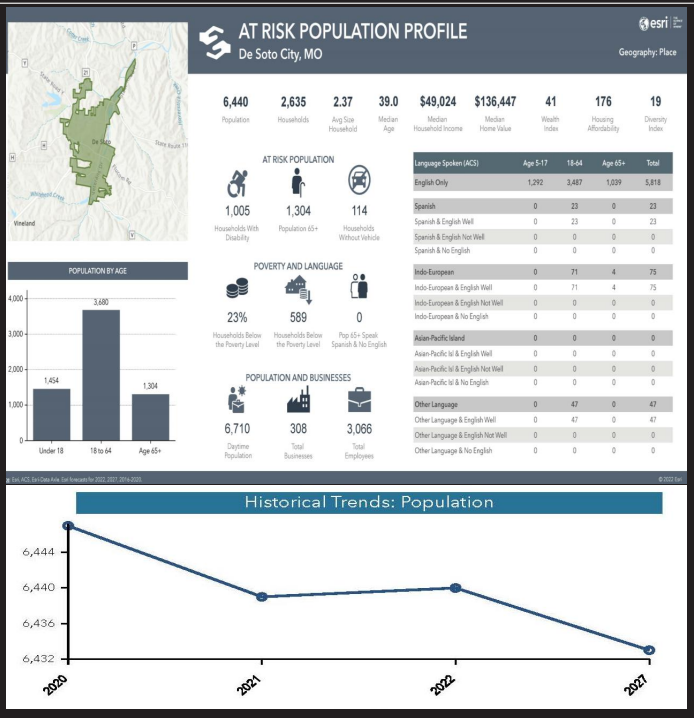
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- The Senior community is most at risk in De Soto and makes up approximately 20% of the total city population
- Additionally, Over 1000 households (38%) in De Soto report having some form of a disability.
- As the De Soto population continues to age. De Soto is expected to lose population in the next few years though not by a substantial amount.



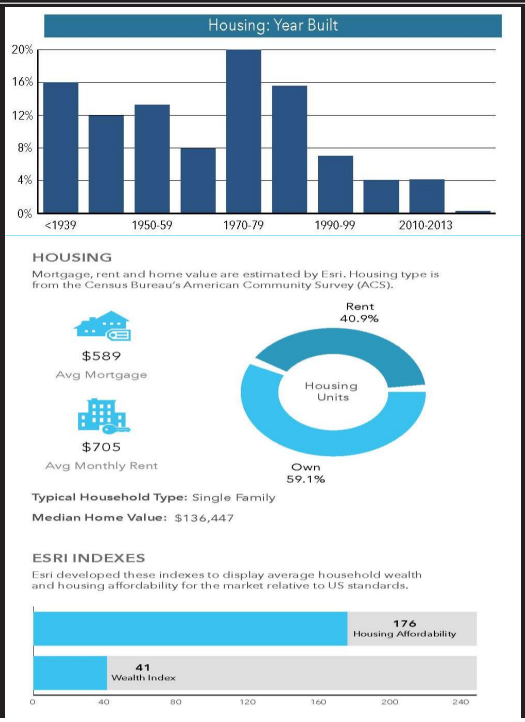
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto City Profile

City Demographics:

- Census Bureau reports that De Soto has approximately 2,595 households with an average of three people living in them.
- Homeownership in De Soto is increasing at 60% of homes , up from 57% with an upwards trend.
- 85% of homes in De Soto were built before 1990 and no new housing development has occurred.





NATURAL RESOURCES + FEATURES

H3 STUDIO

COMPREHENSIVE CITY WIDE ASSESSMENT

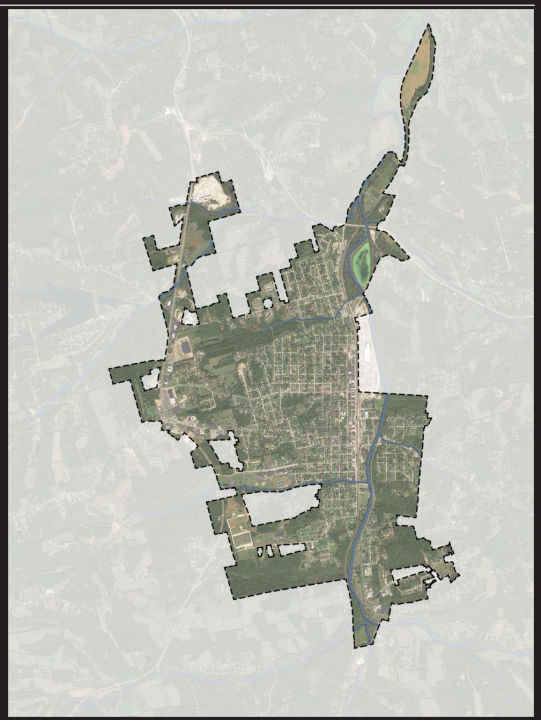
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Topography

- De Soto is a community settled on the edge of the Joachim Creek composed of high bluffs carved out by a narrow valley where the creek flows. The upland condition of the bluffs creates significant runoff fed into the Joachim Creek.



H3 STUDIO

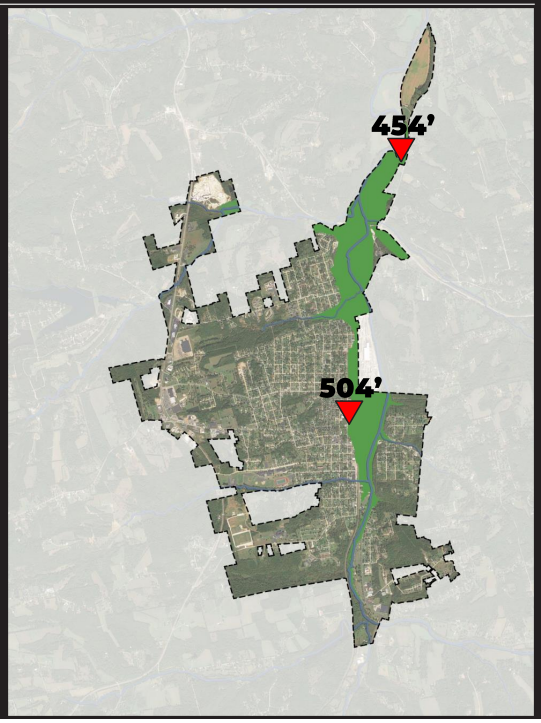
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THE CITY OF DE SOTO, MO

Natural Resources + Features

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- De Soto is a community settled on the edge of the Joachim Creek composed of high bluffs carved out by a narrow valley where the creek flows. The upland condition of the bluffs creates significant runoff fed into the Joachim Creek.

- 454' – 504'
  - The lowest elevations of De Soto are along the creeks edge.



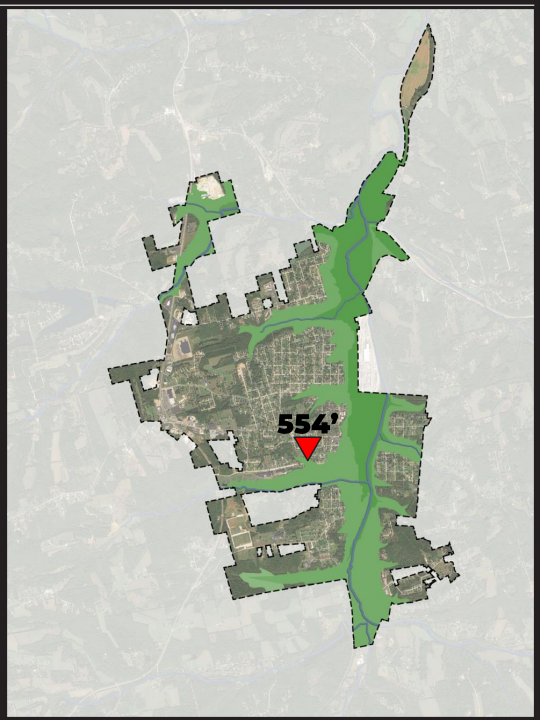
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THE CITY OF DE SOTO, MO

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- 454' – 504'
  - The lowest elevations of De Soto are along the creeks edge.
- 505' – 554'
  - De Soto rises East and West of the Creek Valley along high hills.
  - Along the edge of Main Street there is a 50 rise in elevation contributing to drastic changes in overall topography.



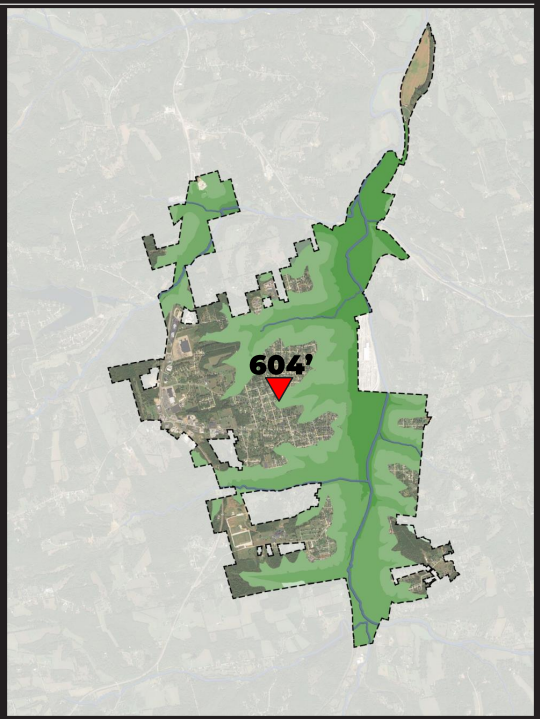
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THE CITY OF DE SOTO, MO

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- 555' – 604'



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

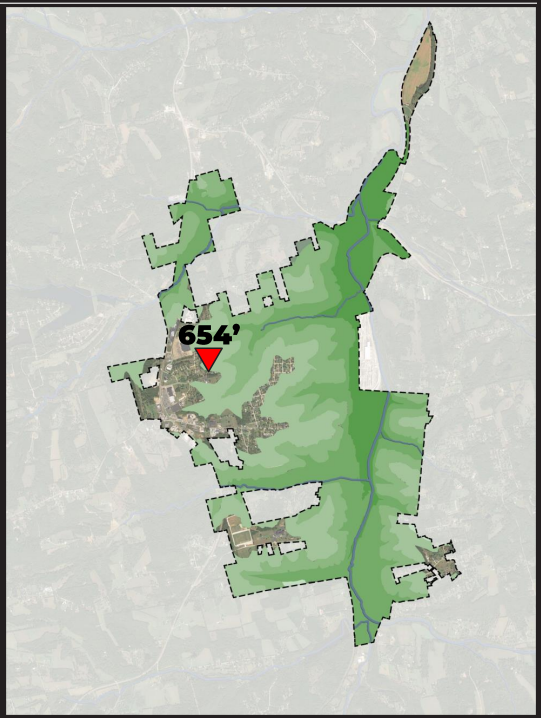
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- 555' – 604'
- 605' – 654'



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

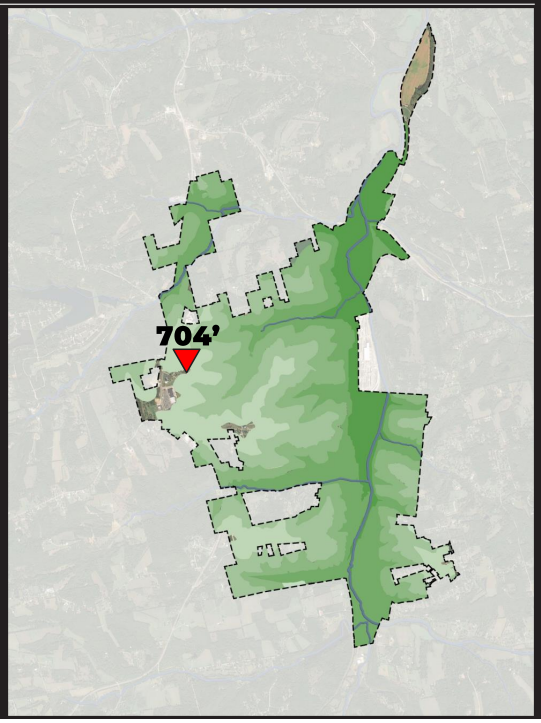
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- 555' – 604'
- 605' – 654'
- 655' – 704'
  - The hills have primarily residential land uses and development.



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Topography

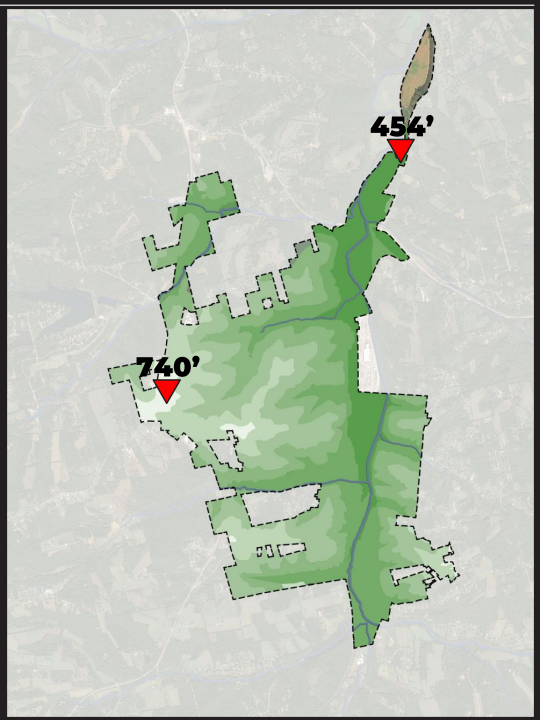
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- 605' – 654'
- 655' – 704'
  - The hills have primarily residential land uses and development.

- 705' – 740'
  - At 740' above sea level De Soto's highest peaks are along Highway 21 on the Western Side of the city.
  - There is a 286' change in elevation in De Soto.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

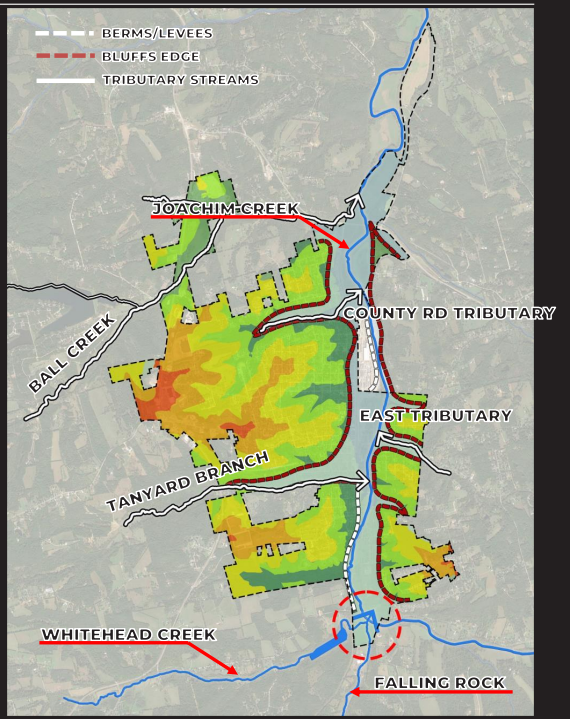
Natural Resources + Features

Topography + Hydrology

- The ridgelines along the creek valley have changes in elevation upwards of 50 feet.

- The Joachim Creek runs East of Main St. De Soto flowing from South to North where four tributary branches flow into it during times of heavy precipitation:
  - The East Tributary
  - The County Road Tributary
  - The Tanyard Branch
  - Ball Creek Branch

- The creek enters the city at Walther's park at the southern most border of De Soto. It is the point of confluence for three creeks – The Joachim, Falling Rock Branch, and Whitehead creek both of which are dam fed waterways.



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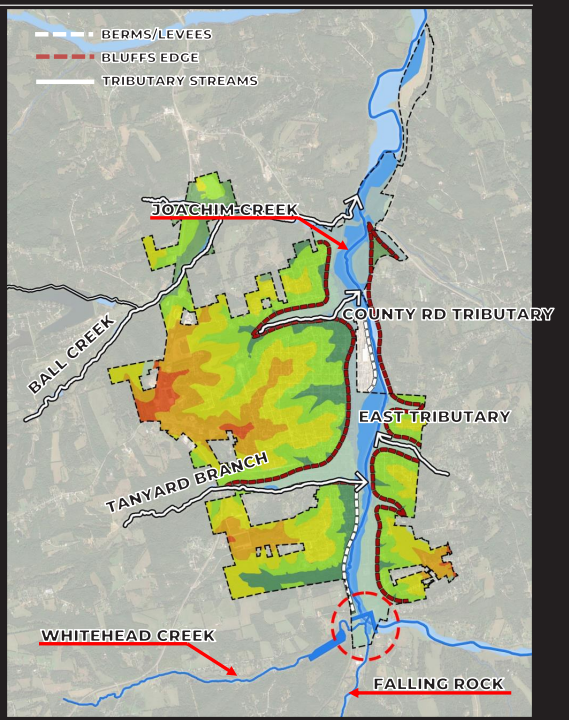
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Floodway



H3 STUDIO

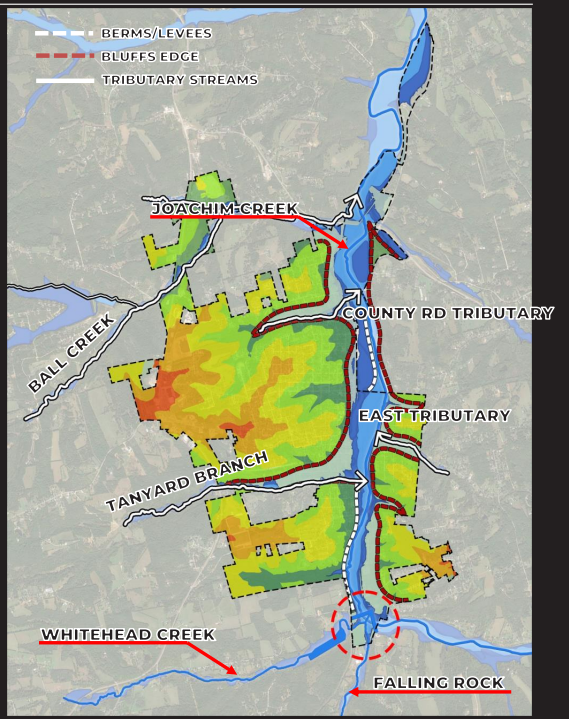
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Floodway
100 year floodplain



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

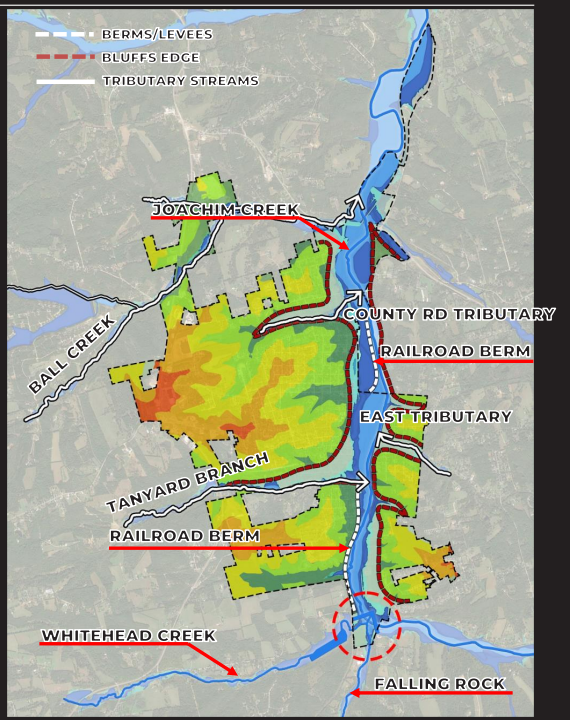
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Floodway
100 year floodplain
500 year floodplain

- The flow of the creek is constricted by two railroad berms – one south of Main St. and one on the eastern edge of the railyard.



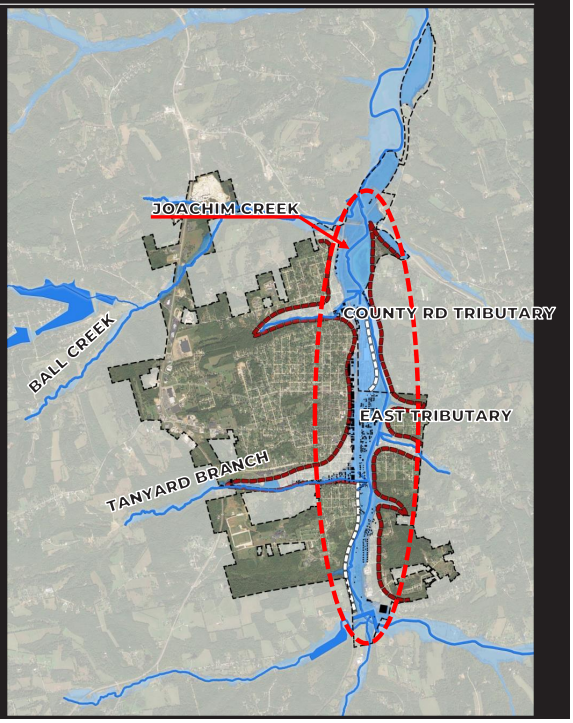
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Topography + Hydrology + Affected Areas

- The De Soto Floodplains affect:
  - 354 homes (15% of homes)
  - 30 miles of city roads (29% of road surfaces)
  - 109 commercial properties (56% of businesses)
  - An electrical substation
  - Government and emergency facilities
- Included in the affected properties is a majority of businesses and properties on Main Street, The Union Pacific Railroad, and homes and businesses east of the railroad tracks including the Historic Arlington Hotel.



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

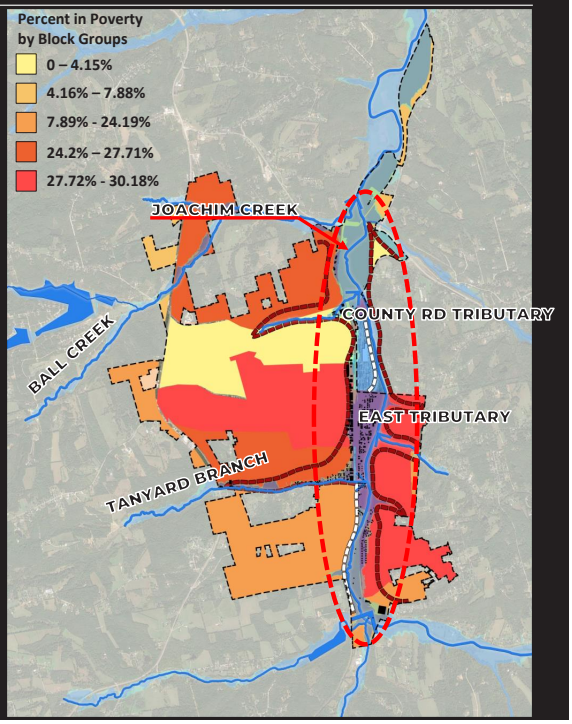
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- Included in the affected properties is a majority of businesses and properties on Main Street, The Union Pacific Railroad, and homes and businesses east of the railroad tracks including the Historic Arlington Hotel.

- The areas of greatest poverty, with an average median income of $32,000, in De Soto are most impacted by the flood plain.



H3 STUDIO

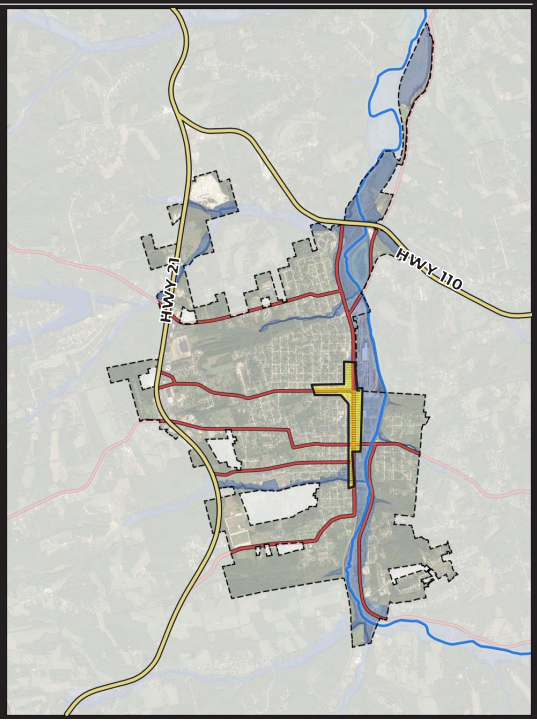
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Floodplain Hazards

- The dangerous conditions of the flood plain are contributed to by increased upstream development both in the watershed and city.

- Main Street De Soto (Historic Downtown) is located at the base of the city hills along the Joachim Creek and Union Pacific Railroad in the low land of the community.



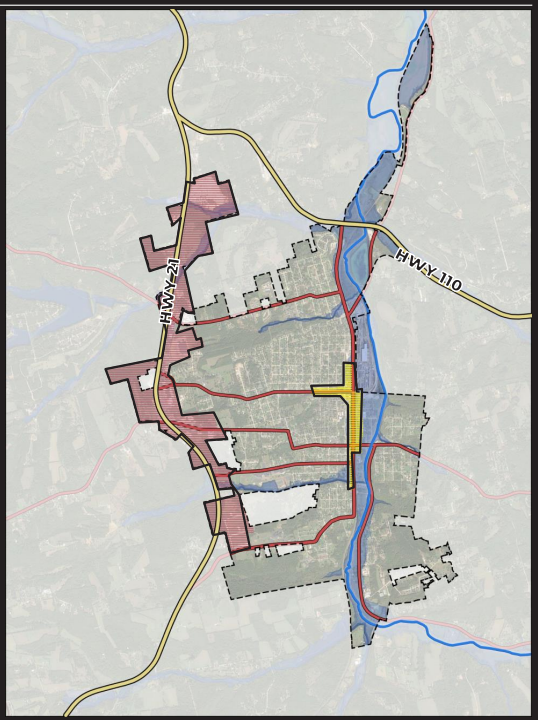
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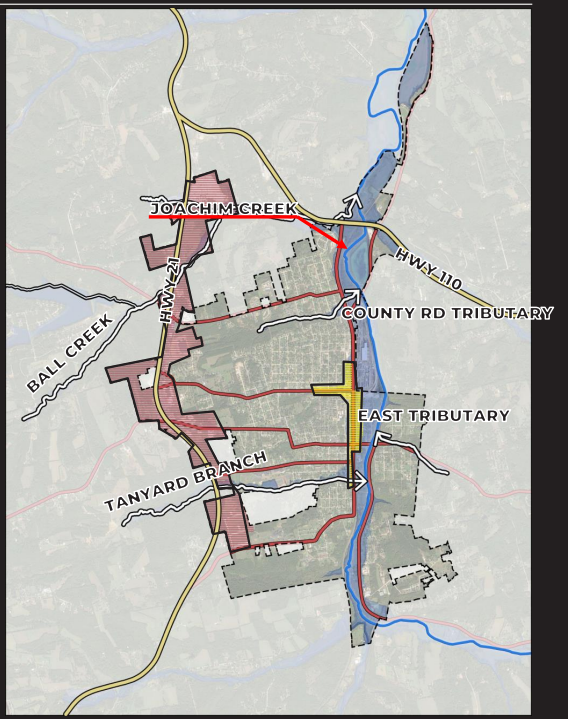
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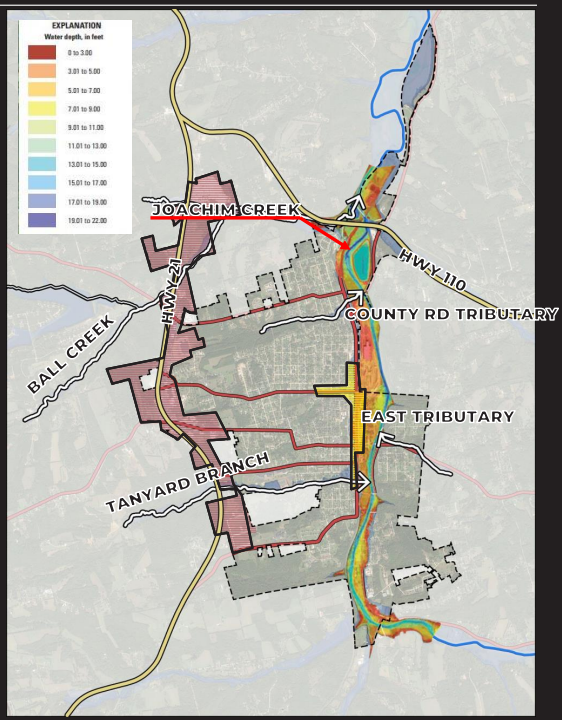
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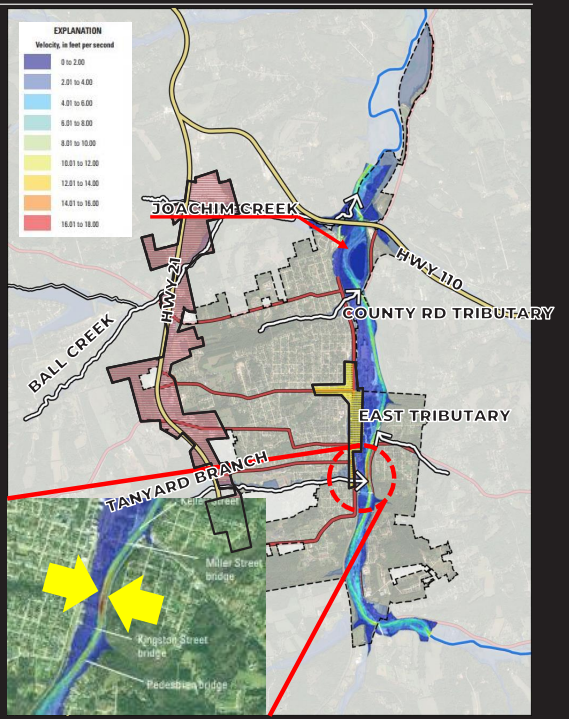
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- Constriction at the Tanyard Branch between the railroad levee and bluffs increase the overall velocity of the water.
- The build up of water causes increased water speed and depth
  - The Tanyard Brach Joachim Creek intersection has the highest registered water velocity along the creek between 16 – 18 feet/second.



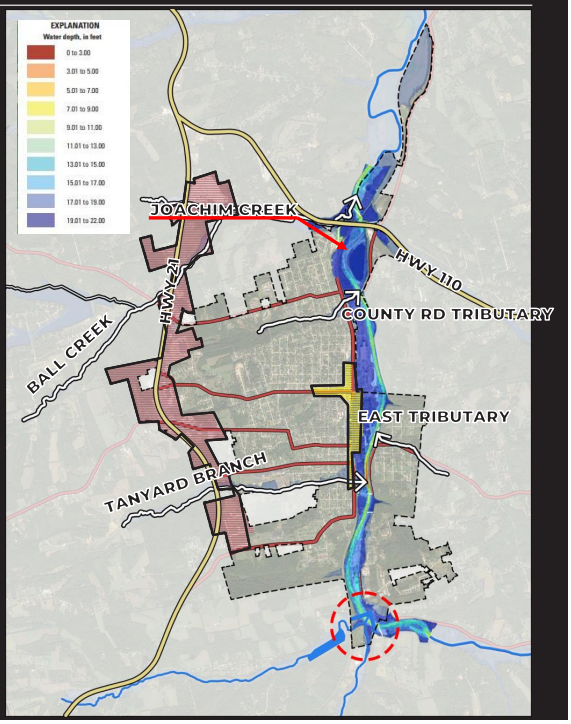
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THE CITY OF DE SOTO, MO

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Floodplain Hazards

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- The tributaries intersect the Joachim Creek at right angles enhancing the danger of the overall speed and disrupting flow intensifying water backups. They also have fluctuating conditions with low banks, debris, and narrow canals.



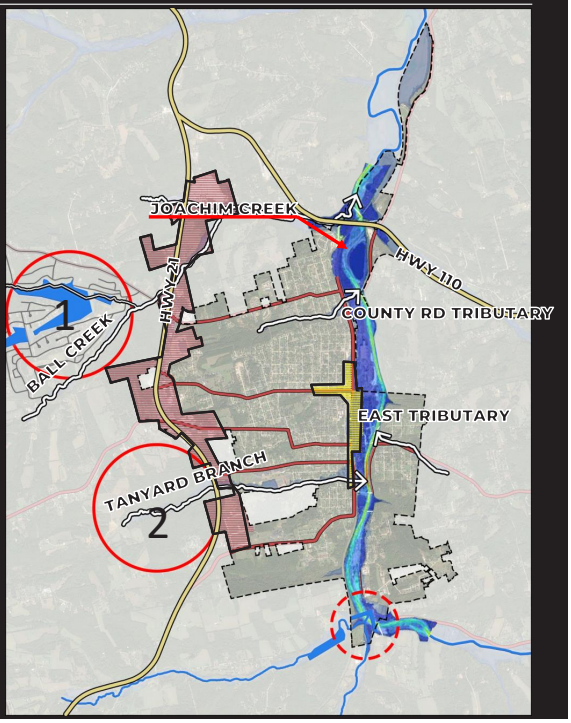
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Floodplain Hazards + Underground Water

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- The tributaries intersect the Joachim Creek at right angles enhancing the danger of the overall speed and disrupting flow intensifying water backups. They also have fluctuating conditions with low banks, debris, and narrow canals.
- Development upstream along highway 21 feeds additional runoff into the Ball Creek Branch, County Tributary, and Tanyard Branches.
- (1) The Briarwood, Spring Lake, and Fisherman's Lake Subdivision is a hazardous damn with a substantial threat to the Ball Creek Branch.
- (2) A new subdivision is being constructed in the county just upstream from the Tanyard Branch.



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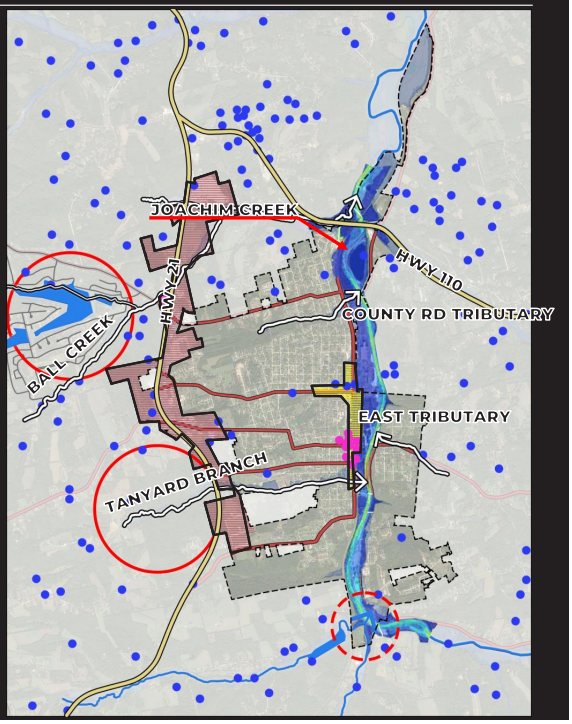
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Floodplain Hazards + Underground Water

- Underground wells and streams contribute to an increased overall intensity in velocity and depth of flood waters entering De Soto.
- The Falling Rock Branch and Mc Mullen Branch (upstream from De Soto) are both classified as gaining Streams meaning they gain additional water from the ground.
    - The Falling Rock Branch flows into De Soto at its Southern edge and the Mc Mullen Branch flows into the Joachim further upstream intensifying flood effects in Walther Park and surrounding neighborhoods.
- Missouri Geological Survey notes hundreds of wells in and around the city of De Soto with high concentrations around tributaries south and north of the City.
- There are 27 monitoring wells along main street which track the ebb and flow of underground water sources.

Well Sites
Monitoring Wells



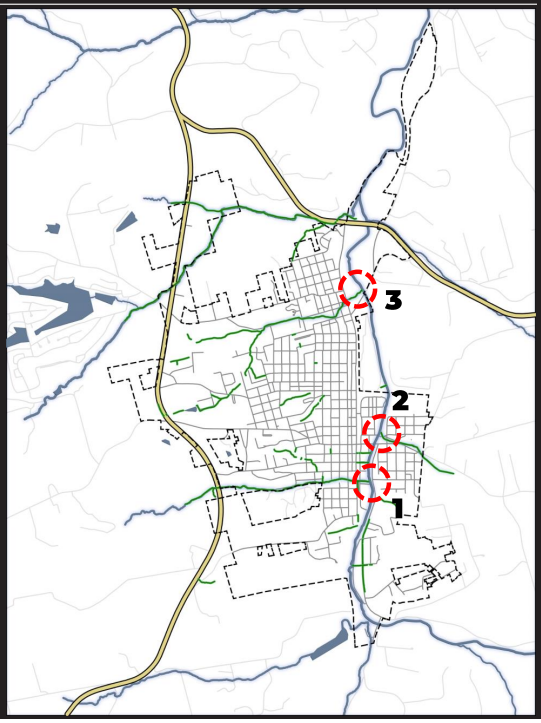
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Stormwater Systems

- Existing Stormwater Systems in De Soto flow into three major Creek Tributaries acting as open drains to the Joachim:
    1. Tanyard Branch
    2. East Tributary
    3. County Road Tributary
- These systems are put under pressure contributing to the increased depth and velocity of the flood areas affecting De Soto.



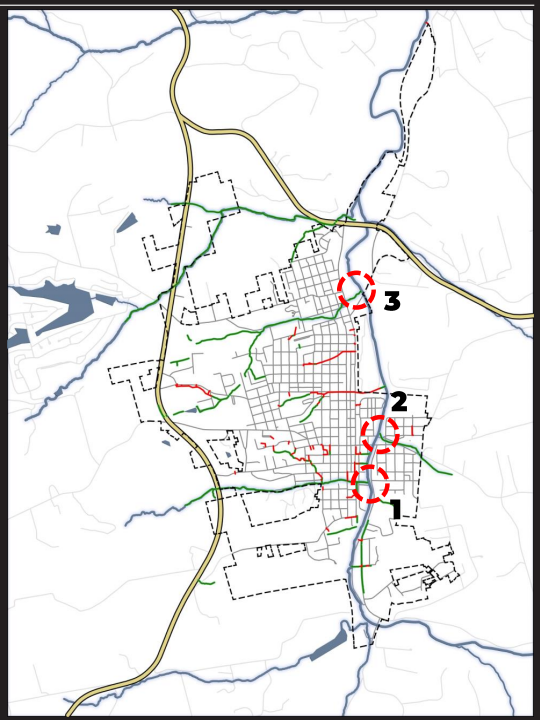
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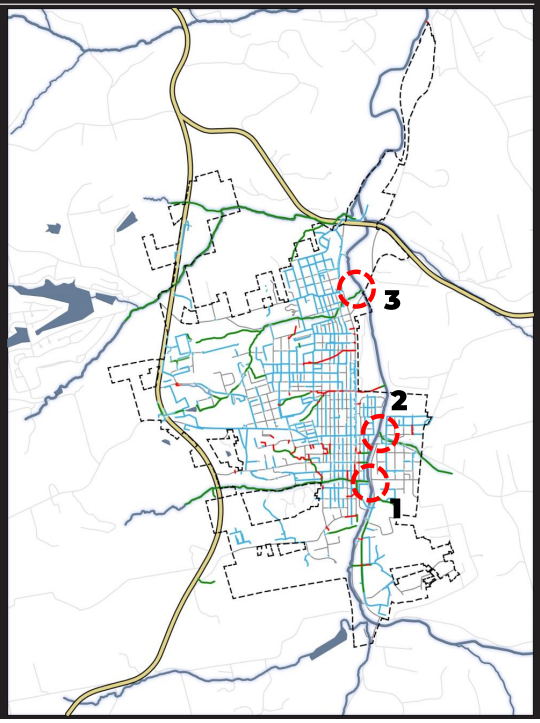
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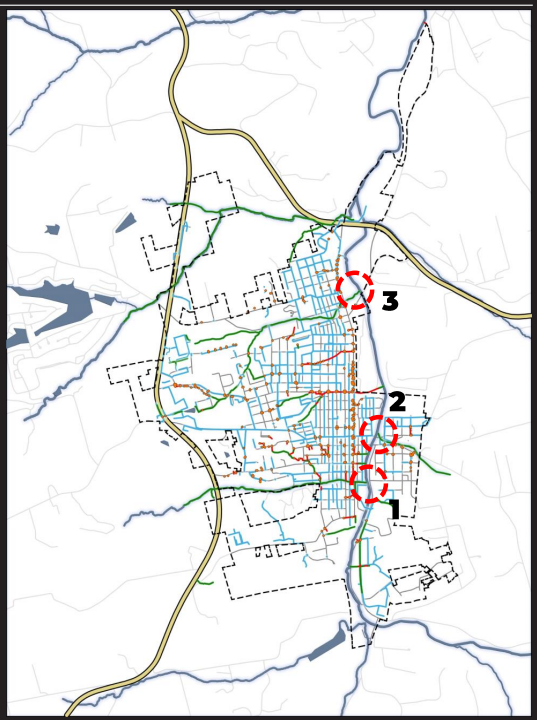
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- There are several open culverts along several roads and forming bridges which can bottleneck and increase flooding intensity.
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- Though inlet points are scattered the majority are concentrated along Main Street and Boyd St. making Main St. more susceptible to back ups and flooding.



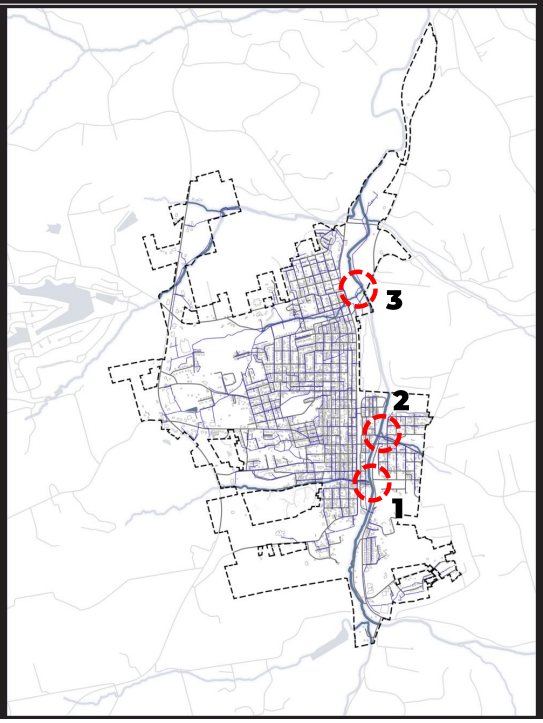
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Floodplain Hazards Code + Stormwater + Erosion Control

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  1. Tanyard Branch
  2. East Tributary
  3. County Road Tributary
- These systems are put under pressure contributing to the increased depth and velocity of the flood areas affecting De Soto.
- Much of the infrastructure at these entry points showed signs of ware and required maintenance including:
  - Erosion on roads, bridges, sewer grates and entry points
  - Cracking
  - Debris and waste back ups in primary water channels that limit flow.
- The Tanyard Branch Bridge was recently replaced and is in good condition.
- The County Road Tributary Bridge and pipe need repair.



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Flood Resiliency Plan

THE CITY OF DE SOTO, MO



H3 STUDIO

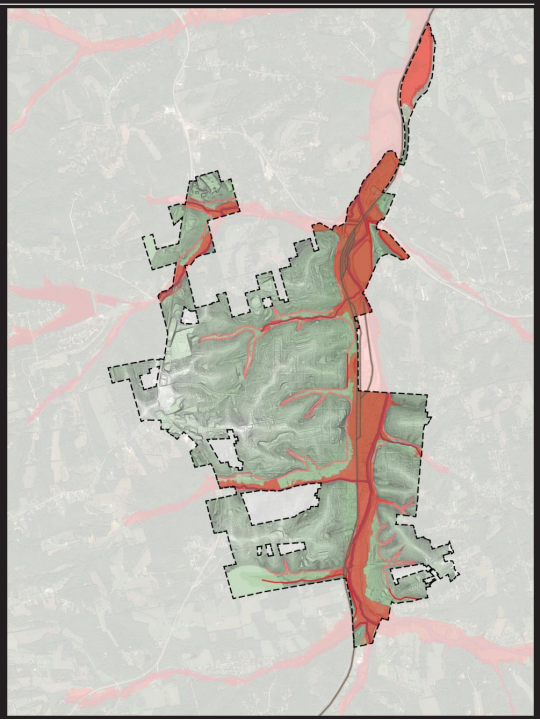
Flood Resiliency Plan

THE CITY OF DE SOTO, MO

Natural Resources + Features

Floodplain Hazards Code + Regulations

- De Soto municipal code currently outlines the following regulations for flood plain management and development:
  - All flood plain developments require a permit for proposed construction or development including placements of manufactured homes inclusive of the following regulations.
  - New developments and substantial improvements have requirements to be elevated 2 feet above the base flood elevation.
  - Designs are required to be floodproofed and include:
    - Adequate anchorage, materials resistant to damage, mechanical systems elevated and protected from flooding, and adequate site drainage.
  - Agricultural, storage, and parking structures no greater than 400 sq ft may be constructed at grade and wet-floodproofed, provided there is no human habitation or occupancy of the structure.
  - The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than thirty-six (36) inches in height above grade and be securely attached to an adequately anchored foundation.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Stormwater and Mitigation Infrastructure

- De Soto municipal code currently outlines the following regulations for stormwater and erosion control:
  - There are by site regulations to regulate Impervious surface development and overall runoff from sites. This is determined by the zoning classification and permitted land use of any given site.
  - The code encourages retention facilities to try and mitigate the effectiveness and safety of sites.
  - It controls the development standards of reservoirs, parking areas, and permanent lakes used as retention methods by regulating setbacks, ponding capacity, water depths and elevations.
  - There are design standards for any runoff discharge systems to ensure the safe and controlled movement of water.

Average C.I. Factors in Cubic Feet Per Second Per Acre (CFS/Acre) 20 Minute Inlet Time

Zoning District	Use	% Imp.[1]	C	C.I. Factors[2] 25-Yr	50-Yr	100-Yr
A-1 Agricultural	All uses	5	0.37	2.00	2.18	2.37
R-1 Residential	One-family dwelling	45	0.54	2.92	3.19	3.46
	All other uses	60	0.60	3.24	3.54	3.84
R-2 Residential	One-family dwelling	47	0.548	2.96	3.23	3.51
	All other uses	75	0.665	3.59	3.92	4.26
R-3 Residential	Two-family dwelling	60	0.600	3.24	3.54	3.84
	All other uses	75	0.665	3.59	3.92	4.26
R-4 Residential	Multiple-family dwelling	70	0.645	3.48	3.81	4.13
	All other uses	75	0.665	3.59	3.92	4.26
C-1 Commercial	Office and professional	Same as R-4	Same as R-4	Same as R-4	Same as R-4	Same as R-4
	All other uses	85	0.705	3.81	4.16	4.51
C-2 Commercial	Downtown	Same as C-1	Same as C-1	Same as C-1	Same as C-1	Same as C-1
	All other uses	85	0.705	3.81	4.16	4.51
C-3 Commercial	General	Same as C-1 and C-2	Same as C-1 and C-2	Same as C-1 and C-2	Same as C-1 and C-2	Same as C-1 and C-2
M-1 Manufacturing	Light	90	0.73	3.94	4.31	4.67
M-2 Manufacturing	General	90	0.73	3.94	4.31	4.67
PUD — Planned Unit Development		As determined on a site-by-site basis.				

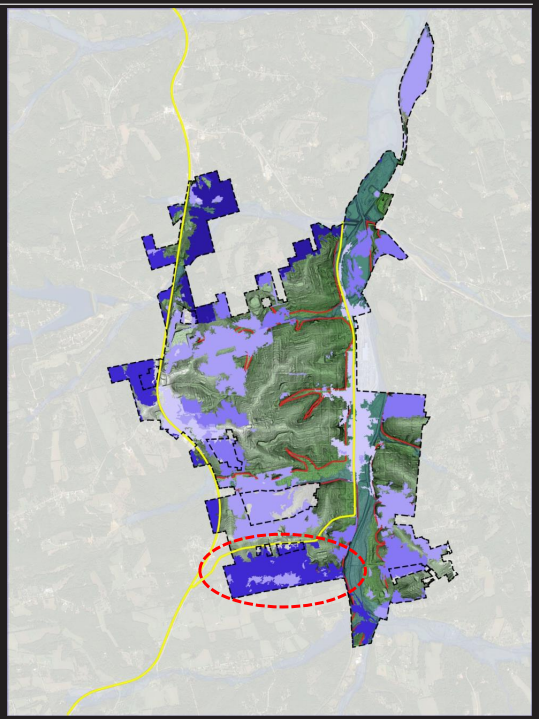
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Natural Resources + Features

Ecological Significance + Remediation Opportunities

- The areas of greatest ecological significance in De Soto are located along highway 21 and at the southwestern part of the city.
- The County Road Tributary and Tanyard Branch Tributaries also have ecologically significant landscapes where potentially resilient landscapes can be developed to hold and control water more efficiently.
- The southwestern land of the city is a series of overgrown well wooded parcels





BUILT FEATURE CHARACTERISTICS

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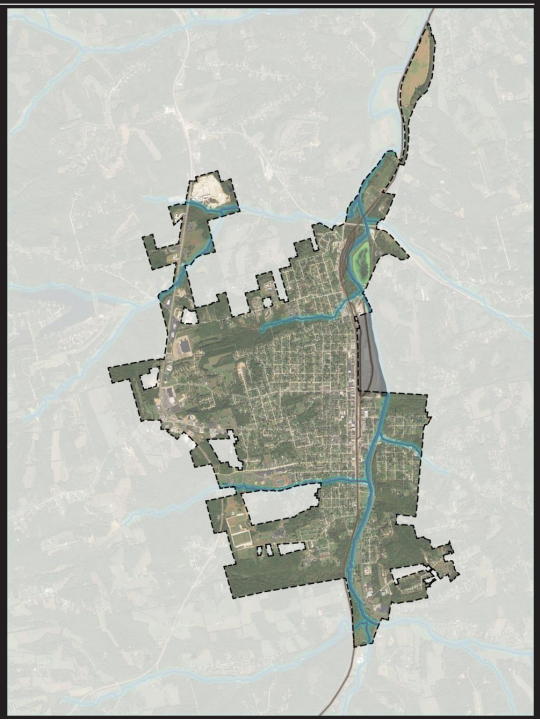
COMPREHENSIVE CITY WIDE ASSESSMENT

H3 STUDIO

Built Feature Characteristics

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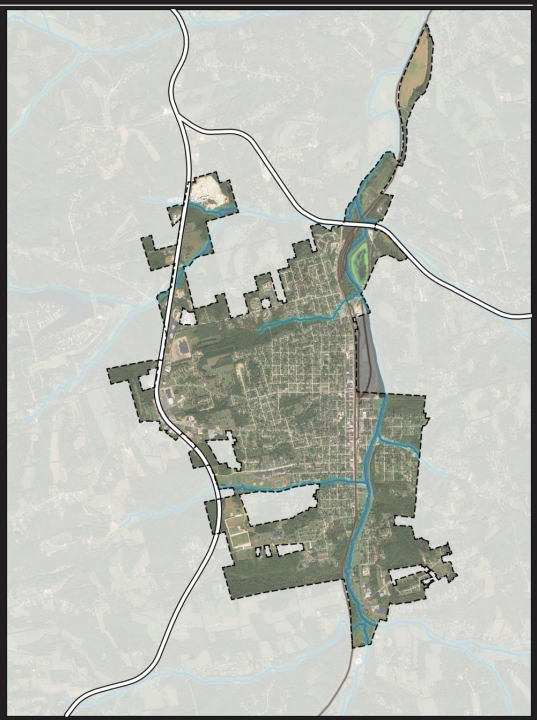
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THE CITY OF DE SOTO, MO

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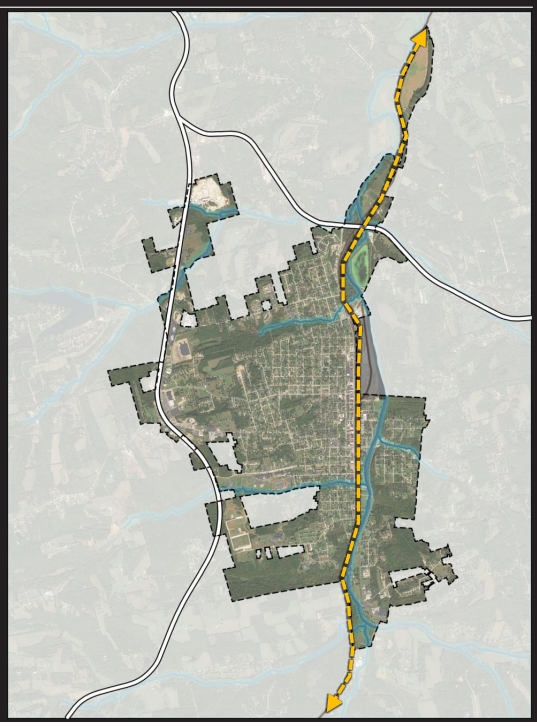
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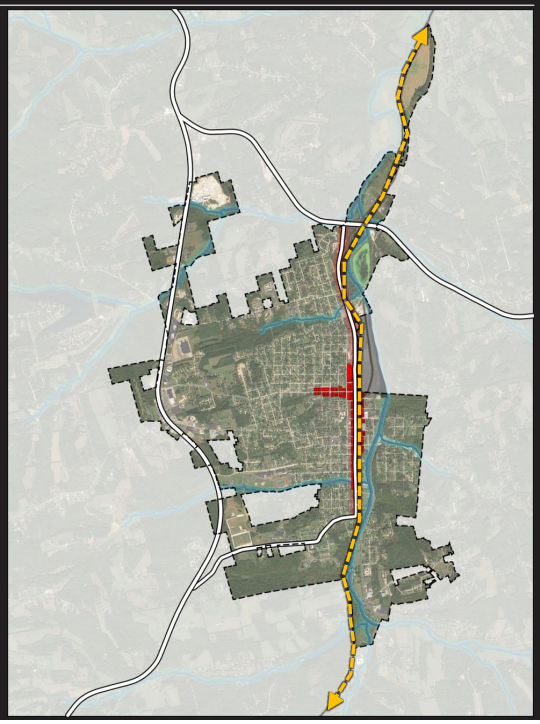
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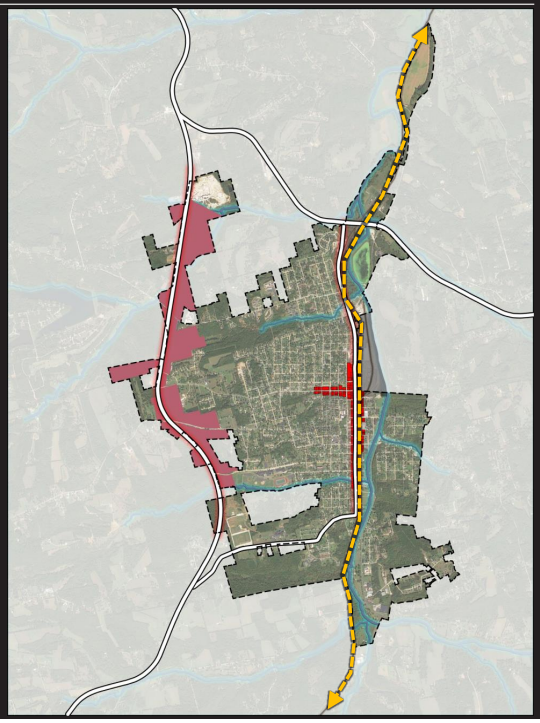
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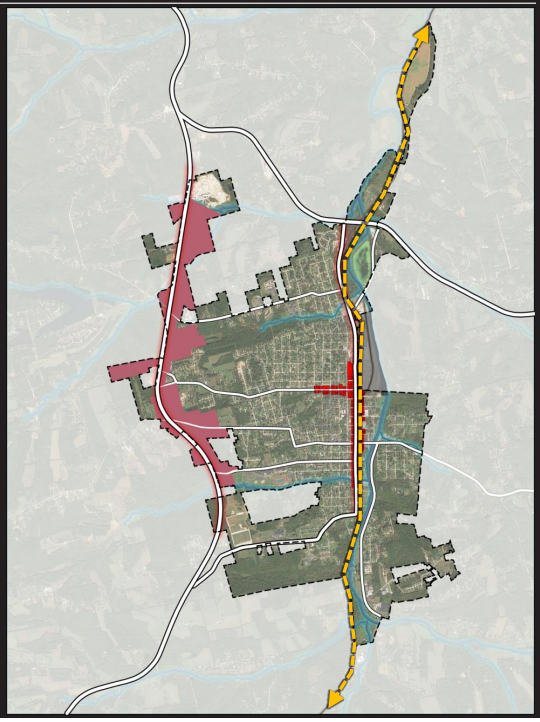
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- There are 5 roads that connect De Soto's two commercial roads East to West:
  - Clarke Street
  - Boyd Street
  - Rock Rd/W. Miller Street (Highway N)
  - Amvets Drive
  - Vineland Rd (becomes Main Street)



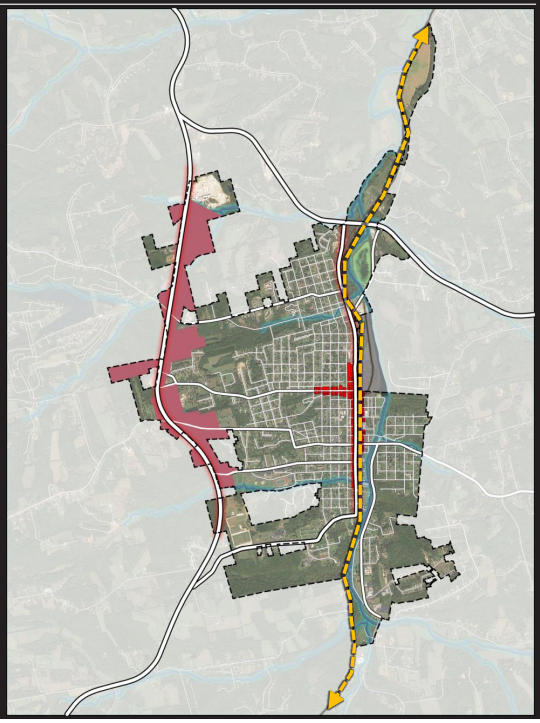
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- Outside of these major roads De Soto maintains a gridded street structure throughout its neighborhoods.



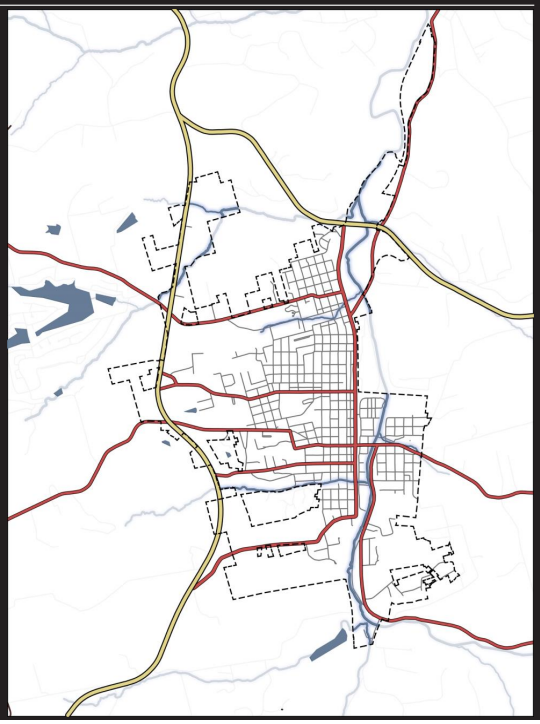
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

Streets + Transportation

- There are approximately 103 miles of road in De Soto City Limits.
- De Soto utilizes its 5 primary East West Connectors and Veterans Blvd. as significant emergency services routes.
- These roads are also priority snow routes during wintry conditions.



H3 STUDIO

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THE CITY OF DE SOTO, MO

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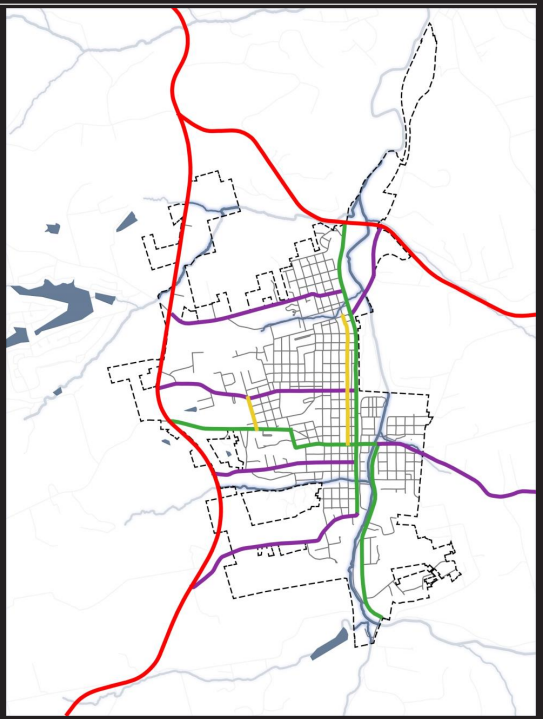
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PRINCIPAL ARTERIALS
- Highway 21 and Highway 110

MINOR ARTERIALS
- Main Street, Highway N, Veterans Blvd.

MAJOR COLLECTORS
- Clarke St, Boyd St, Amvets Ave, Vineland Rd, Flucom Rd

MINOR COLLECTORS
- Donnelly St, 2nd St



H3 STUDIO

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THE CITY OF DE SOTO, MO

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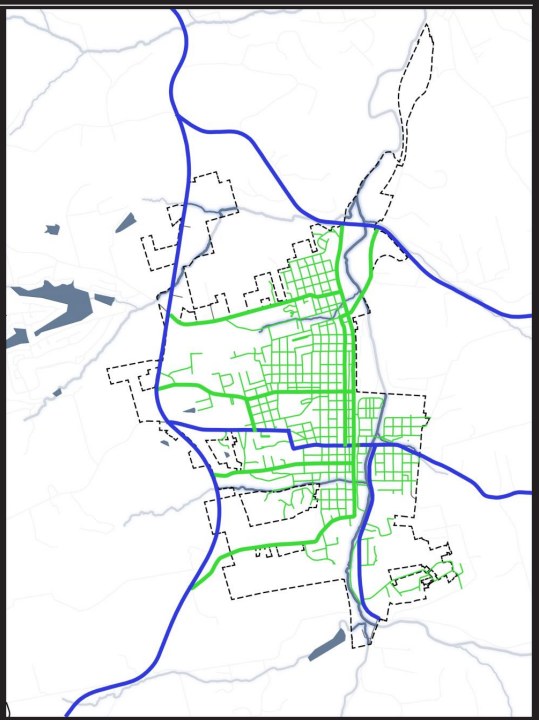
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  - Clarke St, Boyd St, Amvets Ave, Vineland Rd, Flucom Rd

  MINOR COLLECTORS
  - Donnelly St, 2nd St
- ***MODOT*** maintains Highways 21 and 110, Highway N, and Veterans Blvd in De Soto City Limits.
- ***CITY OF DE SOTO*** maintains all other roads in the city.



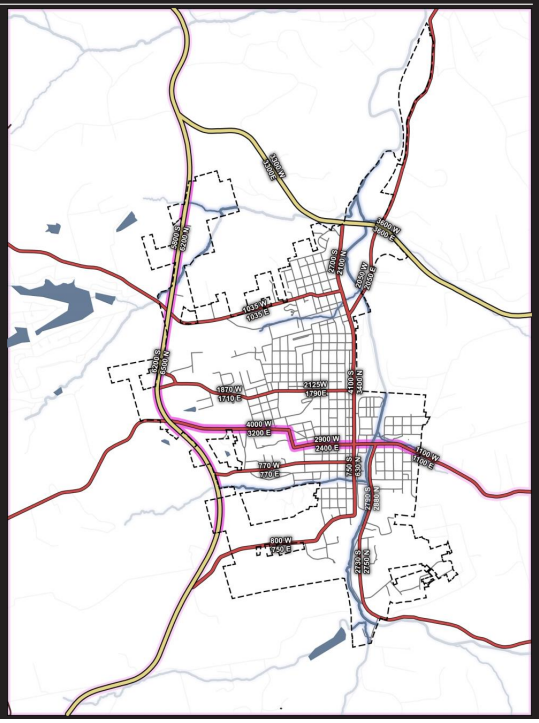
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THE CITY OF DE SOTO, MO

Built Feature Characteristics

Streets + Transportation

- Highway 21 , Highway 110, Rock Rd/W. Miller Street (Highway N), Main Street, and Veterans Blvd are De Soto's most utilized roads.
  - Residents and Visitors primarily enter the city on Highway 21 then use Rock Rd/W. Miller Street (Highway N) to enter the City of De Soto.
- Traffic Counts
  - Highway 21: ***6500 N/6200 S***
  - Highway N (Rock Rd.): ***4000 W/3200 E***
  - Highway 110: ***3600 W/3600 E***
  - Veterans Blvd: ***2880 N/2790 S***
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  - Fountain City Rd: ***2050 W/2050 E***
  - Boyd St: ***2125 W/ 1790 E***
  - Clarke St: ***1035 W/1035 E***
  - Vineland Rd: ***800 W/750 E***
  - Amvets Dr: ***770 W/ 770 E***



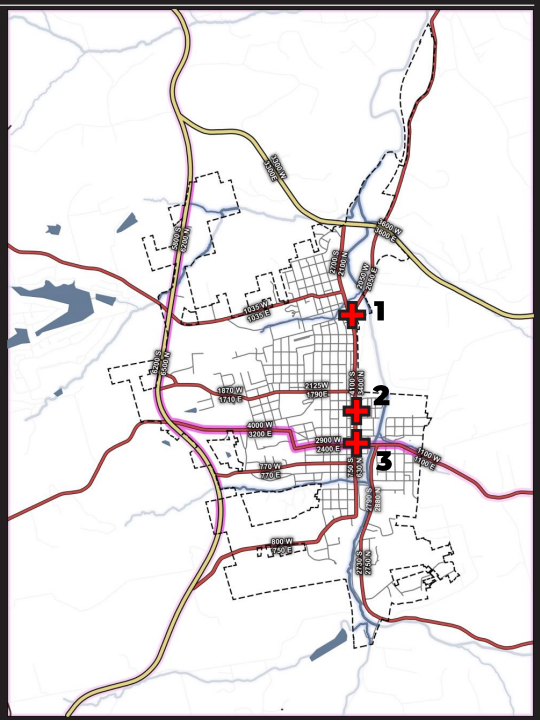
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    - Vineland Rd: ***800 W/750 E***
    - Amvets Dr: ***770 W/ 770 E***
- Highway N is one of three roads in De Soto crossing the rail and the only one continuing beyond the city with a direct connection to highway 67.
    1. Fountain City Road Crossing
    2. Commercial Street Crossing
    3. W. Miller Street Crossing (Primary E/W crossing through De Soto)



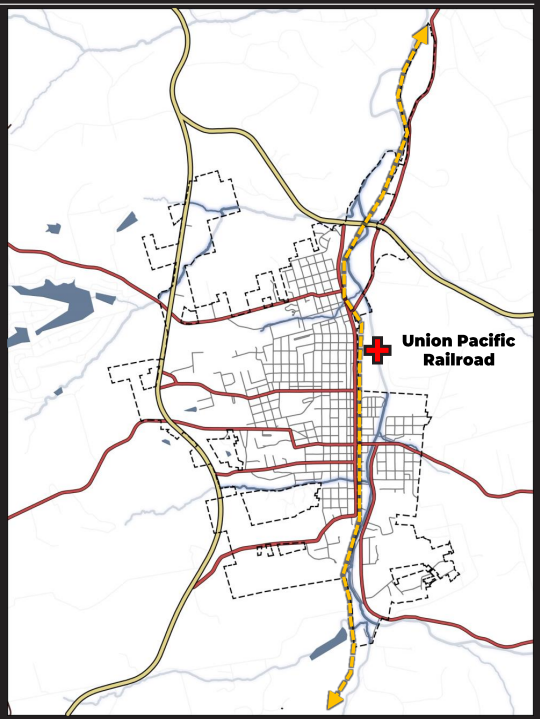
H3 STUDIO

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THE CITY OF DE SOTO, MO

Built Feature Characteristics

City Facilities + Infrastructure

- The Union Pacific Railroad is not within De Soto City limits however it occupies significant frontage along Main Street De Soto.



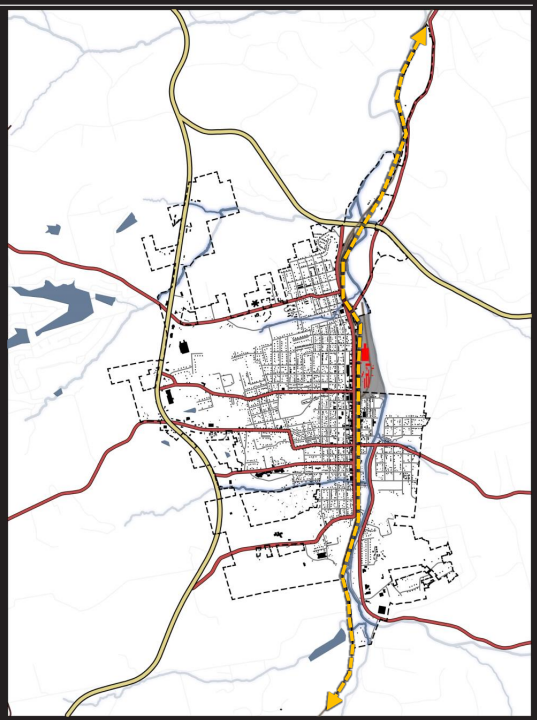
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THE CITY OF DE SOTO, MO

Built Feature Characteristics

City Facilities + Infrastructure

- The Union Pacific Railroad is not within De Soto City limits however it occupies significant frontage along Main Street De Soto.
- There are 2,653 structures in De Soto City Limits.
- The vast majority of structures are single family detached housing (2,438 units 91% of structures)
- Commercial Structures make up 194 buildings at 7% of total structures.
- The remaining two percent of structures are critical and social infrastructure facilities.



H3 STUDIO

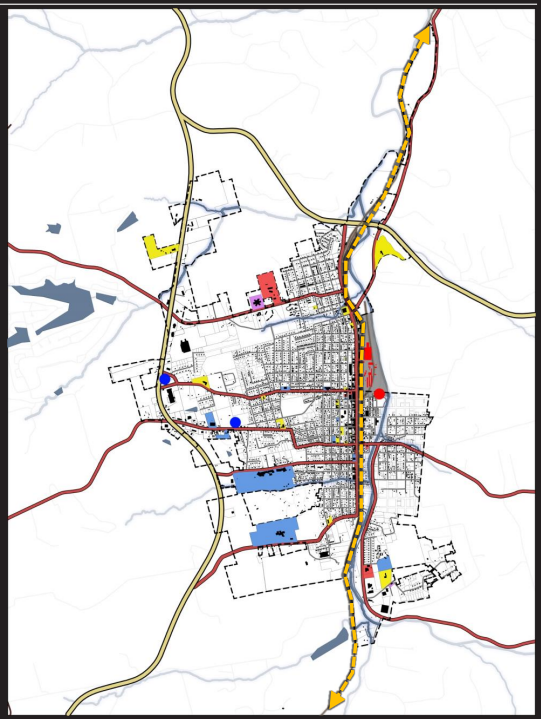
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

City Facilities + Infrastructure

- The Union Pacific Railroad is not within De Soto City limits however it occupies significant frontage along Main Street De Soto.
- There are 2,653 structures in De Soto City Limits.
- The vast majority of structures are single family detached housing (2,438 units 91% of structures)
- Commercial Structures make up 194 buildings at 7% of total structures.
- The remaining two percent of structures are critical and social infrastructure facilities.

  - De Soto offers citizens the following social infrastructure:
    - 2 Senior living facilities
    - A community Center
    - A public library
    - 7 educational and care facilities including:
      - Daycares, Preschool, Elementary, Middle, and High schools.
  - De Soto hosts the following critical infrastructure:
    - A Mercy Health clinic on Main St (only for therapeutic services)
    - An ambulance station
    - A police station and two fire stations
    - An electrical substation
    - 2 water towers
    - 1 water gauge meter



H3 STUDIO

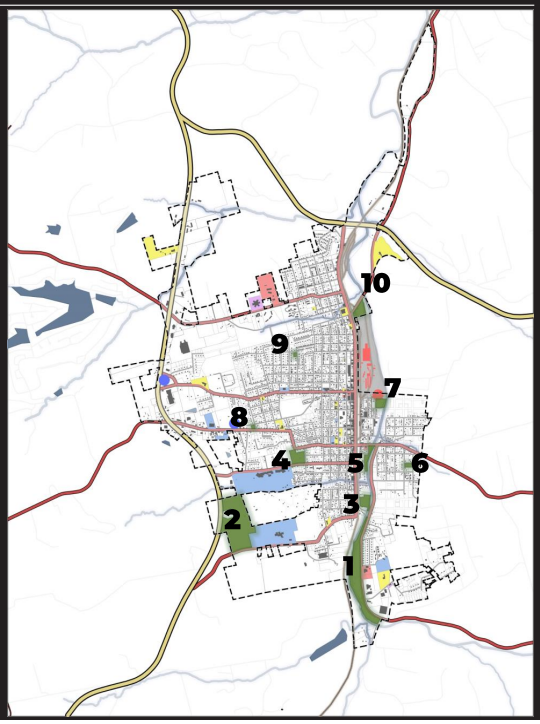
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

Parks + Recreation

- De Soto operates and maintains the following parks and recreational amenities in the community:
  1. Walther Park (18 acres)
  2. De Soto Athletic Complex (45.5 acres)
  3. Hopson Field (4.5 acres)
  4. Spross Park (6 acres)
  5. Joachim Park (1 acre)
  6. Eastside Community Park (1 acre)
  7. Ritchter Park (3.5 acres)
  8. Thomas Basketball Courts (1.5 acres)
  9. Fletcher Park (0.5 acres)
  10. Railroad Memorial (7 acres)

TOTAL PARKS ACREAGE = *88.5 ACRES*
Per NRPA standards De Soto only needs to offer 63 acres of park for its population and is overperforming.



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

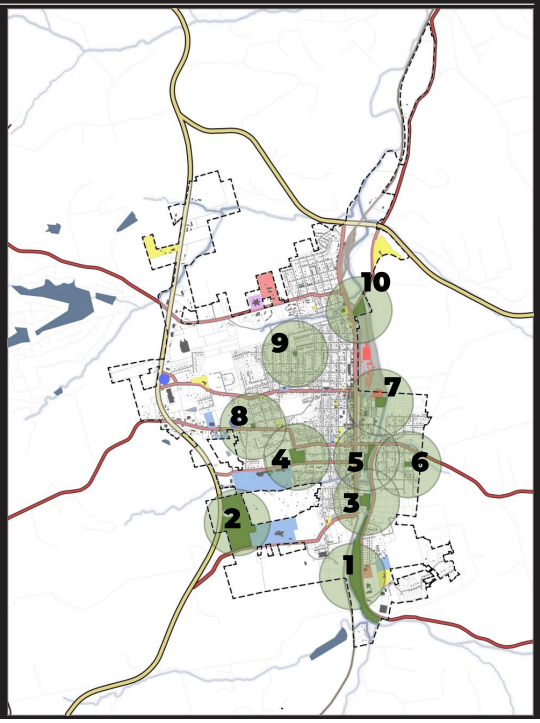
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TOTAL PARKS ACREAGE = *88.5 ACRES*
Per NRPA standards De Soto only needs to offer 63 acres of park for its population and is overperforming.

- Quarter (0.25 miles) Mile Park Radius



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

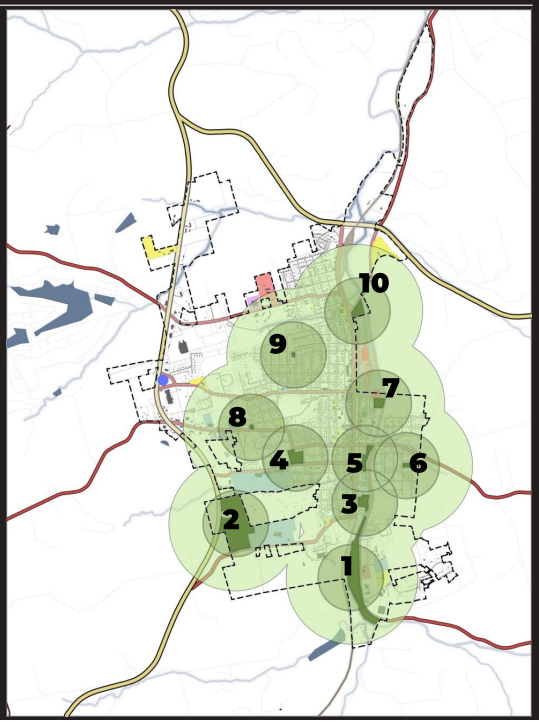
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  TOTAL PARKS ACREAGE = *88.5 ACRES*
  Per NRPA standards De Soto only needs to offer 63 acres of park for its population and is overperforming.

- Quarter (0.25 miles) Mile Park Radius
- Half (0.5 miles) Mile Park Radius

- Nearly all households in the city of De Soto are within half a mile (10-15 min walk) from a Park or recreational amenity in the city of De Soto.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

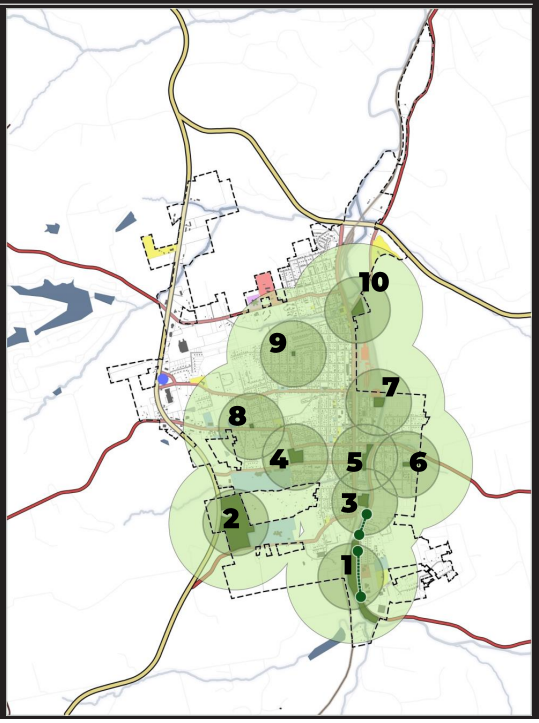
Built Feature Characteristics

Parks + Recreation

- De Soto has no greenways or major trails that run through it.

- Walther Park offers two recreational trails in De Soto:
  - A trail along the historic tree museum from Walther Park to Hopson Field.

  - An internal park walking trail with public fitness amenities for community use.



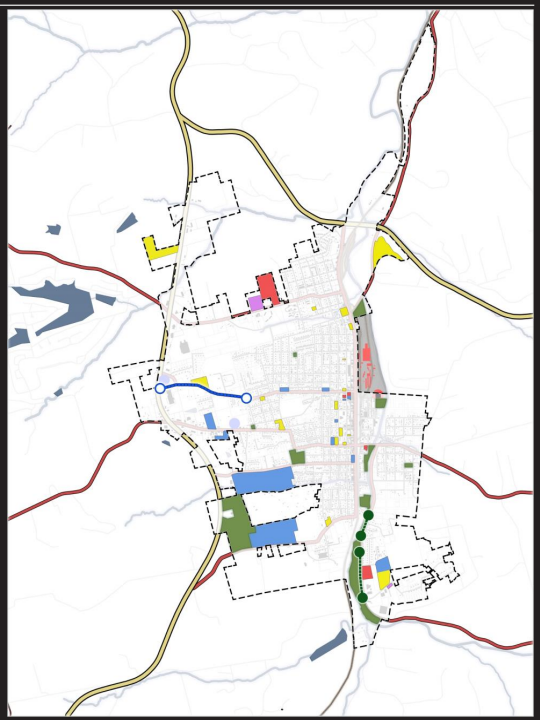
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

Mobility + Connectivity

- Sidewalks are present throughout several neighborhoods and districts in the city.
- De Soto has one existing bike path on Boyd St beginning on highway 21 and culminating at Thomas St.



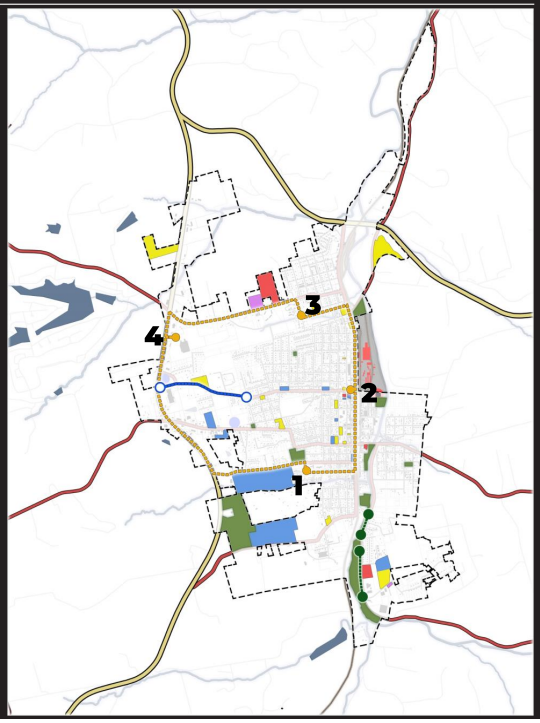
H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

Mobility + Connectivity

- Sidewalks are present throughout several neighborhoods and districts in the city.
- De Soto has one existing bike path on Boyd St beginning on highway 21 and culminating at Thomas St.
- Bus services are handled by JeffCo. Express and they provide 4 stops in De Soto at:
  1. The De Soto Apartments
  2. 17 Boyd Street
  3. Sycamore Hills
  4. Walmart Pharmacy on highway 21
- The buses run once in the morning, once at mid day, and once in the afternoon every two hours during the day.
- Bus transportation provides stops in Crystal City, Hillsboro, Festus, Arnold, and Pevely.



H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

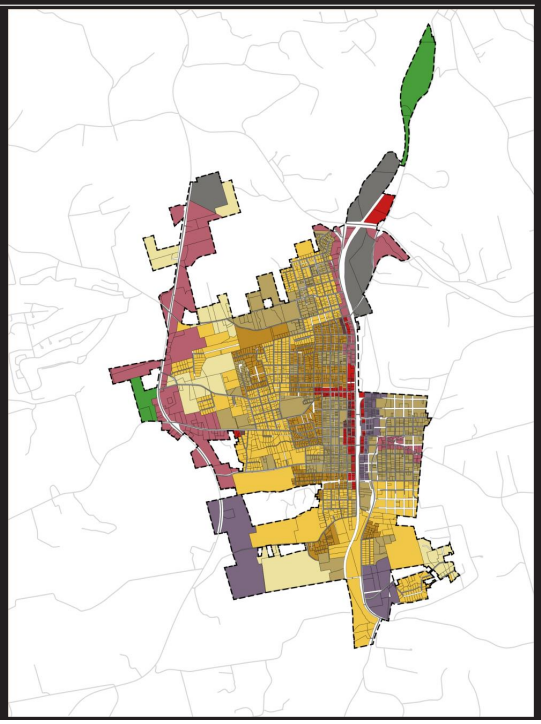
Zoning Classifications

- R1 – Low Density Residential – ***9% of area***
- R2 – Medium Density Residential – ***24% of area***
- R3 – High Density Residential – ***8% of area***
- R4 – Multi-Density Residential – ***14% of area***
- C1 – Office and Professional – ***<1% of area***
- C2 – Light Commercial – ***2% of area***
- C3 – General Commercial – ***12% of area***
- M1 – Light Industrial – ***7% of area***
- M2 – General Industrial – ***5% of area***
- A1 – Agricultural Activity – ***3% of area***

- ***55% of De Soto is zoned for residential uses***
- ***15% of De Soto is zoned for commercial uses***
- ***12% of De Soto is zoned for industrial uses***
- ***3% of De Soto is zoned agriculturally***

- ***15% of De Soto is occupied by the Right of Way.***

- ***The areas zoned along the Joachim are higher density allowances with greater impervious surface coverage contributing to adverse flooding effects.***



H3 STUDIO

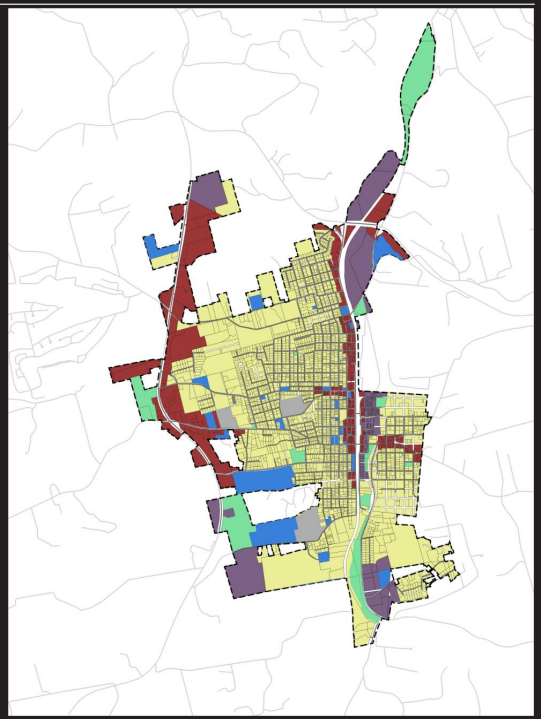
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Built Feature Characteristics

Land Use Classifications

- Residential Use – **50% of land**
- *Commercial Use – **13% of land***
- *Institutional/Civic Uses – **5% of land***
- *Parks, Recreation, and Agriculture – **7% of land***
  - *Agricultural Use – 3% of land*
  - *Parks and Recreation – 4% of land*
- *Industrial Uses – **10% of land***
- *Right of Way – **15% of land***

- ***De Soto is primarily a residential community.***





CITY ECONOMIC OVERVIEW

H3 STUDIO

COMPREHENSIVE CITY WIDE ASSESSMENT

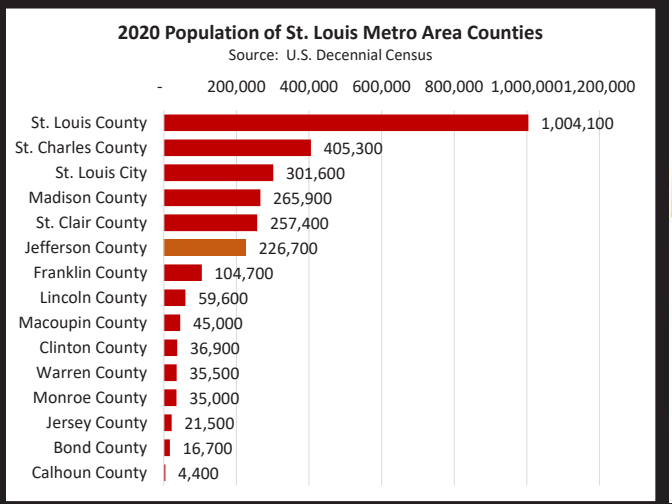
SAINT LOUIS UNIVERSITY COMMUNITY PLANNING LAB

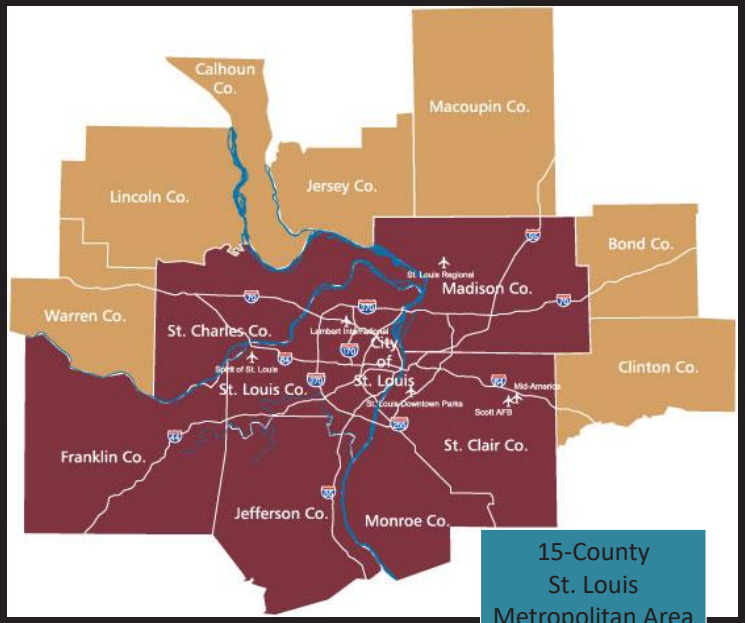
Flood Resiliency Plan

THE CITY OF DE SOTO, MO

Jefferson County & St. Louis Metro Area

With a 2020 population of 226,700, Jefferson County is the sixth most populated of the St. Louis metropolitan area's 15 counties.





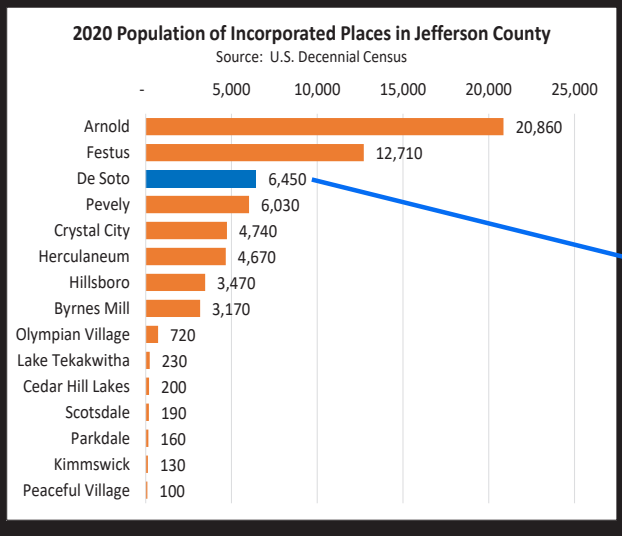
15-County St. Louis Metropolitan Area

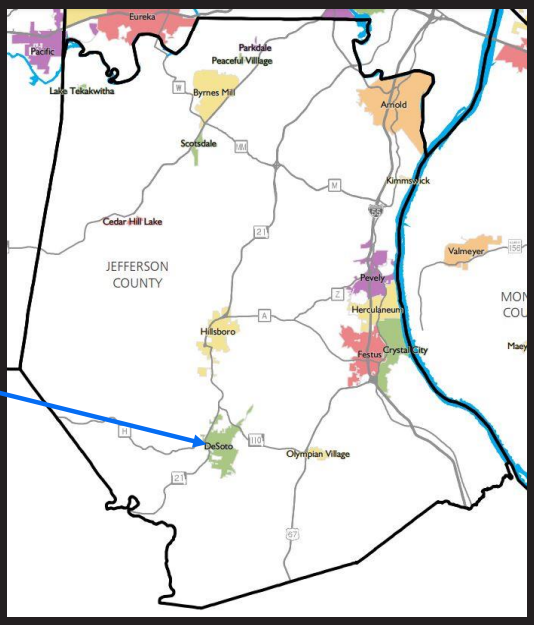
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THE CITY OF DE SOTO, MO

De Soto Population Within Jefferson County

With a 2020 population of 6,450, De Soto was the third most populated of Jefferson County's incorporated areas. Today it is the fourth with a population of 6,435.





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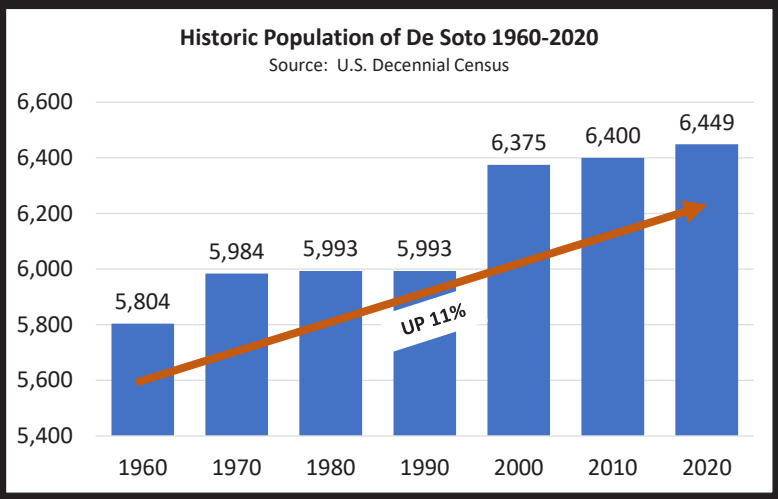
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THE CITY OF DE SOTO, MO

Population Trends in De Soto

De Soto's location was first settled by the Van Metre family in 1803. The city was formally incorporated in 1869 and today is a third class city in Missouri.

The population of De Soto was counted at 6,449 as of the 2020 Census, up 11 percent from 1960.

Meanwhile, Franklin County was no slouch. Its overall population increased by 242% from 1960 to 2020 (264% outside of De Soto). Festus, the second largest city in Jefferson County, added 81% more residents. Arnold, the county's largest city, was incorporated between 1970 and 1980, added just nine percent more residents between 1980 and 2020, but has more than three times the population of De Soto. De Soto grew almost eight percent between 1980 and 2020, while Festus grew 68 percent.



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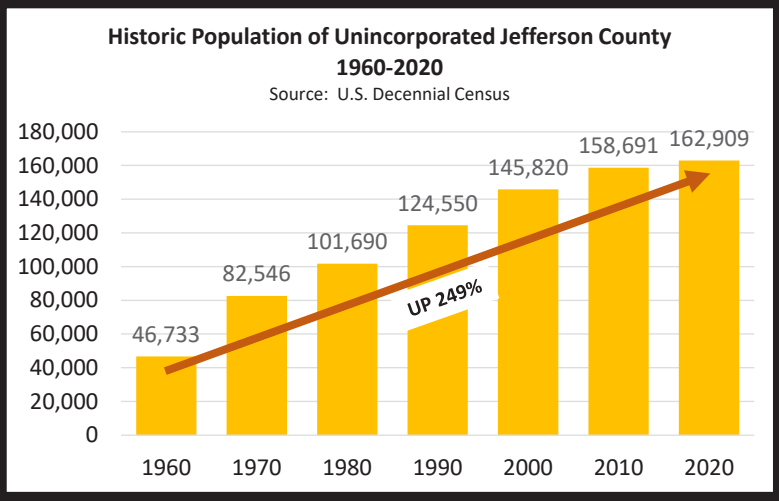
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THE CITY OF DE SOTO, MO

Population Trends in Unincorporated Jefferson County

While Jefferson County experienced 225 percent population growth between 1960 and 2020, the unincorporated portions of the county (that is, outside of the various cities) expanded 249 percent. Unfortunately, De Soto seems not to have shared in the growth, most of which has been in the northern part of the county.

Much of the growth in the incorporated cities and villages, of course, resulted from annexation of already-populated areas, so unincorporated growth is a substantial contributor to the county's residential expansion.

Meanwhile, the population of the 15-county metropolitan area increased only 25 percent from 1960 to 2020.



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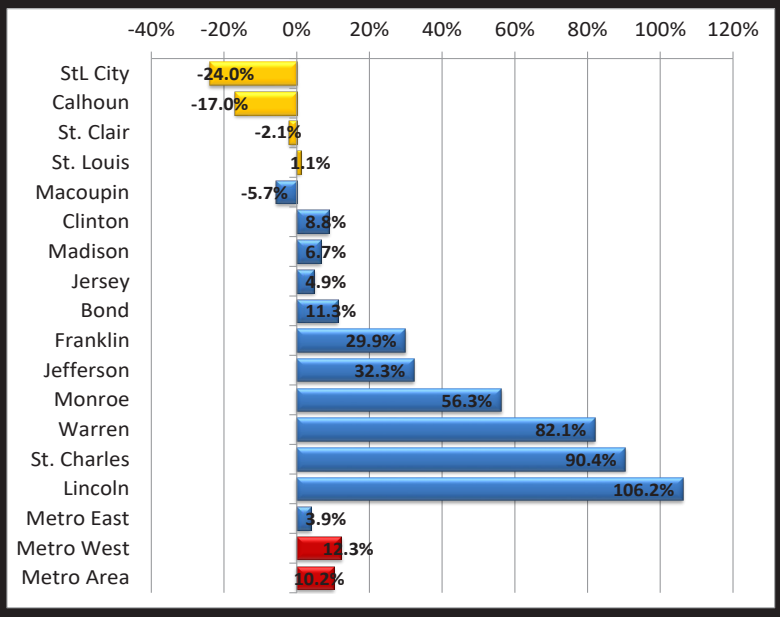
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THE CITY OF DE SOTO, MO

Population Trends 1990 to 2020, Metro Counties

More recent trends at the metropolitan county level show that Jefferson County added 32 percent more residents between 1990 and 2020, about the middle of the pack among the 15 counties. Lincoln County grew most rapidly at 106 percent (just over double) while St. Charles County almost doubled at 90 percent.

Four counties experienced net decline between 1990 and 2020: St. Louis City and Calhoun, St. Clair, and St. Louis Counties.

As a whole, the metro area added just over ten percent more residents in that 30-year period while the Missouri counties (Metro West) added 12 percent and the Illinois counties lost four percent,



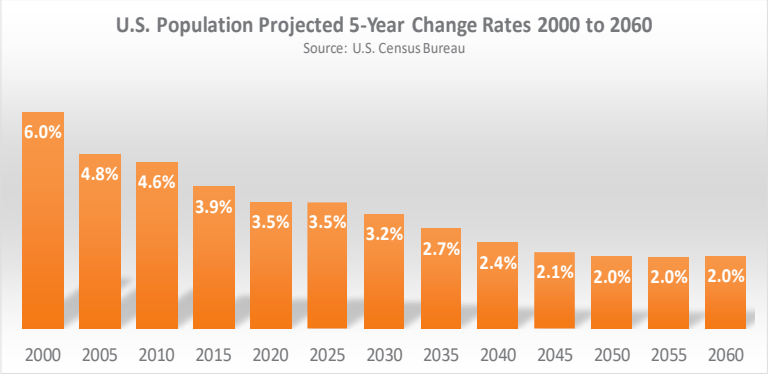
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THE CITY OF DE SOTO, MO

Rapid Drop In U.S. Growth Rates

While growth has been generally sluggish in the metro area, it is clear that there has been, effectively, movement of populations among the various counties. Since 1970, the metro area has grown about between one quarter and one third the rate of the United States as a whole.

But America is slowing down. Census Bureau projections of U.S. growth rates show unprecedented slowdowns coming. The 2010s was the slowest national growth decade since 1790 except the 1930s. It only gets slower based on Census projections to 2060. Jefferson County and De Soto will have to work extra hard to continue to attract more residents.



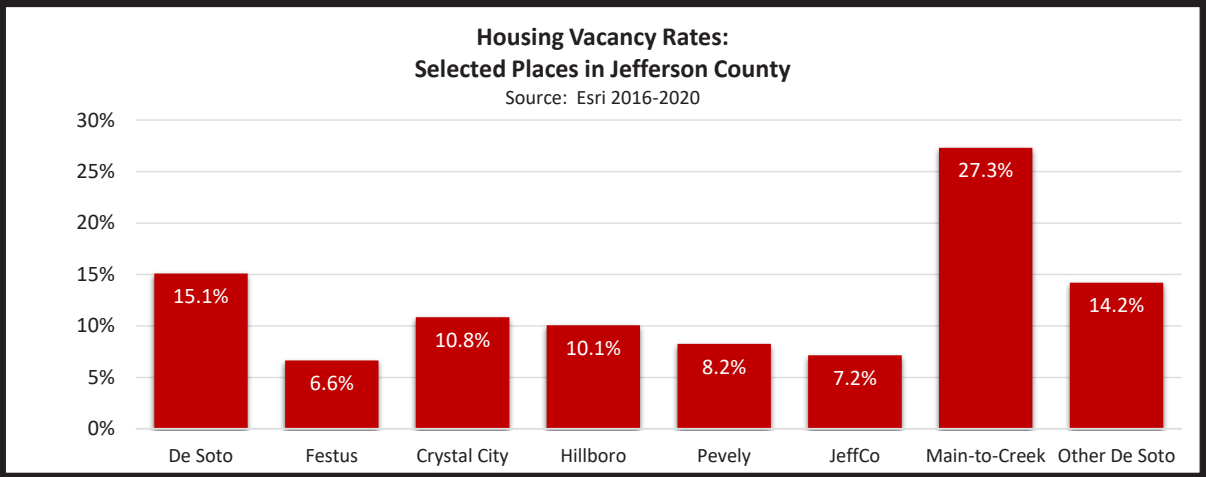
Note: The highest growth rates in U.S. history were the 1950s and 1990s, but national projections that combine both natural increase and net migration to the year 2060 show dramatically slower population expansion. Midwest metro areas and all rural areas are anticipated to have the greatest struggles to attract growth from this "smaller pie."

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THE CITY OF DE SOTO, MO

Housing Vacancy 2020

De Soto has a relatively high housing vacancy rate compared to several of its Jefferson County peers. The Main Street-to-Joachim Creek corridor has almost double the city's vacancy rate. There are an estimate 205 housing units in the study corridor, over a quarter of which are vacant, compared to about 14 percent vacant in the rest of the city. All of those rates are higher than in peer cities and the county as a whole.

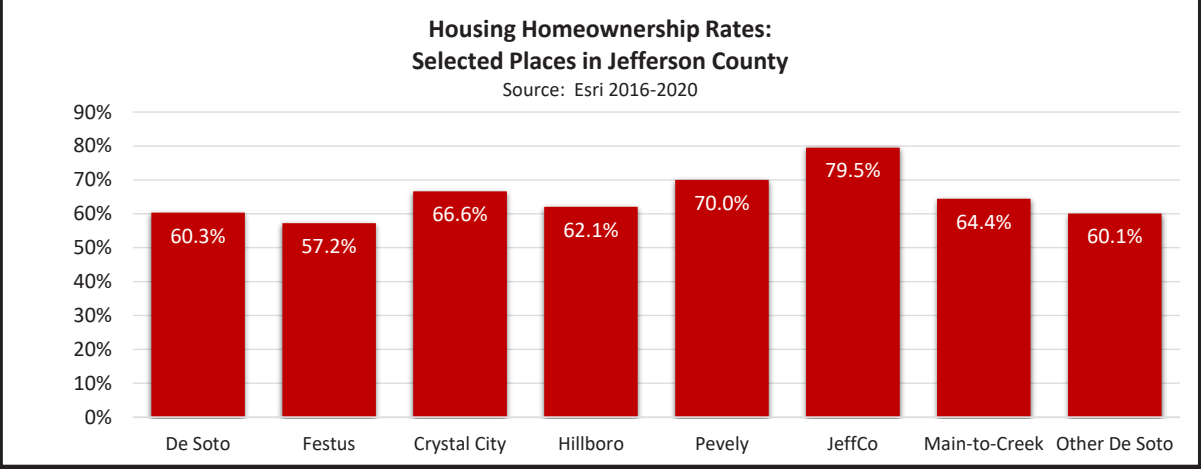


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THE CITY OF DE SOTO, MO

Homeownership Rates 2020

Despite high vacancy rates, De Soto—and even the Main-to-Creek corridor—has a strong homeownership rate. This measures the percent of housing units that are occupied by their owners, unlike dwelling units occupied by renters. In fact, the study corridor has a higher rate than the rest of the city. The county as a whole as a very high homeownership rate of almost 80 percent. . .the national average is about 66 percent.



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THE CITY OF DE SOTO, MO

Main Street to Joachim Creek Study Corridor

Data retrieved from various sources includes the accompanying self-defined corridor in De Soto. Estimates of socio-economic characteristics are based on this tentative geography, referenced often herein as "Main-to-Creek."



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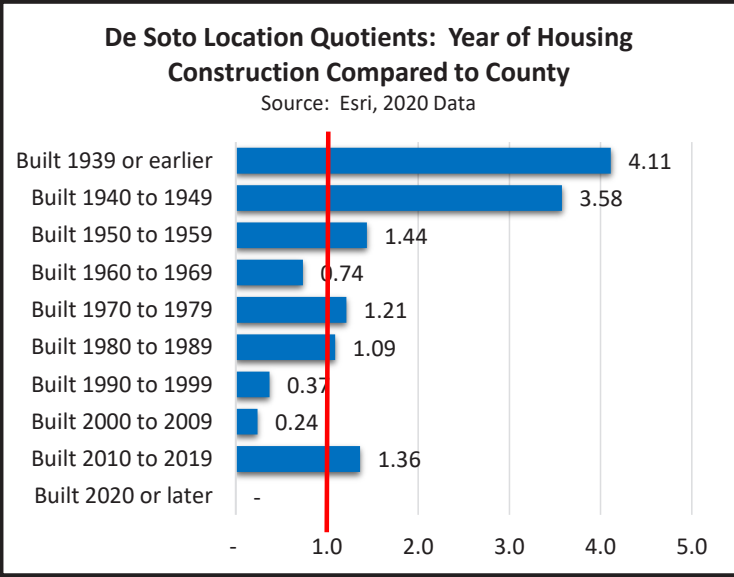
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Year Housing Built De Soto as of 2020

De Soto's housing stock is comparatively old when compared to all of Jefferson County, reflecting slower population growth. Measured against all of Jefferson County, De Soto's housing is dominated by structures built before 1960. The graph depicts the location quotient of the city within the county. A value of "1.0" means that the percent of housing in De Soto for that time period is the same as the county's percent. Higher LQs reflect higher shares than the county.

Four out of ten De Soto housing units (41.3%) were built before 1960, compared to 15.3% in the county and 27.0% in the entire U.S.A.

The median year built of all housing in De Soto is 1970, compared to 1984 in Jefferson County and 1977 for the entire country.



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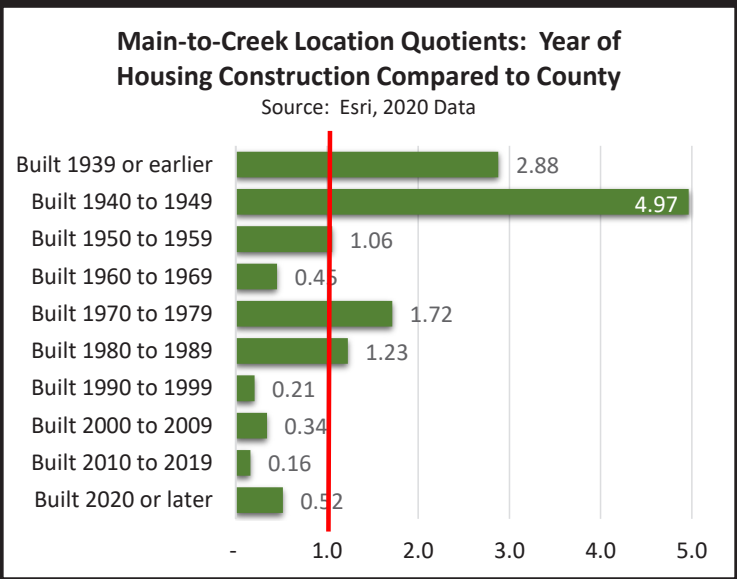
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THE CITY OF DE SOTO, MO

Year Housing Built : Main-to-Creek as of 2020

The Main-to-Creek corridor's housing stock is also comparatively old when compared the County, but slightly "younger" than in the rest of the city. The corridor's housing is dominated by structures built before 1950. The graph depicts the location quotient of the corridor within the county. A value of "1.0" means that the percent of housing in the corridor for that time period is the same as the county's percent. Higher LQs reflect higher shares than the county.

Almost four out of ten corridor housing units (37.6%) were built before 1960, compared to 15.3% in the county and 41.3% in De Soto as a whole.

The median year built of all housing in Main-to-Creek Corridor is 1973, compared to 1970 in De Soto and 1977 for the county.



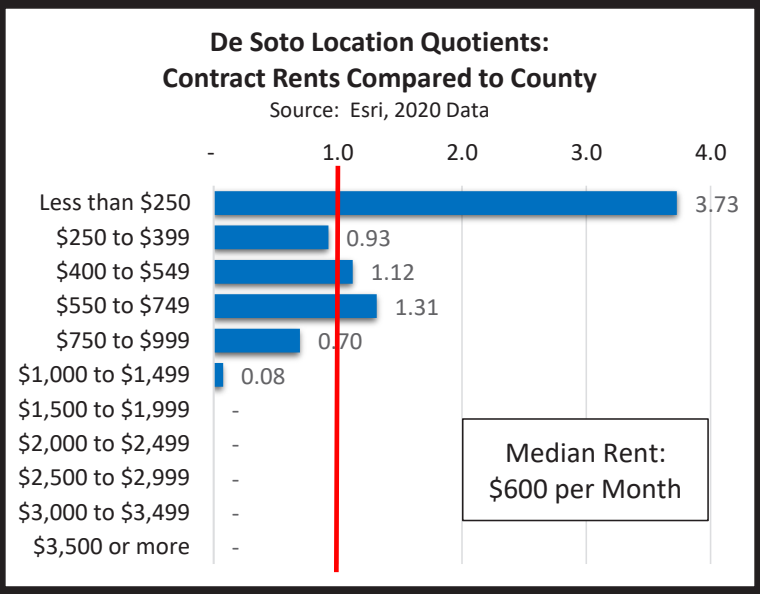
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THE CITY OF DE SOTO, MO

Contract Rent De Soto as of 2020

De Soto's contract rent for renter-occupied housing is comparatively low when compared to all of Jefferson County. Measured against the county, De Soto's rental housing, comprising one out of four occupied units, is actually dominated by monthly rents between $550 and $749, but the city has a much higher share of rents below $250 when compared to the county.

This keeps overall rents rather low, with a median of just $600 per month. Median rent in Jefferson County is $677, almost 13% higher than in De Soto. Moreover, De Soto's median is also lower than in the Main-to-Creek Corridor at $612.



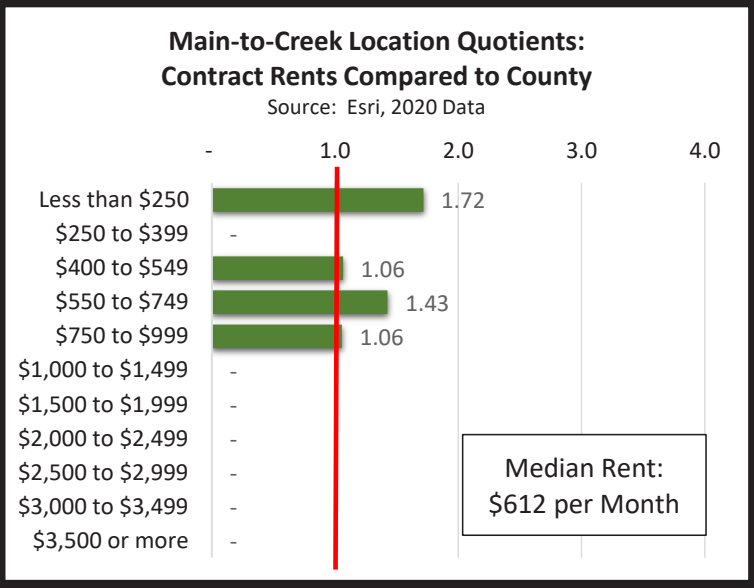
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THE CITY OF DE SOTO, MO

Contract Rent Main-to-Creek as of 2020

Rents in the Main-to-Creek study corridor are also comparatively low but the concentration is such that the median is higher at $612 per month than in the city of as a whole ($600).

Almost half (48.7%) of the units in the corridor that have contract rents fall between $550 and $749, about 43% higher than in the county as a whole. Still, the corridor has a substantially higher LQ for the "less than $250" category, which keeps the median rent at only about ten percent lower than throughout the county.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

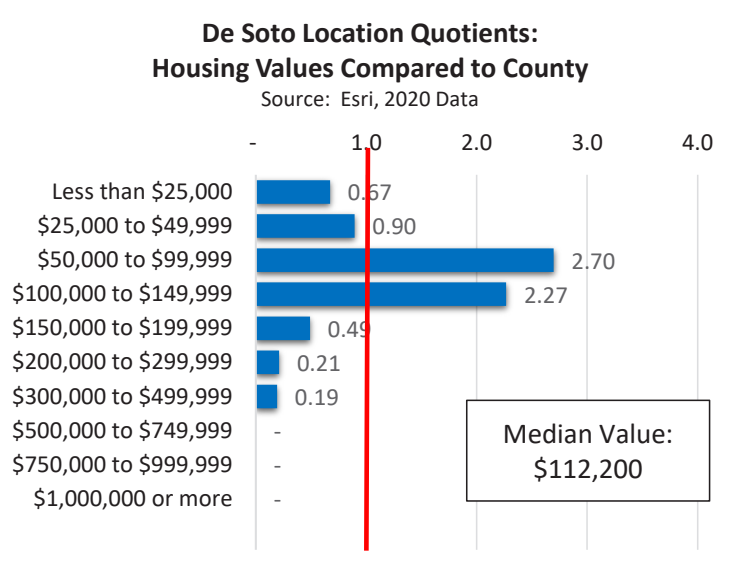
Housing Values De Soto as of 2020

De Soto has much higher shares of owner-occupied housing units that are valued between $50,000 and $150,000 than in Jefferson County as a whole. Location quotients in these two value ranges significantly exceed 2.0 while all other LQs fall below 1.0.

Three quarters (75.0%) of all owner-occupied housing in the city falls into that $50,000 to $150,000 range, compared to less than a third in the county.

This keeps the median value relatively low in De Soto at about $112,200, about two thirds of the county's median of $167,700.

The city has no housing with values exceeding a half million dollars, while the rest of Jefferson County has almost 1,300 in this range.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

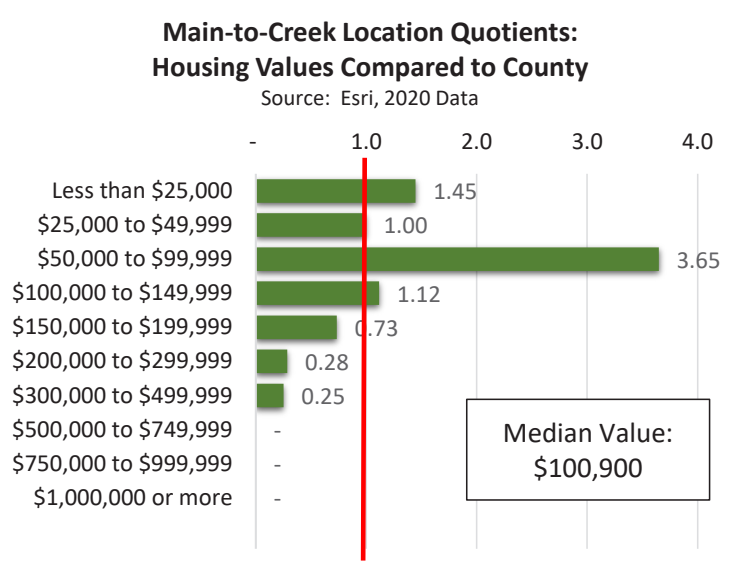
Housing Values Main-to-Creek as of 2020

The median is markedly lower in the Main Street to Joachim Creek corridor at $100,900, some ten percent less than throughout De Soto and just 60 percent of the county median.

Four out of ten (39.2%) of the 96 owner-occupied housing units in the Main-to-Creek corridor fall in the value range of $50,000 to $100,000. This percent is 3.65 times the percentage for the entire county in this value range.

Almost another quarter (22.7%) of the corridors owner-occupied units fall in the $100,000 to $150,000 range.

The corridor has no units with values exceeding a half million dollars.



SAINT LOUIS UNIVERSITY COMMUNITY PLANNING LAB

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Aggregate Housing Values as of 2020

The average housing value for the 96 units that are recorded as having values in the Main Street to Joachim Creek corridor is estimated by Esri to have been $114,200 in 2020, considerably higher than the median of $100,900. This suggests that the corridor has a few more highly valued housing units which increases the average over the median.

An average of $114,200 indicates that the overall value of the 96 housing units is approximately $11 million. In 2023, given inflation of the intervening three years, that aggregate value is probably closer to $12.7 million, or an average of $132,300.

On a topside assumption that all other housing units in the corridor have the same market value (that is, those that are presently occupied by renters plus those that are vacant), the aggregate value of all housing in the Main-to-Creek corridor is about $27 million.





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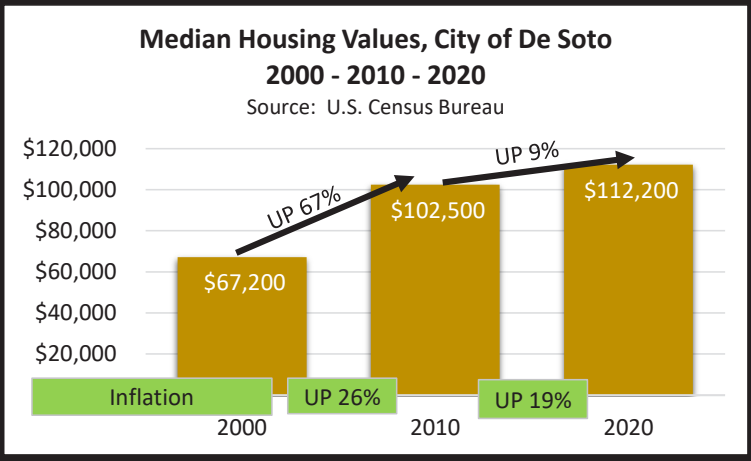
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Median Housing Value

The median value of owner-occupied housing in the city of De Soto increased from $67,200 in the year 2000 (Census data) to $102,500 in 2010 and $112,200 in 2020.

Median value increases strongly exceeded the rate of inflation between 2000 and 2010. The median value in De Soto increased by 67% while inflation advanced only 26%.

Fortunes reverse in the subsequent decade. The median value of homes in De Soto grew just nine percent over ten years but inflation was roughly double that.



Reminder: Median value means that half of the housing units have values above that number and half have values below the median. The median is not the average.

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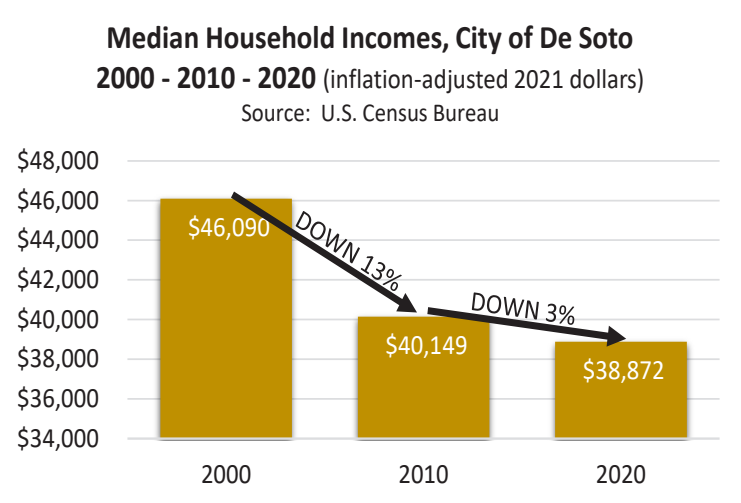
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Median Household Income (inflation-adjusted)

Probably a major contributing factor to the relatively slow increase in median housing value between 2010 and 2020 was a three percent net decline in median household income in De Soto during that time—even accounting for inflation.

But median household incomes decreased even more rapidly between 2000 and 2010. The inflation-adjusted median income in De Soto decreased by 13% in that decade.

Reduced household incomes, overall, contributes to an inability to afford higher prices or rents in the housing market. This results in depressed prices and rents as the market adjusts over time.



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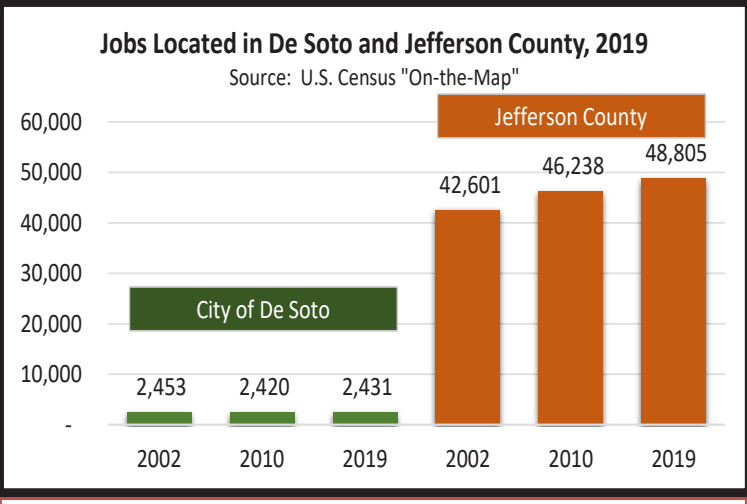
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Jobs in De Soto and Jefferson County

The Census Bureau's "On-the-Map" data series shows 2,431 jobs located in De Soto as of calendar year 2019, the latest year for this data series. Unfortunately, this "city data" excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.

There has been virtually no growth in jobs in the city since 2002, the beginning of this data series.

Meanwhile, Jefferson County added about 6,200 jobs, up 14.6%. This pace outperformed the 8.8% growth in metropolitan area jobs.



Note: These numbers are almost certainly an undercount based on how the data are compiled, but the proportion of jobs by economic sector is quite valid. The data rely on jobs where the addresses of both the workers and their employers are known, so it is mostly payroll-based and not accounting for as many as 20% additional kinds of jobs.

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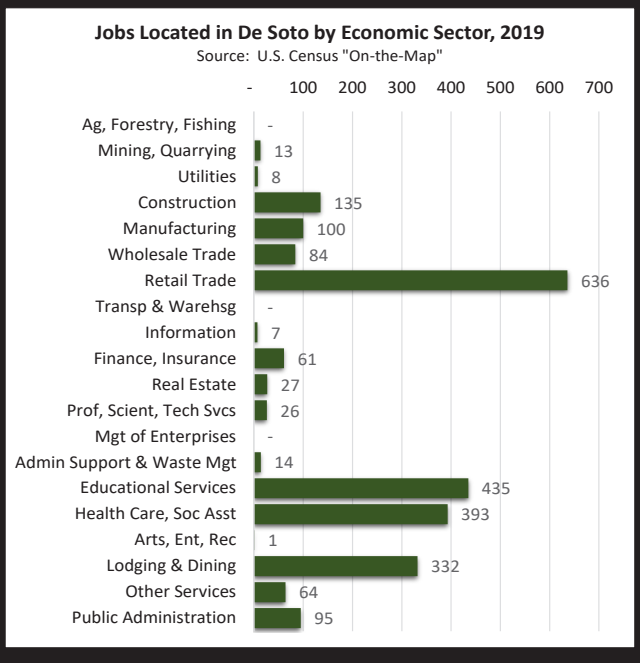
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Jobs by Economic Sector in De Soto, 2019

De Soto's largest job sector is retail trade where over a quarter (26%) of all jobs are found. Unfortunately, this "city data" as provided by the U.S. Census Bureau excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.

De Soto also has a relatively high number of educational service jobs (18% of all jobs), health care and social assistance (16%), and lodging and dining (14%).

De Soto captured 5.8% of all Jefferson County jobs in 2002 but this dropped to 5.0% by 2019 given the county's growth and De Soto's stability.



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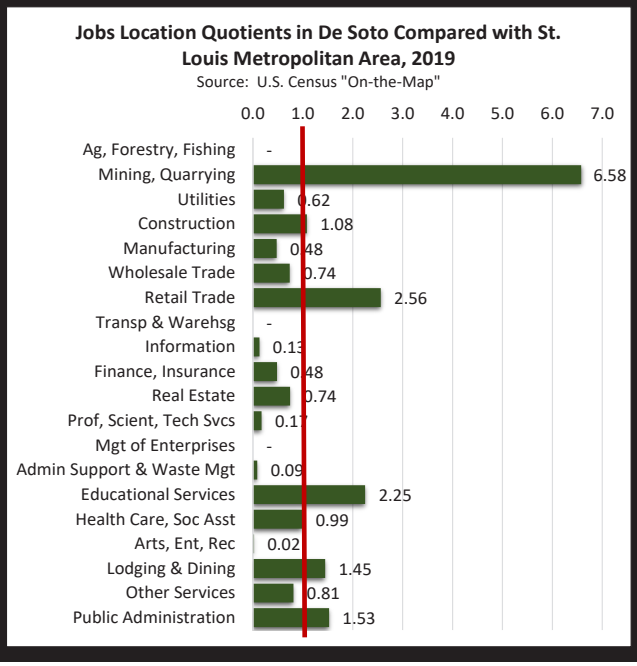
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Jobs Location Quotients in De Soto, 2019

De Soto's largest job sector is retail trade where over a quarter (26%) of all jobs are found. Unfortunately, this "city data" as provided by the U.S. Census Bureau excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.

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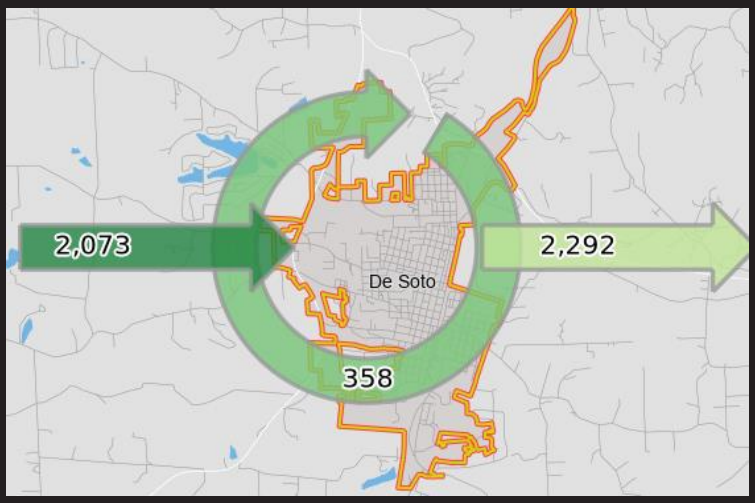
Flood Resiliency Plan
THE CITY OF DE SOTO, MO

De Soto Commuting Patterns, 2019

De Soto is a "net bedroom community." More residents leave the city for jobs elsewhere than commute into the city for jobs. But the differences in commuting aren't particularly large. Almost 2,300 De Soto residents commuted to jobs in other places in 2019. They were not quite replaced by almost 2,100 in-commuters taking jobs in De Soto (again excluding jobs at Union Pacific).

Using these data, there were 2,431 jobs in the city in 2019. Of these jobs in De Soto, 358 were held by De Soto residents (15%) while 2,073 were held by outsiders (85%). The "daytime" population of De Soto was smaller than its "nighttime" population.

This imbalance is more pronounced for the entire county. About 82,700 JeffCo residents left the county for jobs in 2019 on an average day, compared to 23,200 commuting into the county from other places. But 25,600 JeffCo residents stayed within the county for their jobs.



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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

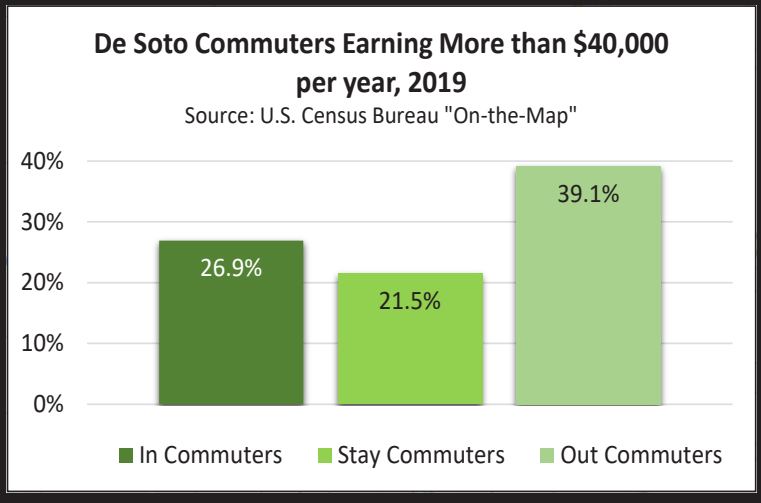
Earnings of De Soto Commuters

Out-commuters from De Soto brought home higher earnings in 2019, on average, than those who work in De Soto.

Almost four in ten (39.1%) out-commuters earned more than $40,000 per year from their jobs, the highest of three earning categories of this Census Bureau database.

Just over a quarter (26.9%) of the people commuting into De Soto for jobs earned over $40,000, while only about a fifth (21.5%) of those who both live and work in De Soto earned that much.

In short, jobs in De Soto are relatively low-paying (again, excluding the UP jobs) while De Soto residents who live elsewhere bring home higher incomes from their jobs.



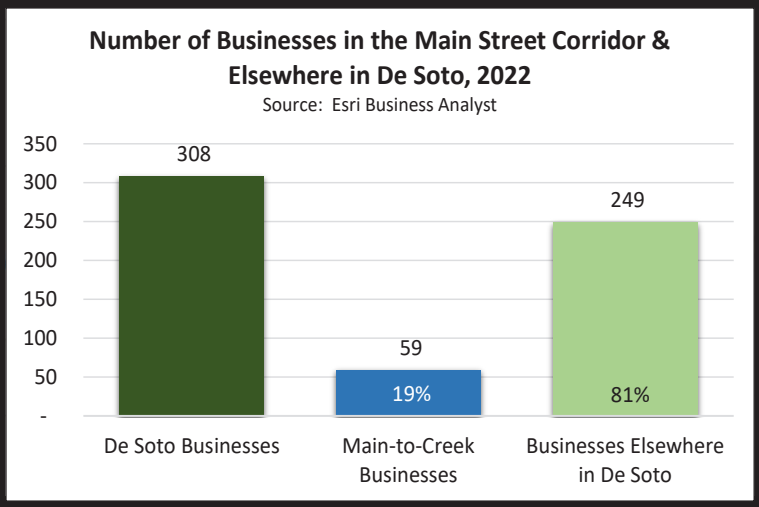
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Number of Businesses

Esri Business Analyst estimates that there are 308 business establishments in the city of De Soto. This excludes, of course, Union Pacific which is located outside the city limits. It does include, however, public or governmental establishments like city hall and the library. (There are 12 such public establishments in De Soto, four of which are in the Main Street-to-Joachim Creek corridor.

Of the 308 businesses throughout the city, 59, or 19 percent, are located in the Main Street-to-Joachim Creek Corridor. The rest of the city contains the other 249 businesses, or 81 percent.



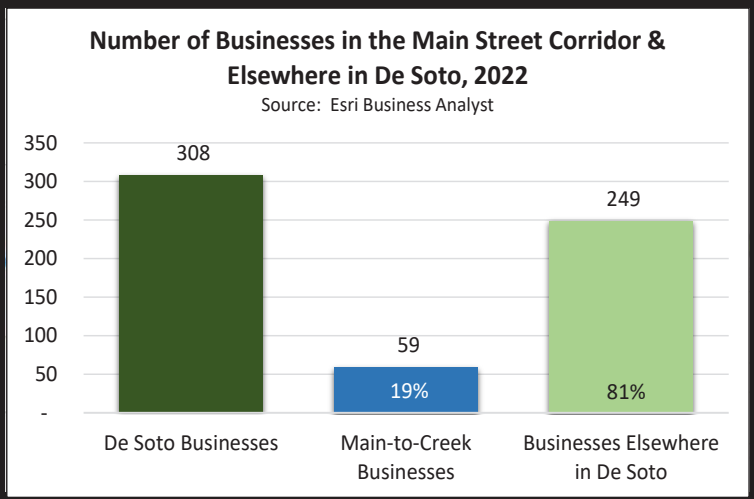
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Number of Employees

Esri Business Analyst estimates that there are 3,066 employees in the 308 business establishments in the city of De Soto. Again, this excludes Union Pacific.

Of those 3,066 employees, 382, or 12 percent, work in the Main Street-to-Joachim Creek Corridor. The rest of the city contains the other 2,684 employees, or 88 percent.



NOTE: The employee count for De Soto presented here (3,066) is less than presented earlier (2,431) by about 20 percent. See explanation on the next page.

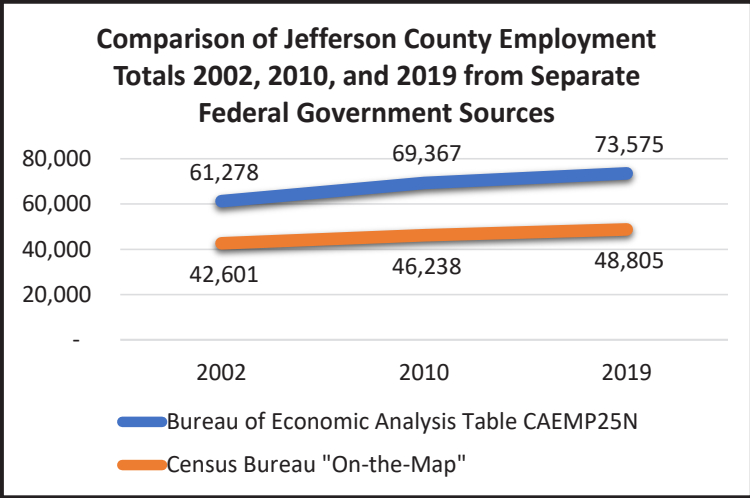
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THE CITY OF DE SOTO, MO

Note on Different Sources of Employment Data

The employee count for De Soto presented above (3,066) is less than presented earlier (2,431) by about 20 percent. This is primarily due to differences in sources of data. The U.S. Census Bureau (2,431) uses a database that matches addresses of workers to the addresses of their employment. Thus, it necessarily excludes workers where such data does not exist, but it does enable estimates of jobs in cities, unlike other sources which are limited to county-level data.

Esri estimates employees based on a broader perspective which is consistent with the county-level data produced by the U.S. Bureau of Economic Analysis. Note here for Jefferson County as a whole that Census estimates are between 66% and 70% of the BEA estimates.



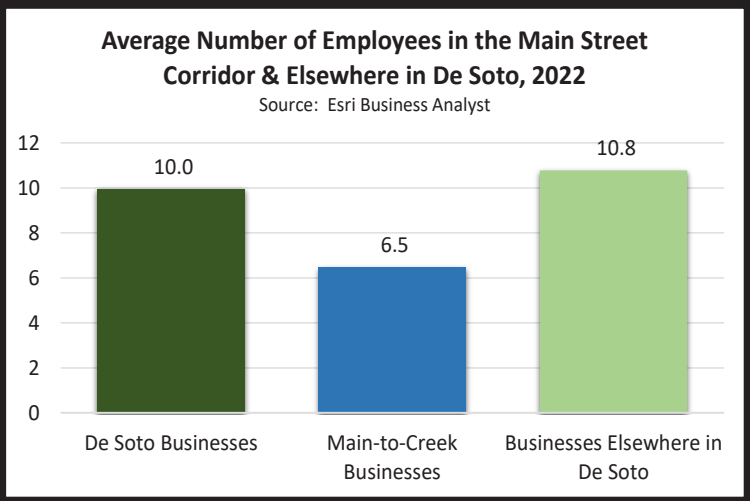
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THE CITY OF DE SOTO, MO

Average Number of Employees per Business

The average business in the Main-to-Creek corridor is considerably smaller than elsewhere in the city.

The average business in the Main-to-Creek corridor has 6.5 employees, about 60 percent the size of the average business elsewhere in the city where the typical business as 10.8 employees.



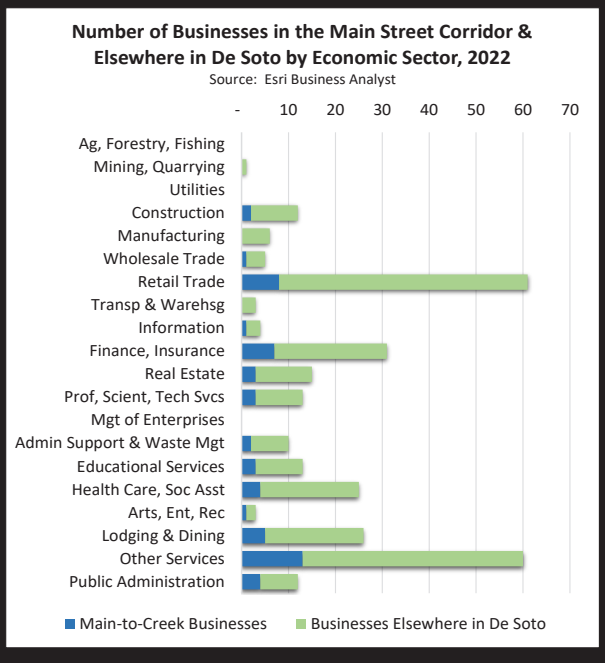
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Number of Businesses by Economic Sector

De Soto has no businesses in three of 20 sectors tracked by Esri, and the Main-to-Creek Corridor has no businesses in six of those sectors. Still, the downtown/Main Street area has business establishments in 14 of the 17 sectors represented in the entire city, suggesting that economic conditions in the downtown area are relatively robust.

Again, this excludes the Union Pacific operations, but employment there certainly contributes to the support of some Main-to-Creek businesses.



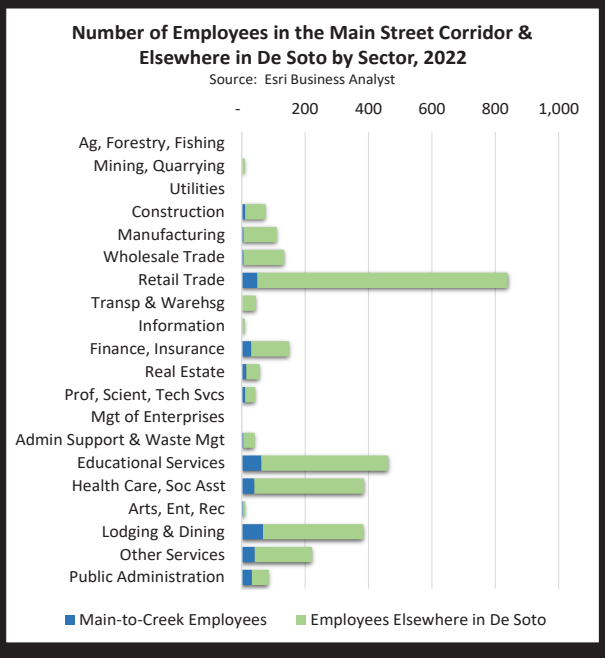
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Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Number of Employees by Economic Sector

The Main-to-Creek Corridor averages between 2.0 and 20.7 employees per business establishment. Highest averages are found in the education services (20.7) and lodging & dining (13.4). Esri counts five dining establishments in the corridor and no lodging establishments. It also counts three educational services establishments totaling 62 employees.

The rest of De Soto averages between 2.7 and 40.0 employees per business establishment, higher than in the Main-to-Creek Corridor. Like Main-to-Creek, the largest establishments in the rest of the city are in the educational services sector (e.g., schools). Wholesale trade businesses average 32.0 employees in the rest of the city followed by manufacturing at 17.5 per business.





KEY CONCLUSIONS SUMMARY

H3 STUDIO

COMPREHENSIVE CITY WIDE ASSESSMENT

H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Conclusions Summary

Key Conclusions at the Watershed Level

- De Soto is founded on the low points of the Upper Joachim Watershed and is susceptible to increased flooding and effects of runoff.
- Nearly 65% of the Joachim Creek Watershed drains into De Soto while the other 35% actively runs through the city.
- The Rocky Nature of The Upper Joachim Watershed makes water absorption challenging and creates dangerous flow, depth, and velocity conditions in the creek.
- Water quality is highly monitored in Jefferson County due to residual contamination from mining upstream of several creeks and streams in the Watershed.
- Unregulated dams in the county which lack appropriate maintenance and inspection parameters present a critical threat to the downstream De Soto community if they were to fail.
- 1,365 acres of upstream development in the county poses a threat to dam stability and creek levels during high precipitation events due to increased runoff & decreased permeability.

H3 STUDIO

Flood Resiliency Plan
THE CITY OF DE SOTO, MO

Conclusions Summary

Key Conclusions at the City Level

- During heavy precipitation events upstream debris and contamination is carried downstream through De Soto contributing to piled up, debris filled, blocked channels which inhibit the flow of water.
- Tributary banks are low, narrow, and poorly maintained with narrow culverts at major crossings increasing the chances of overflow and backup into the neighborhoods.
- Runoff from steep bluffs makes its way to the Joachim Creek down main roads with low absorption contributing to the overall flooding condition of the city which is exacerbated by outdated stormwater systems and increased backup.
- The bluffs and berms contain the flood to the valley but create narrow waterways and constriction points increasing localized water velocity in the Joachim Creek and its most vulnerable neighborhoods. The community sees water speeds up to 18ft/sec and areas as deep as 9-11 ft below water.
- Increased upstream development will increase the need for De Soto to manage runoff and hold water as not to overwhelm the open channels and intensify flooding.
- Key emergency city routes are affected by the flood plain making De Soto challenging to navigate during a flood event after certain gauge levels.
- Most people of affected in the flood plain are low income residents with little to no capital for repairs, flood proofing, and elevation strategies.
- De Soto has an out of date housing stock with little ability to withstand repetitive flooding events.

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C

Vulnerability Assessment

APPENDIX C: VULNERABILITY RISK ASSESSMENT



CITY OF DESOTO

COMMUNITY DEVELOPMENT BLOCK GRANT MITIGATION PLANNING PROJECT

H3 STUDIO

VULNERABILITY RISK ASSESSMENT

JANUARY 14TH 2023

H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

DeSoto Mitigation Planning Project

Table of Contents:

Vulnerability Risk Assessment

- Executive Summary
- Exposure Analysis
- Physical Vulnerabilities
- Non Physical Vulnerabilities
- Social Vulnerabilities
- Natural Environment Vulnerabilities



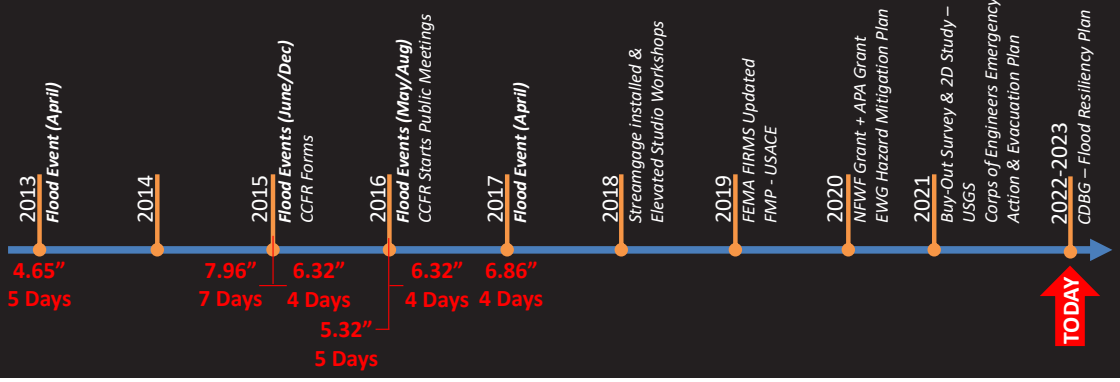
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FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

DeSoto Mitigation Planning Project

Timeline
Flash Flood events have increased in frequency and intensity. DeSoto experienced 6 flood events in a 5 year period (from 2013 to 2017). Much work has been done to prepare DeSoto for future resiliency to flooding. Thus, our work builds upon the previous efforts outlined below.

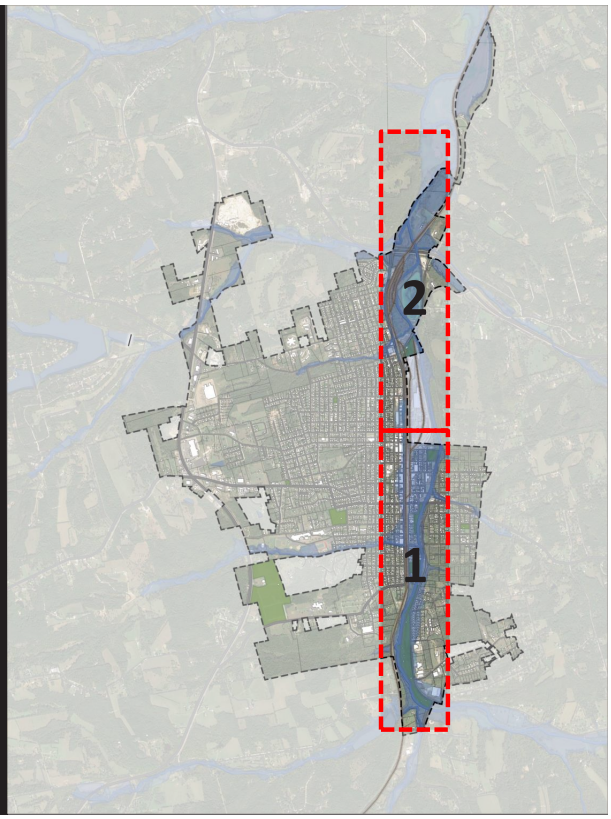
For Reference:
500-year (24-hour storm) is 9.91" rainfall
100-year (24-hour storm) is 7.43" rainfall
Note: Multi-day rain events have a similar impact to a 24-hour storm when there is no additional storage capacity underground or ability to absorb.



H3 STUDIO

Summary:

- Subarea 1 South of Easton St.
  - Subarea 1 categorizes the land south of the Union Pacific Railyard to the Southern Edge of Walther Park at the Highway E bridge. It includes the historic Main St. of Desoto and the most impacted neighborhoods in the area as well as commercial development along Veterans Blvd.
- Subarea 2 North of Easton St.
  - Subarea 2 encompasses the Union Pacific Railroad and the land North of it which is primarily open/agricultural land with limited commercial and residential developments.





EXPOSURE ANALYSIS

H3 STUDIO

VULNERABILITY RISK ASSESSMENT

OCTOBER 12TH 2022

H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- Four parks are located in this area
- The railroad runs almost parallel to the creek as does De Soto Main St.
- The rail line is built as a levee south of Main St.



Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information

H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- Four parks are located in this area
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- The rail line is built as a levee south of Main St.
- The bluffs around the creek carve out a shallow valley



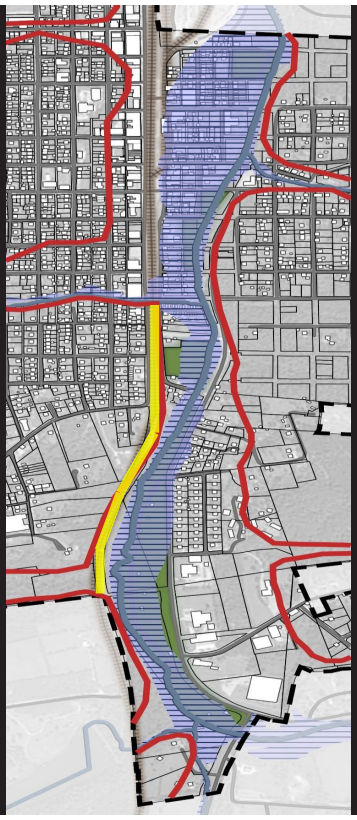
Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information

H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- Four parks are located in this area
- The railroad runs almost parallel to the creek as does De Soto Main St.
- The rail line is built as a levee south of Main St.
- The bluffs around the creek carve out a shallow valley
- Floodway
  - Includes several area parks, homes and businesses.



Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information

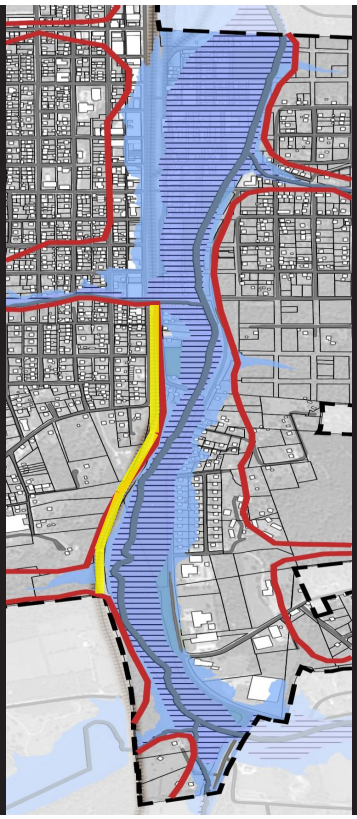
H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- Four parks are located in this area
- The railroad runs almost parallel to the creek as does De Soto Main St.
- The rail line is built as a levee south of Main St.
- The bluffs around the creek carve out a shallow valley
- Floodway
- 100 year flood plain
  - Begins to affect Main Street Business and the railroad

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



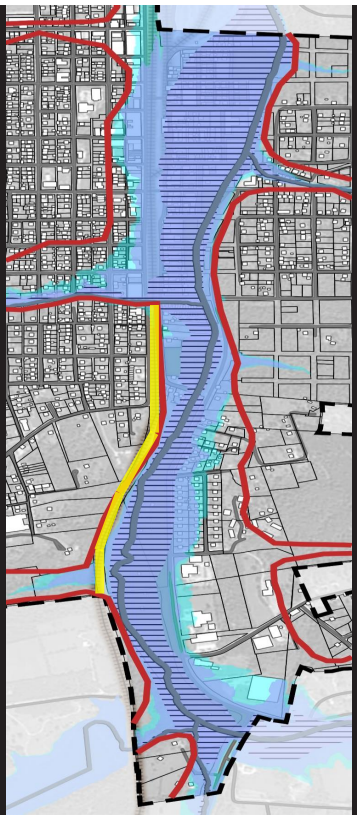
H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

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- The railroad runs almost parallel to the creek as does De Soto Main St.
- The rail line is built as a levee south of Main St.
- The bluffs around the creek carve out a shallow valley
- Floodway
- 100 year flood plain
- 500 year flood plain
  - Flows further into Main Street up to 2nd St and increases the backflow of tributaries like the East Tributary, County Tributary, and Tanyard Branch.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



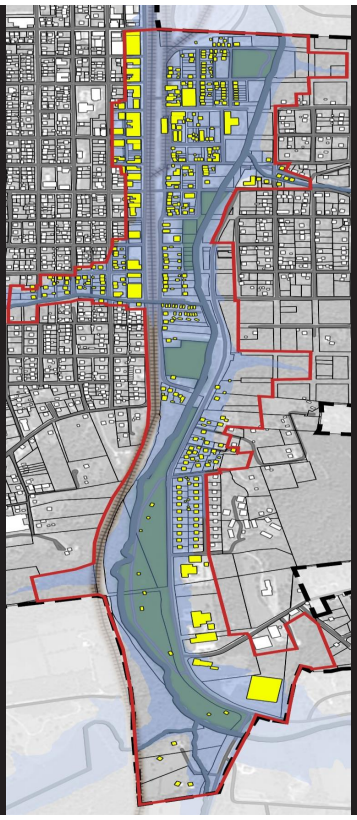
H3 STUDIO

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- The bluffs around the creek carve out a shallow valley
- Floodway
- 100 year flood plain
- 500 year flood plain
- The total floodplain area affects hundreds of structures inclusive of industrial, commercial, and residential uses alike.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



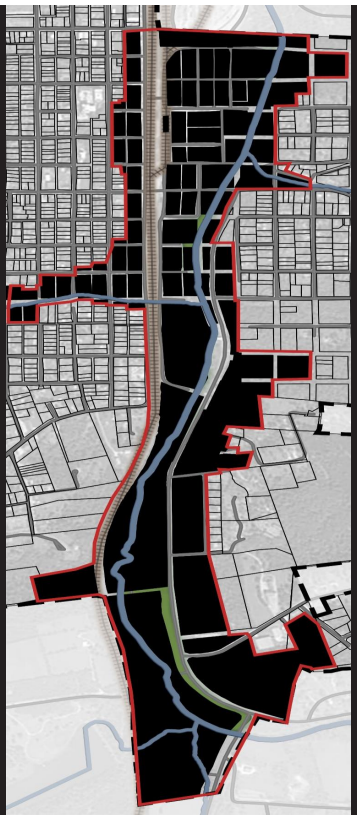
H3 STUDIO

South of Easton St. Sub Area

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- The rail line is built as a levee south of Main St.
- The bluffs around the creek carve out a shallow valley
- Floodway
- 100 year flood plain
- 500 year flood plain
- The total floodplain area affects hundreds of structures inclusive of industrial, commercial, and residential uses alike.
- It encompasses 217 acres of land and 350 individual parcels
- The total appraisal of land and buildings for this subarea is $23,203,670

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



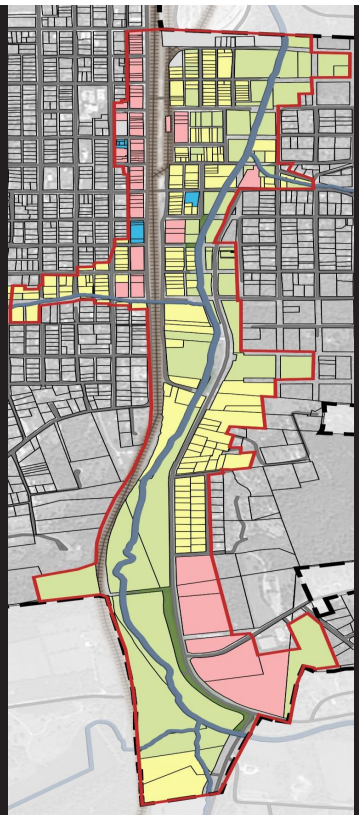
H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- The land is composed of:
  - 48% (106 acres) Vacant/Agricultural Land
  - 31% (67 acres) Residential development
  - 17% (38 acres) Commercial Development
  - 3% (5 acres) land dedicated to utilities and services
  - 1% (1 acres) Civic

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



H3 STUDIO

South of Easton St. Sub Area

Vulnerability Risk Assessment

- The land is composed of:
  - 48% (106 acres) Vacant/Agricultural Land
  - 31% (67 acres) Residential development
  - 17% (38 acres) Commercial Development
  - 3% (5 acres) land dedicated to utilities and services
  - 1% (1 acres) Civic

- The city of De Soto owns 22% of the land in the floodplain which equates 30 parcels (49 acres).
  - The majority of this land is classified as vacant/agricultural land and is primarily park space including:
    - 1. Walther Park
    - 2. Hopson Field
    - 3. Joachim Park
    - 4. Richter Park.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.
- Floodway
  - Constricted at the railyard affects primarily agricultural/vacant land and part of the railroad line.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.

- Floodway
- 100 year flood plain
  - Affects several businesses along Northern Main St. and along the County Branch Tributary.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



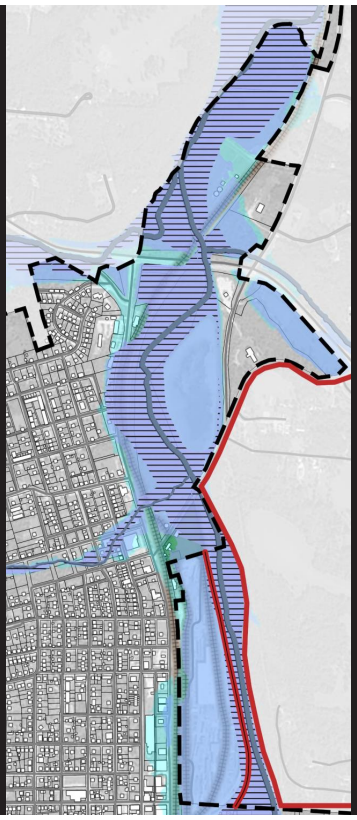
H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.
- Floodway
- 100 year flood plain
- 500 year floodplain
  - Affects the water treatment facility and flows into more businesses on Main Street.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



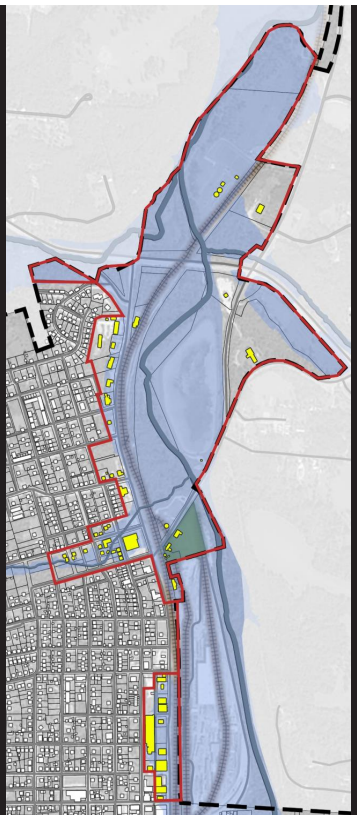
H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.
- Floodway
- 100 year flood plain
- 500 year floodplain
- The total floodplain area affects a mix of residential, commercial, and industrial structures including railroad tracks.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



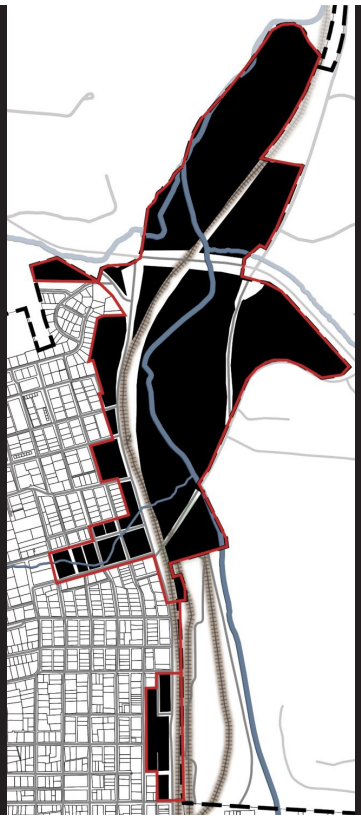
H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- One park exists in this area – The Railroad Workers Memorial
- Union Pacific Rail line runs parallel to main street and the repair shed lies between Main Street and The Joachim Creek on County Land.
- Union Pacific built a levee on the right side of their property across from a high bluff creating a constriction point of flow for the creek.
- Floodway
- 100 year flood plain
- 500 year floodplain
- The total floodplain area affects a mix of residential, commercial, and industrial structures including railroad tracks.
- It encompasses 200 acres of land and 67 individual parcels
- The total appraisal of land in this area is $7,624,800

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



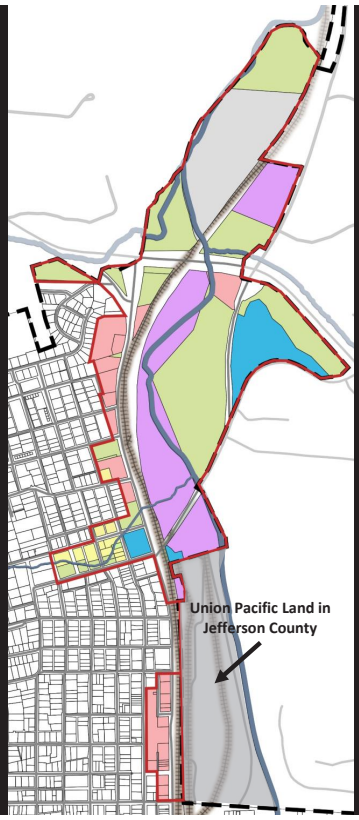
H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

- The land is composed of:
  - 40% (80 acres) of vacant/agricultural land
  - 23% (47 acres) of industrial land
  - 16% (32 acres) of land dedicated to utility
  - 11% (21 acres) of commercial use
  - 8% (16 acres) of civic uses
  - 2% (4 acres) of residential uses
- While the railroad owns some property within the City of DeSoto, the majority of their land and operations lie outside of the City in Jefferson County.

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information



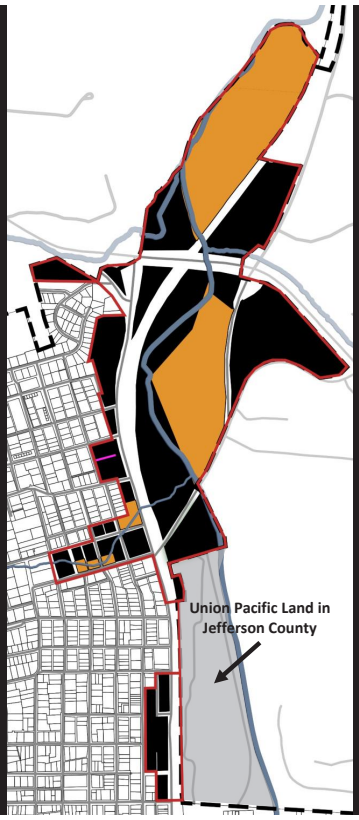
H3 STUDIO

North of Easton St. Sub Area

Vulnerability Risk Assessment

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  - 16% (32 acres) of land dedicated to utility
  - 11% (21 acres) of commercial use
  - 8% (16 acres) of civic uses
  - 2% (4 acres) of residential uses
- While the railroad owns some property within the City of DeSoto, the majority of their land and operations lie outside of the City in Jefferson County.
- Jefferson County owns 1 parcel
- The City of De Soto owns 62% of land in this flood subarea which equates 9 parcels or 126 acres
- The majority of the city land is classified vacant/agricultural or utility

Data acquired from Jefferson County Assessor Property Information and Desoto GIS Information





PHYSICAL VULNERABILITIES

H3 STUDIO

VULNERABILITY RISK ASSESSMENT

OCTOBER 12TH 2022

H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

Physical Vulnerabilities

Vulnerability Risk Assessment

- Rainfall & Creek Levels
- Joachim Creek at DeSoto USGS stream gauge (station 07019500) was installed July 2018.

- According to the National Weather Service:
- 8 feet – "action stage" or near bank full stage. This is the level that triggers evacuation.
- 10 ft – flood stage
- 13 ft – major flood stage
- 17 ft – flood stage approx. to 0.2-percent AEP flow.



Data acquired from USGS Water Data and Flood Inundation Mapper

H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

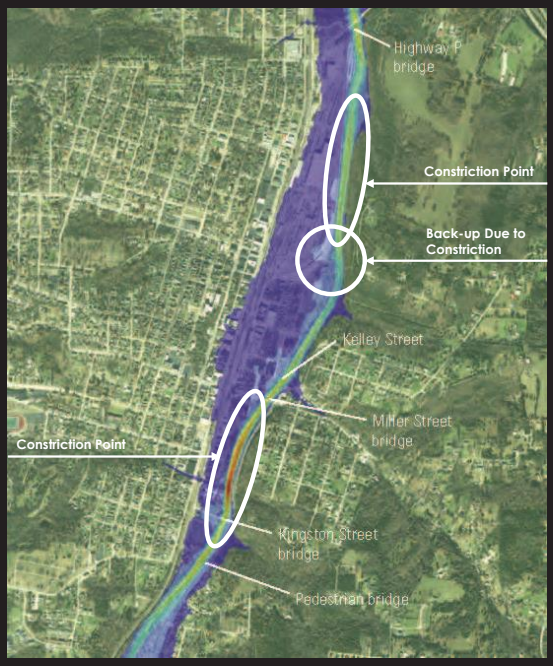
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- The flooding conditions are enhanced by three constriction points along the path of the Joachim Creek which increases overall velocity and depth of the water flow affecting a greater number of physical infrastructures.



Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

H3 STUDIO

Physical Vulnerabilities

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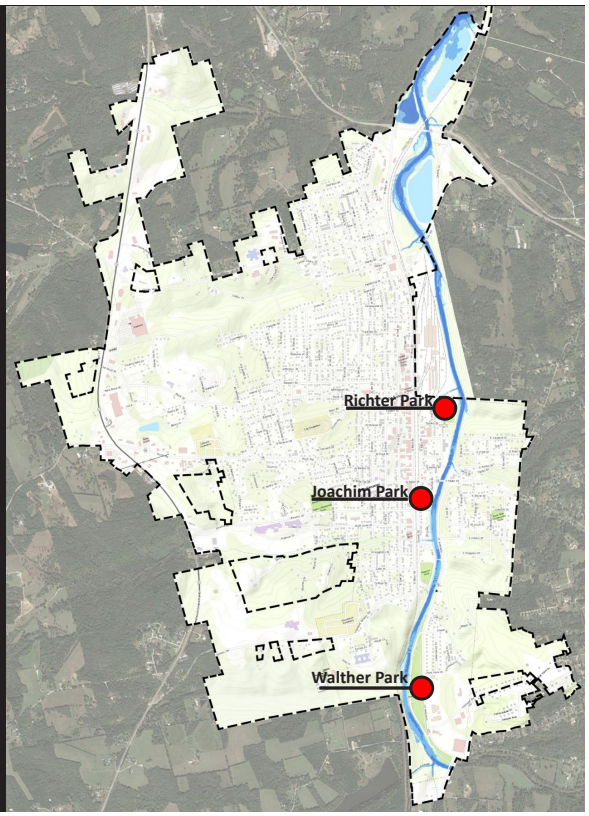
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H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **8 ft. gauge**
  - At 8 ft gauge Walther, Richter, and Joachim Park begin taking on water inhibiting access and use.



Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

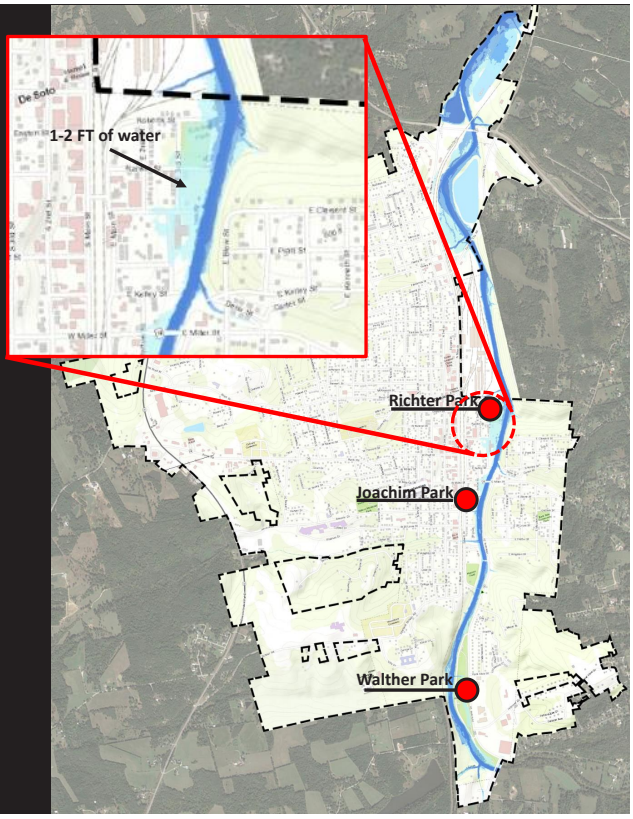
H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **8 ft. gauge**
  - At 8 ft gauge Walther, Richter, and Joachim Park begin taking on water inhibiting access and use.
- **9 ft. gauge**
- **10 ft. gauge**
  - Historic De Soto South of Richter Park begins taking on water.
  - Residential properties begin flooding.

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study



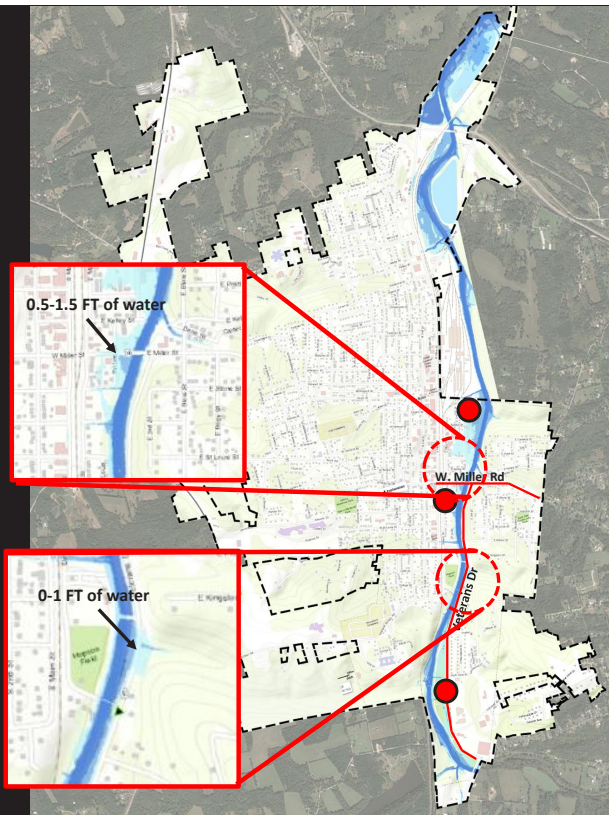
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  - Residential properties begin flooding.
- **11 ft. gauge**
  - Veterans Rd. and West Miller Rd. begin taking on water

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study



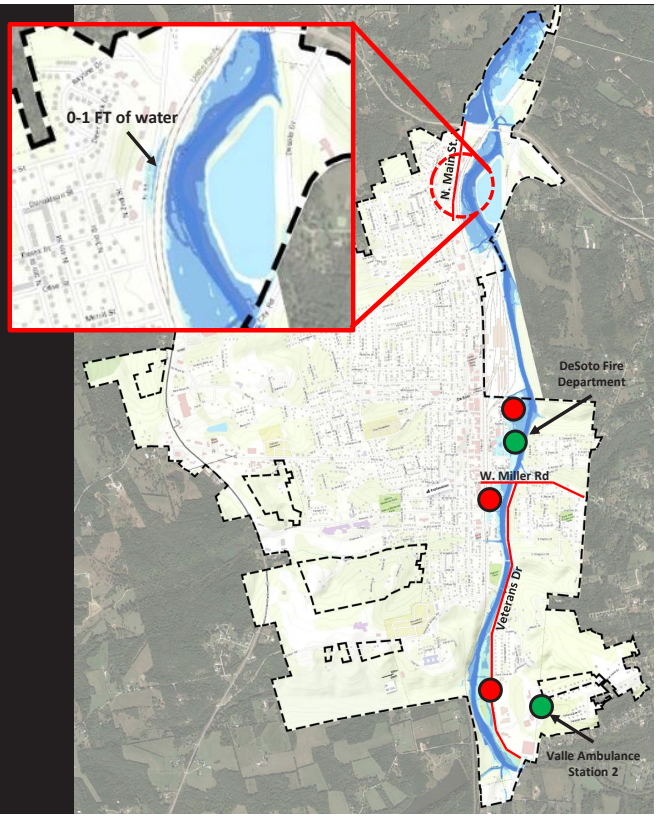
H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

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- **9 ft. gauge**
- **10 ft. gauge**
  - Historic De Soto South of Richter Park begins taking on water.
  - Residential properties begin flooding.
- **11 ft. gauge**
  - Veterans Rd. and West Miller Rd. begin taking on about 0.5' – 1' of water.
- **12 ft. gauge**
  - Veterans Rd., West Miller Road, N. Main St begin flooding with ranges between 1' and 3'.
  - Flooding of Veterans Rd. lead to limited access to Valle Ambulance station two.
  - Firehouse by Joachim Park begins to flood.
  - N. Main St. begins flooding cutting off HWY 110 access.

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study



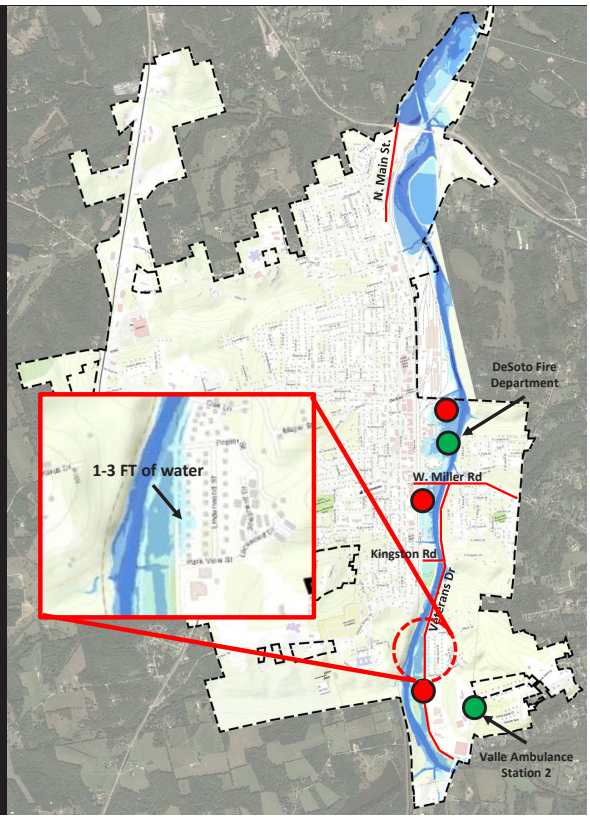
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  - Flooding of Veterans Rd. lead to limited access to Valle Ambulance station two.
  - Firehouse by Joachim Park begins to flood.
  - N. Main St. begins flooding cutting off HWY 110 access.
- **13 ft. gauge**
  - Kingston Rd Floods cutting access from Veterans Dr to Dewitt.
  - The neighborhood across from Walther Park begins flooding.

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

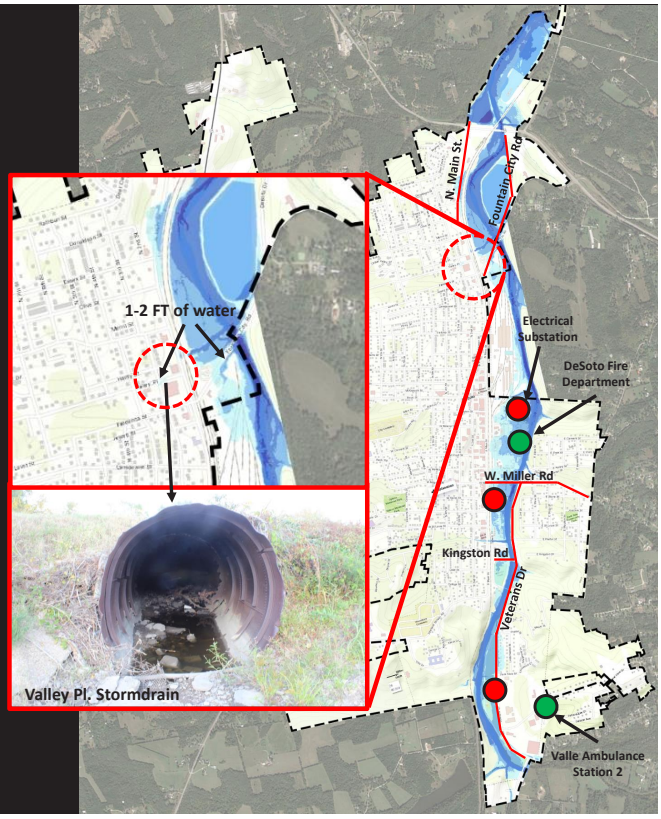


H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **14 ft. gauge**
  - Valley Place storm drain backs up and floods Valley Pl.
  - Fountain City Road begins flooding cutting off remaining access to highway 110.
  - The electrical substation near Richter park begins taking on water cutting power to properties



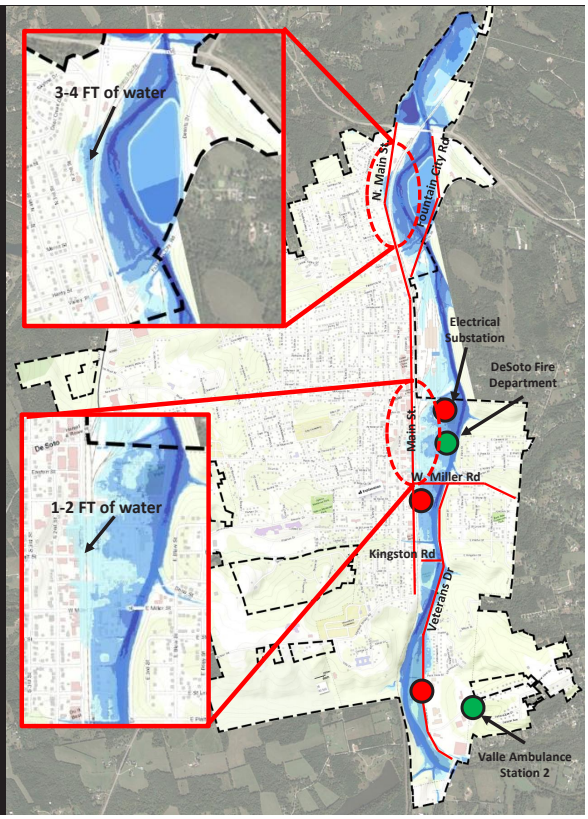
Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **14 ft. gauge**
  - Valley Place storm drain backs up and floods rd.
  - Fountain City Road begins flooding cutting off remaining access to highway 110.
  - The electrical substation near Richter park begins taking on water cutting power to properties
- **15 ft. gauge**
  - North side rail line and Union Pacific Railyard begin flooding.
  - Main St. begins flooding
  - Pedestrian footbridge at water gauge begins to flood



Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

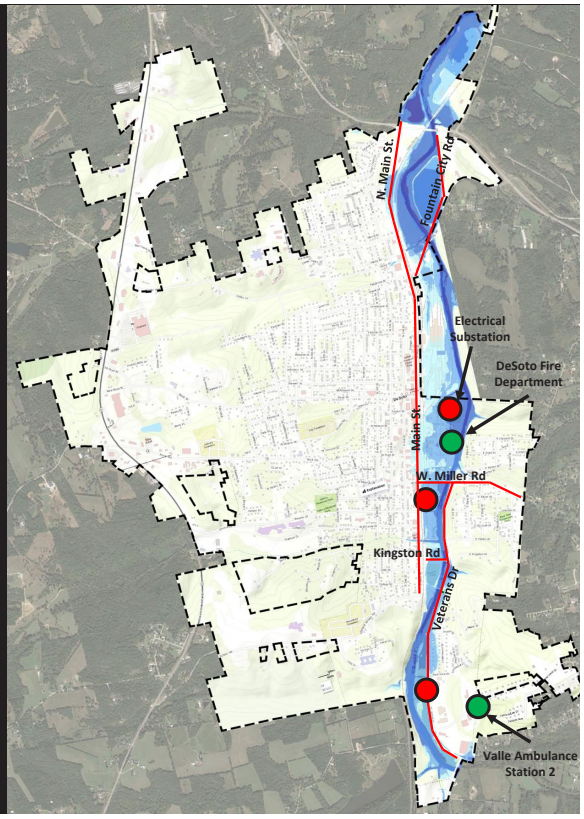
H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **14 ft. gauge**
  - Valley Place storm drain backs up and floods rd.
  - Fountain City Road begins flooding cutting off remaining access to highway 110.
  - The electrical substation near Richter park begins taking on water cutting power to properties
- **15 ft. gauge**
  - North side rail line and Union Pacific Railyard begin flooding.
  - Main St. begins flooding
  - Pedestrian footbridge at water gauge begins to flood
- **16 ft. gauge**
  - State Rd. V floods cutting off southern access to the city.

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study



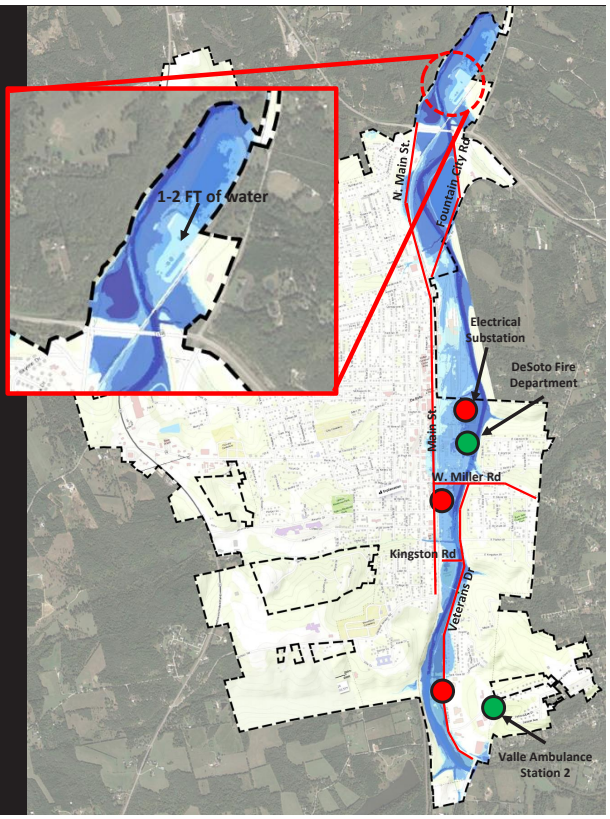
H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- **14 ft. gauge**
  - Valley Place storm drain backs up and floods rd.
  - Fountain City Road begins flooding cutting off remaining access to highway 110.
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- **15 ft. gauge**
  - North side rail line and Union Pacific Railyard begin flooding.
  - Main St. begins flooding
  - Pedestrian footbridge at water gauge begins to flood
- **16 ft. gauge**
  - State Rd. V floods cutting off southern access to the city.
- **17 ft. gauge**
  - The Water Treatment Facility begins flooding

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study



H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO



Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study

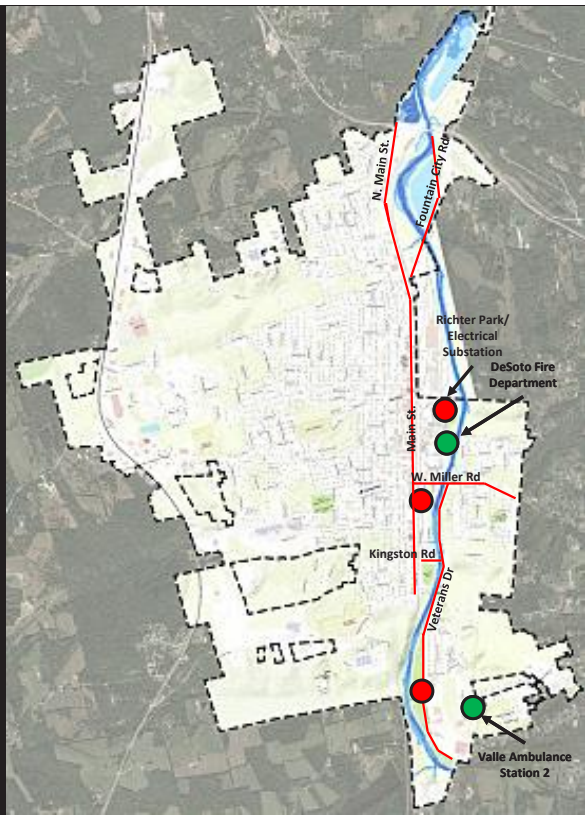
H3 STUDIO

Physical Vulnerabilities

Vulnerability Risk Assessment

- In any given flood event physical and emergency response infrastructure is inhibited as water levels rise.
- At stream gauge level 12 access between the area East of Main St. and West of Main Street is cutoff given that West Miller Rd. the only direct east west connector across the tracks is inundated.
- Since Veterans Rd. is also partially inundated at this level access to and from Southern De Soto is limited.
- Once Fountain City Rd and N. Main St. Flood access from Northern De Soto is cutoff to highway 110 leaving Highways 21 and Flucom Rd as the major entries to either side of the city.
- Once Highway V floods at gauge level 16 Highway E which has no direct connections to Highway 21, 110, or major local roads is the only way into the Southern portion of De Soto.
- An electrical substation, an ambulance station, and the Fire Station are all critical facilities impacted early on in a flood condition.

Data acquired from USGS Water Data and Flood Inundation Mapper, and USGS 2D Hydraulic Study





NON-PHYSICAL VULNERABILITIES

H3 STUDIO

VULNERABILITY RISK ASSESSMENT

OCTOBER 12TH 2022

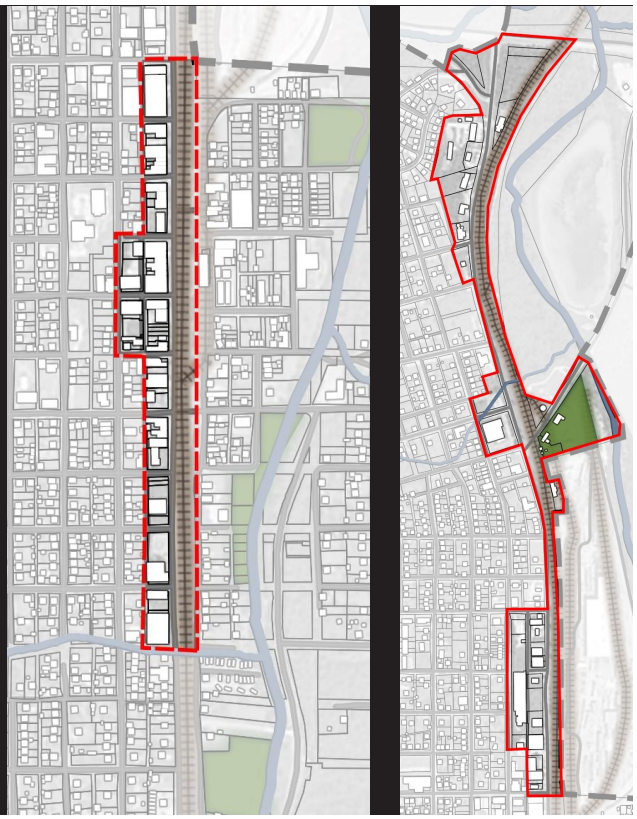
H3 STUDIO

Non-Physical Vulnerabilities

Vulnerability Risk Assessment

- Main Street is one of DeSoto's main economic engines and runs parallel to the Union Pacific Railroad and lies adjacent to the Railyard.
- Main Street boasts a diversity of commercial and civic uses and has The Railroad Workers Memorial Park along it.
- Other notable programs along Main Street include the De Soto Library and Mercy Mental Health Clinic.

Data acquired from DeSoto GIS, FEMA, Site Survey, and Jefferson County Assessor



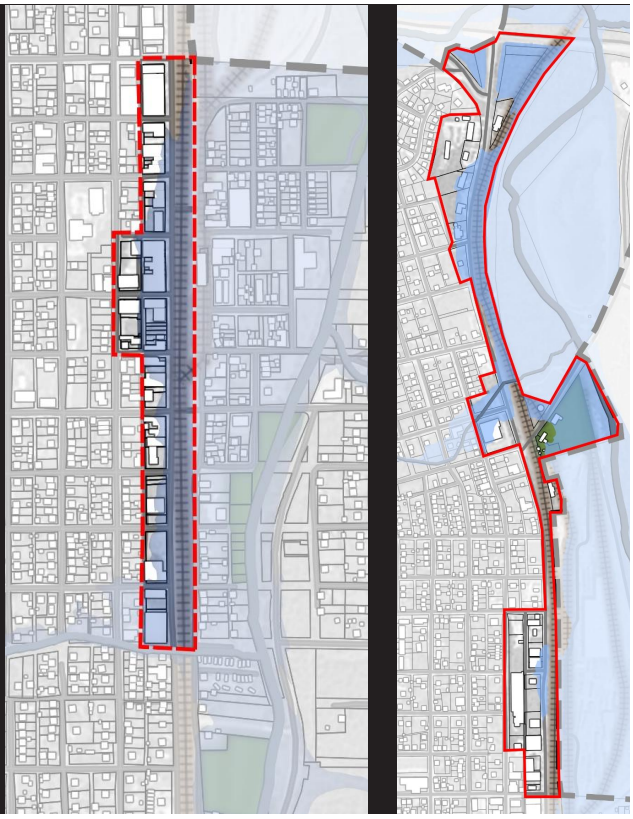
H3 STUDIO

Non-Physical Vulnerabilities

Vulnerability Risk Assessment

- The *100 year flood plain* impacts
  - 16 retail stores
  - 15 professional services
  - 8 vacant buildings/lots
  - 5 warehouse/storage
  - 3 restaurant/dining uses
  - 2 civic/institutional uses
  - 1 recreational amenity

Data acquired from DeSoto GIS, FEMA, Site Survey, and Jefferson County Assessor



H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

Non-Physical Vulnerabilities

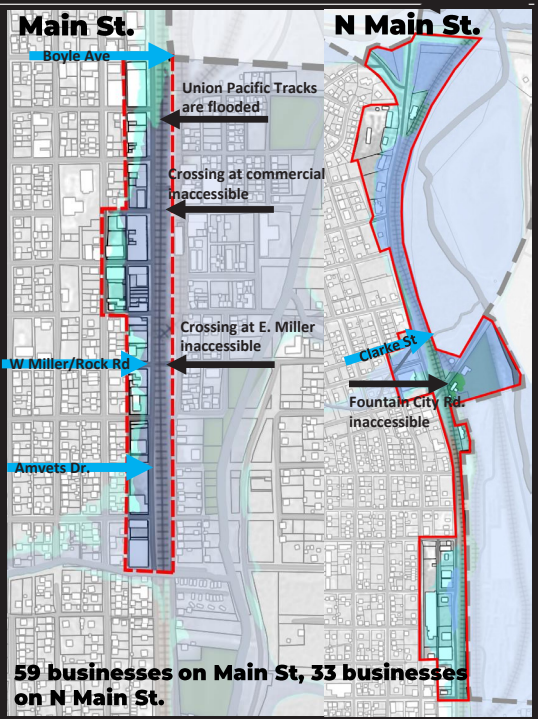
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  - 16 retail stores
  - 15 professional services
  - 8 vacant buildings/lots
  - 5 warehouse/storage
  - 3 restaurant/dining uses
  - 2 civic/institutional uses
  - 1 recreational amenity

- The *500 year flood plain* impacts an additional
  - 14 professional services
  - 10 retail stores
  - 5 vacant buildings/lots
  - 4 restaurant/dining uses
  - 4 warehouse/storage
  - 3 recreational amenities
  - 2 civic/institutional uses

- Based on county assessor data **the flood condition impacts $12,104,400 dollars in combined building and land value** on Main Street and North Main Street.

92 businesses are at risk of flooding and shutting down operations. Main Street is shut down at 12' gauge.



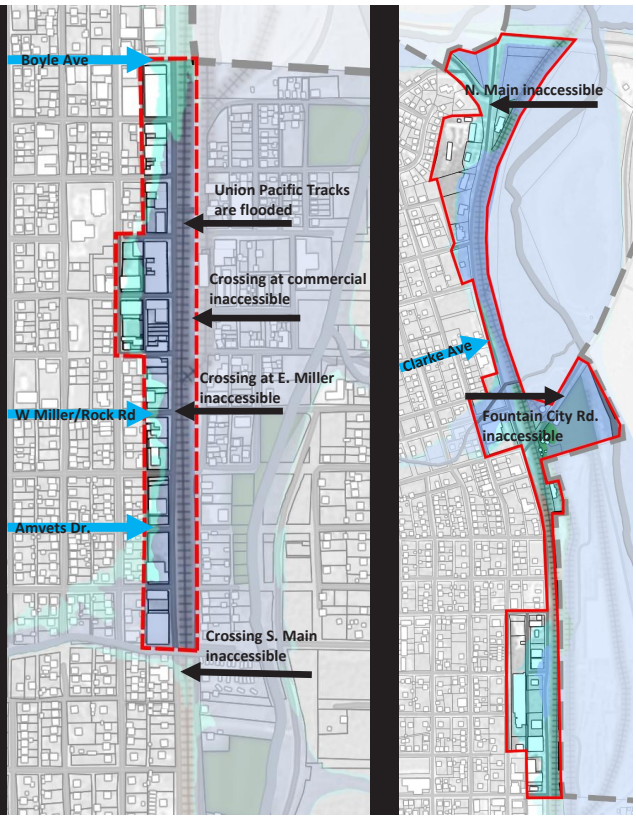
H3 STUDIO

Non-Physical Vulnerabilities

Vulnerability Risk Assessment

- At peak flood levels, access to main street is dangerous and operations are likely to seize given the limited access and conditions of flooded non operational businesses.
- The affected electrical substation may affect access to electricity in this area.
- Access to major roadways from Main St is inaccessible.
- Roads from highway 21 i.e. Boyle Ave., Amvets Dr, Clarke Ave, and Rock Rd/W Miller remain unflooded and can provide close access to Main St.

Data acquired from DeSoto GIS, FEMA, Site Survey, and Jefferson County Assessor



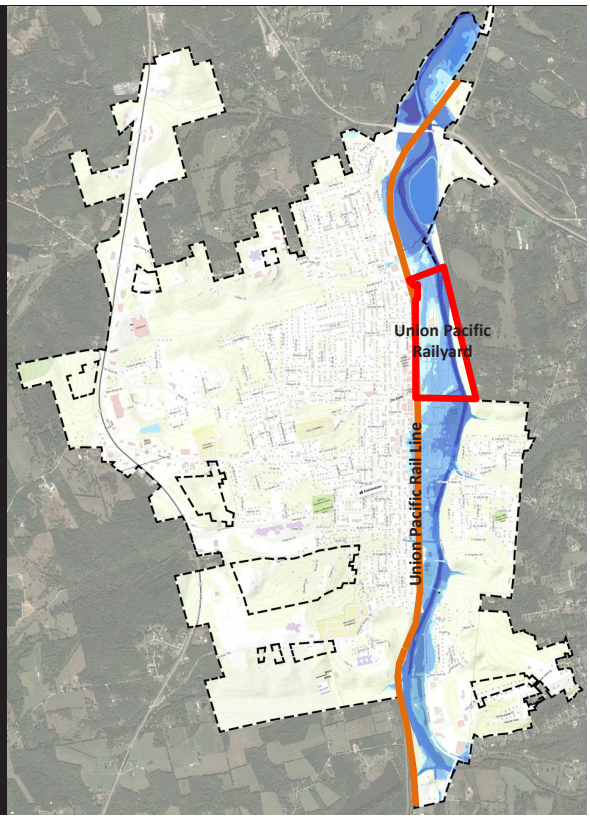
H3 STUDIO

Non-Physical Vulnerabilities

Vulnerability Risk Assessment

- Union Pacific Railroad is the City of Desoto's single largest employer and major source of capital.
- At 13' gauge their railyard begins to flood as well as tracks in their property.
- Between 14' and 15' gauge the primary lines running along main street begin to flood putting operations at a halt limiting revenue and working capacity for citizens of De Soto.

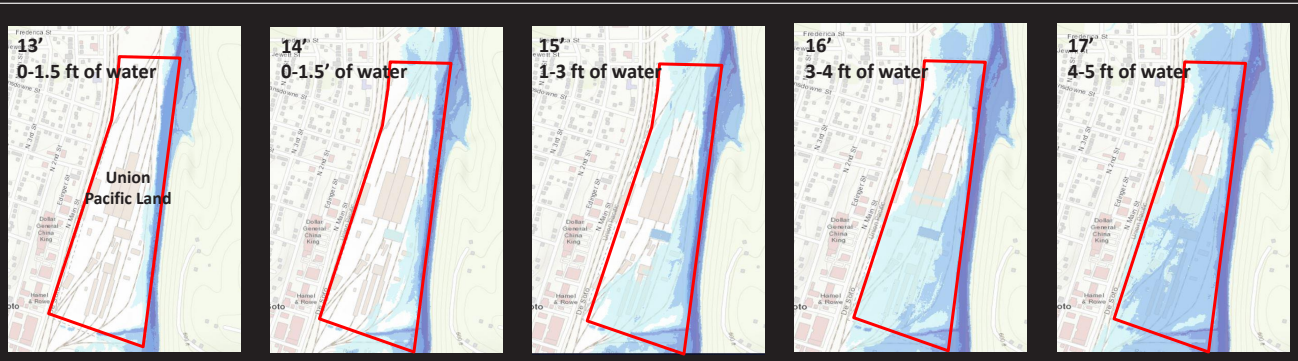
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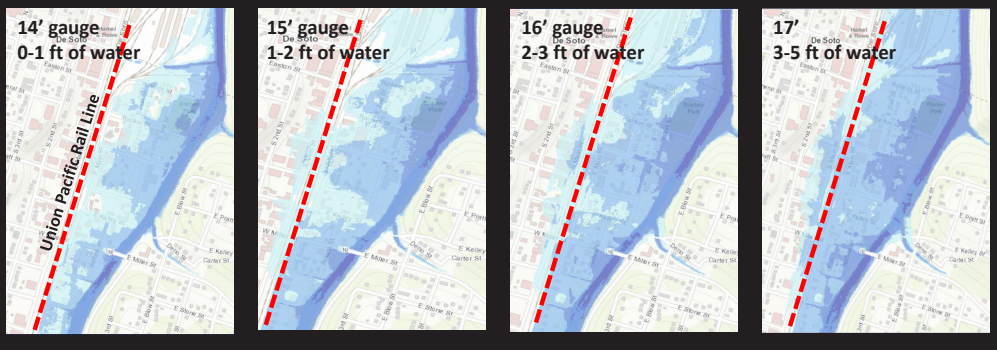
H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO



The condition of the levee road along the railyard helps control the water. At no point does the primary structure get over 2ft of water. Most of the water is concentrated south and north of the site or at the creek edge.



Data acquired from USGS



SOCIAL VULNERABILITIES

H3 STUDIO

VULNERABILITY RISK ASSESSMENT

OCTOBER 12TH 2022

H3 STUDIO

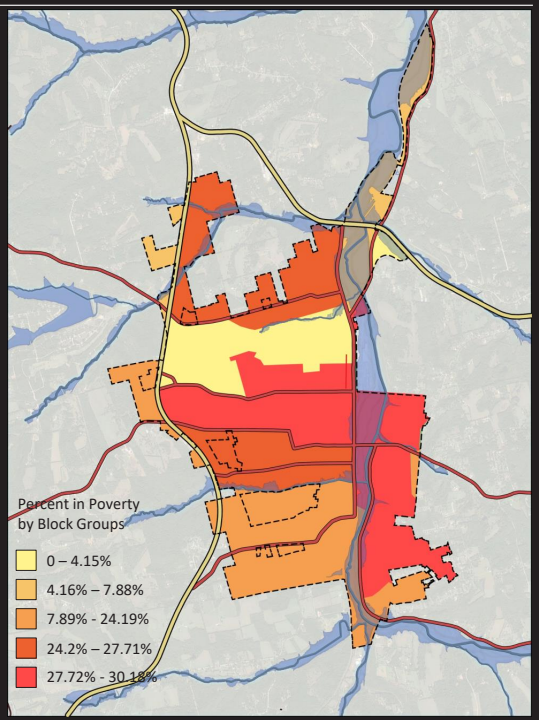
FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

Social Vulnerabilities

Vulnerability Risk Assessment

- 51% of households in De Soto make less than $50,000/year and 23% sit below the poverty line. .
    - 20% of these households make less than $10,000/year.
    - The most disadvantaged low income areas (in red) are along the Joachim Creek and its tributaries meaning they suffer adverse flood effects with limited recovery resources and capital.



Data acquired from ESRI

H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

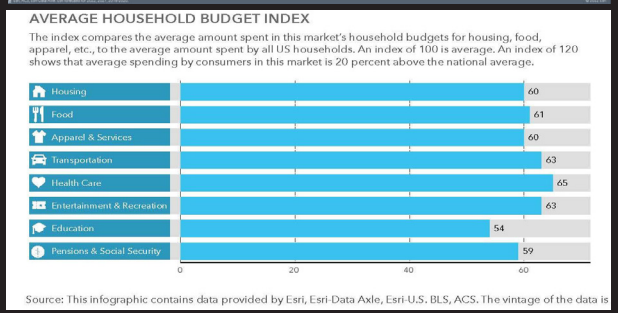
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Vulnerability Risk Assessment

- 51% of households in De Soto make less than $50,000/year and 23% sit below the poverty line. .
    - 20% of these households make less than $10,000/year.
    - The most disadvantaged low income areas (in red) are along the Joachim Creek and its tributaries meaning they suffer adverse flood effects with limited recovery resources and capital.

- The Senior community is most at risk in De Soto and makes up approximately 20% of the total city population
- Additionally, Over 1000 households (38%) in De Soto report having some form of a disability.





Data acquired from ESRI

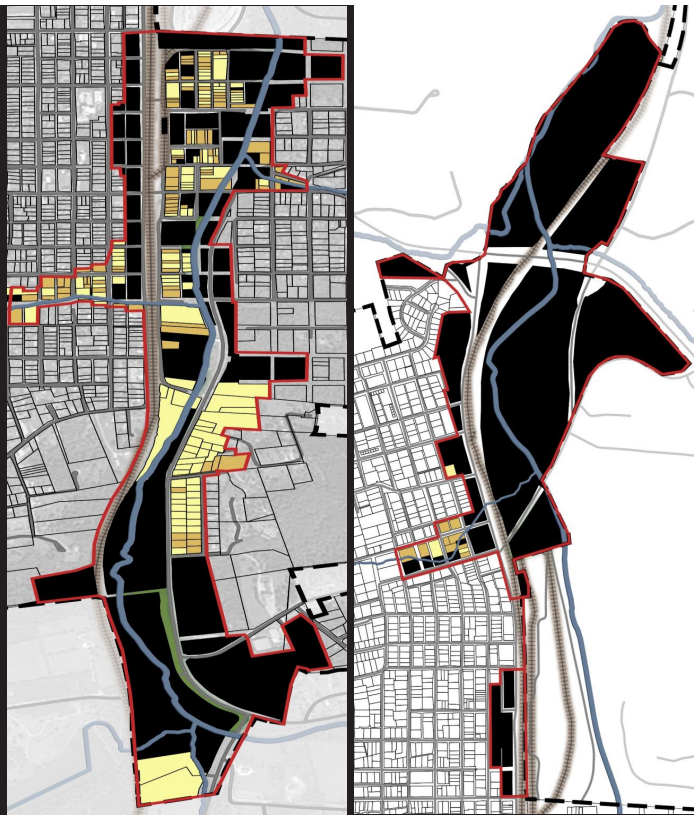
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Social Vulnerabilities

Vulnerability Risk Assessment

- Combined there are a total of 229 residential properties in the flood plain areas.
- Of those 229 residential properties 117 properties or 51% of residential properties are rental properties.

Data acquired from Jefferson County Assessor Property Information



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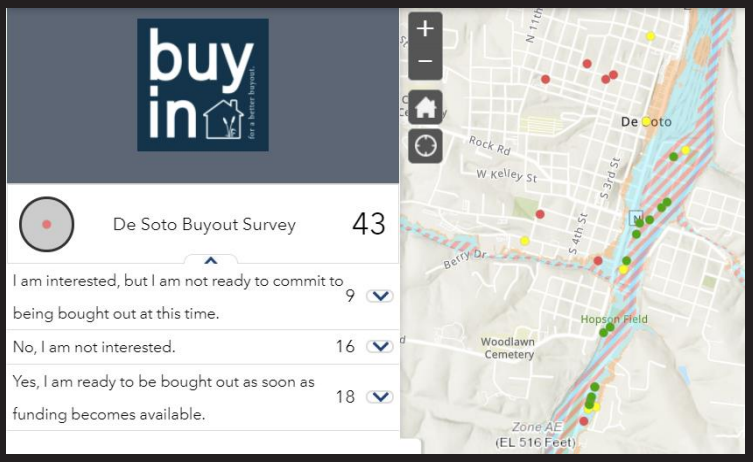
FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

Social Vulnerabilities

Engaging Floodway Residents:

- Starting in 2020, Buy-In Community Planning worked with the Citizen's Committee for Flood Relief to survey De Soto floodway residents.
- The goals of the survey included:
  - To better understand residents' experiences with flooding
  - To understand the impacts that flooding has had on people's well being
  - To better understand the financial, psychological, and physical barriers people face to moving.
  - To understand people's interest in relocation as an option for improving their resilience to flooding.
- Although the goal was to survey floodway residents, other members of the community chimed in about their flood experiences.
- The majority of residents living in the floodway were either interested in a buyout or ready to participate in a program (shown in green and yellow).



H3 STUDIO

FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

Social Vulnerabilities

Community Safety & Flood Impact:

- **53 households** took the survey representing **127 people.**
  - **The average age was 60.** The oldest respondent was 82 and the youngest was 28.
  - **17 (47%)** self reported as being handicapped or disabled.
  - **42%** reported a second person in their household as handicapped or disabled.
- ***53% of respondents felt that their homes were not safe places for the elderly or disabled.***
- ***89% of respondents reported their homes have been affected or damaged by flooding.***
- ***73% of respondents do not feel they are physically prepared to deal with a major flooding event.***

Floodplain residents are feel neither safe nor prepared to deal with a major flooding event.



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FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

Social Vulnerabilities

Psychological Impact & Repetitive Loss:

- **40% of respondents reported experiencing stress, anxiety or emotional trauma due to flooding.**
- **33% of respondents said that their concerns about flooding keep them up at night.**
- **65% stated that it would be likely or extremely likely that their current home would be damaged by flooding in the next 12 months.**
- The most common experiences with flooding included experiencing stress and losing a vehicle. Additional losses reported include:
  - "Electrical outages during storm and sump pump in basement couldn't operate"
  - "Financial losses for clean up both times with professional service, and the loss of everything downstairs"
  - "My husband had cancer and suffered emotional stress in the last days of his life."

Floodplain residents fear for life and safety in their current conditions and expect to flood again.



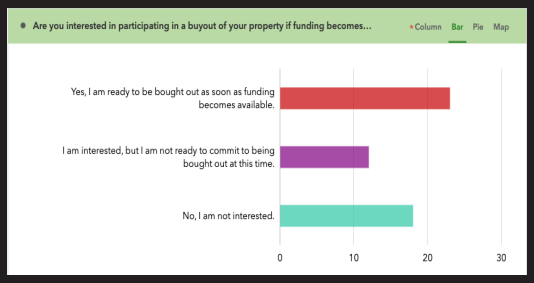
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FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

Social Vulnerabilities

Buy-Out Perception

- 23 out of 53 households expressed interest in participating in a buyout program.
- 12 said they were interested but needed additional information.
- 28 of 41 (68%) said that the amount of money they were offered was the most important factor in their decision to participate in a buyout program.



When we asked for more information, they said:

- "As long as it is a fair offer. Hate living in a home that you worry every time it rains. Hate paying 250 a month for insurance"
- "At the time we bought our home, we were not fully explained the possibility of flooding. We aren't spring chickens anymore, my husband is basically deaf without his hearing aids in, therefore it causes a lot of stress at night waiting to get that call."
- "Don't want to have to worry about myself every time it floods. Scared to go to sleep when it rains bc of flooding. Cant replace stuff over and over again."
- "I'm ready to sell I'm tired of being scared when it rains for a few days."
- "We do not feel safe in our home due to flooding. We have had to evacuate in swiftly moving water, my spouse is disabled & unsteady on their feet. We fear being trapped in flood water. We have high anxiety & unable to sleep when creek is rising."
- ***"Right now our hope is not dying from a flood."***

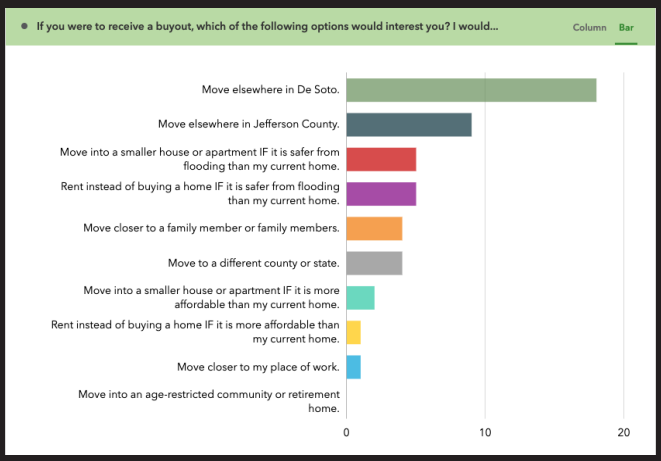
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FLOOD MITIGATION PLANNING PROJECT
THE CITY OF DESOTO, MO

Social Vulnerabilities

Buy-Out Perception & Relocation

- Residents often expressed interest in trying to move elsewhere in De Soto or, less frequently, within Jefferson County. Several respondents prioritized their household's safety from flooding over the size of their home, and were willing to consider renting instead of buying a home if it would help them move somewhere safer from flooding.
- When asked how they felt about Desoto respondents replied:
- They feel connected to their neighbors; have access to quality open spaces and recreational areas; and live in a place that allows them to travel where they need to go safely, comfortably, and easily.
- Respondents expressed dissatisfaction with the lack of job opportunities and affordable housing in De Soto.



Safe, accessible, and affordable housing and employment opportunities continue to be significant wants of the Desoto community.

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FLOOD MITIGATION PLANNING PROJECT

THE CITY OF DESOTO, MO

Social Vulnerabilities... Our Analysis

- Residents in the De Soto Floodway are deeply concerned about their financial, physical, and emotional well being due to extreme flood risk.
- Floodway residents who have experienced flooding are ready and willing to participate in a buyout program.
- Residents are financially constrained by their ability to move without support. Those include:
  - Limited or fixed incomes
  - Outstanding mortgages:
  - "I have a mortgage loan and would need enough to pay off the loan and a down payment for another home."
- People who live outside of the floodway also see the importance of providing support to floodway residents:
  - "I am not concerned with a buyout for myself, but many other houses need it in order to better themselves and our town."

Next Steps and Opportunities

- Buy-In is working with the City of De Soto and CCFR to submit 5 applications to SEMA.
- Additional resources are available through multiple federal programs (FEMA & HUD) to support buyouts for floodway residents
- Community visioning to support an end use plan for the floodway can create an amazing recreational and environmental amenity for De Soto while reducing flood risk.
- Working with residents to identify prioritization and timing will help facilitate the process.



NATURAL ENVIRONMENT VULNERABILITIES

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VULNERABILITY RISK ASSESSMENT

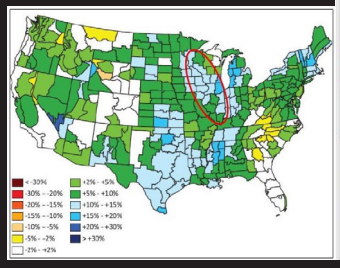
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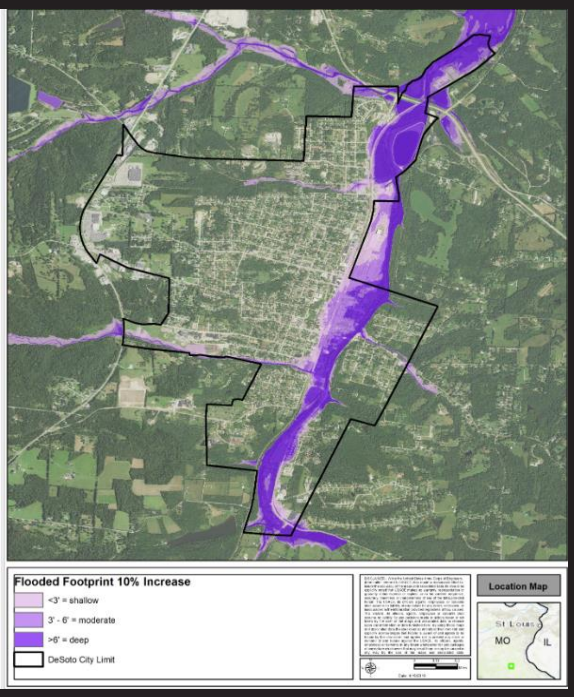
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Natural Environment Vulnerabilities

Vulnerability Risk Assessment

- Climate Change
  - The Watershed is expected to have an increase in annual precipitation of 5% to 10%, change per century.
  - This study considered a hypothetical 10% increase in 1% annual chance of exceedance (ACE) flow (runoff), to determine potential future conditions.
  - Assuming a 10% increase to FEMA's 2019 Flood Insurance Study 100-year flow, the average depth of flooding in a majority of DeSoto was increased by approx. 1 foot.





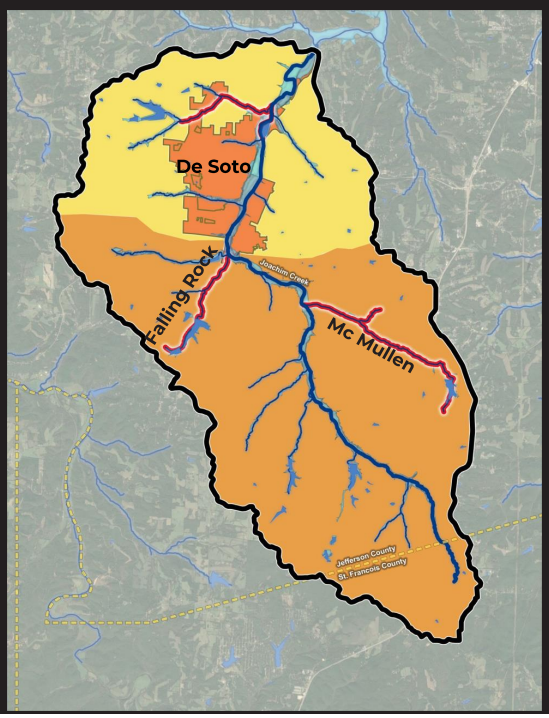
Data acquired from APA Resiliency Report

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Natural Environment Vulnerabilities

Vulnerability Risk Assessment

- The Joachim Creek is the primary waterway through the watershed and traverses East De Soto along Main St and the Union Pacific Railroad.
- 13 tributary streams flow into the Joachim Creek within the watershed intensifying the effects of flash flooding events.
  - Nine (9) of these streams, ***65% of the watershed drainage area***, enters the Joachim before reaching the city of De Soto
  - Five (5) additional streams, ***35% of the watershed drainage area***, flow through the city of De Soto and into the Joachim Creek.
- The Falling Rock Branch and Mc Mullen Branch are considered gaining streams meaning they are susceptible to ground water intensifying flood effects.



Data acquired from Desoto GIS, APA Resiliency Report, and DNR GeoStrat

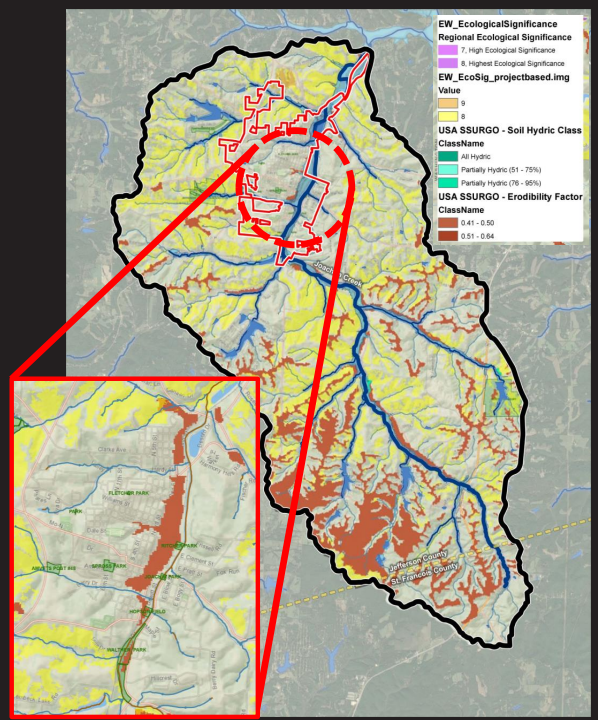
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Natural Environment Vulnerabilities

Vulnerability Risk Assessment

- The Upper Joachim Watershed has a series of steep bluffs and narrow valleys which aid in intensifying water flow and contributing to flash flooding when it rains.
- The watershed is generally rocky with a bedrock layer at an average depth of 25'.
- The mining areas and rocky nature of land in the region contribute to high erosion areas in the Southwestern portion of the watershed and in Downtown De Soto.
- The Joachim Creek flows parallel to Main Street De Soto along areas highly susceptible to erosion.
- The flood plain covers the full extent of the De Soto Main Street erosion area putting businesses, residences, critical infrastructure, and city buildings at a higher risk of significant damage and loss.

Data acquired from Desoto GIS, APA Resiliency Report, and DNR GeoStrat



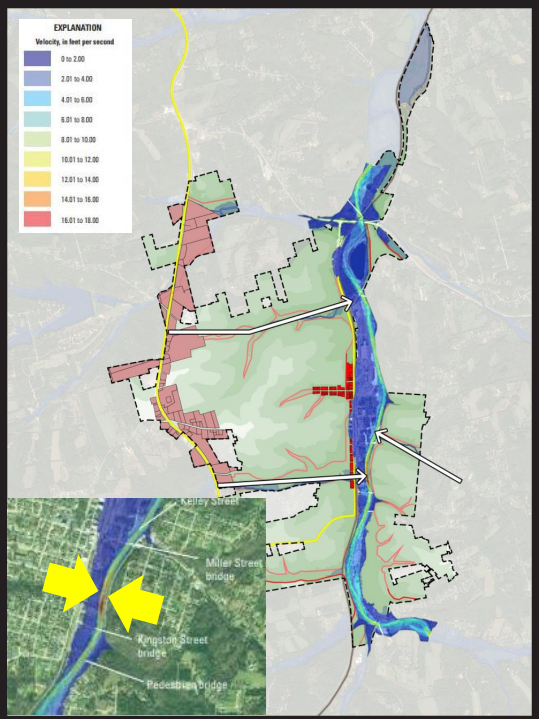
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Natural Environment Vulnerabilities

Vulnerability Risk Assessment

- Desoto is not in Jefferson Counties primary growth area and is therefore not expecting to intense increases in development.
- As the Upper Watershed grows and increases development in its several subdivisions all the impact of development will continue building upstream and reaching Desoto inclusive of increased water and debris flowing through the city.
- Increased commercial development along highway 21 in Desoto will intensify the effects on the Joachim tributaries like the Tanyard and County Branches expanding the extent of the flood plain and overall water levels during flood events.

Data acquired from Desoto GIS, APA Resiliency Report



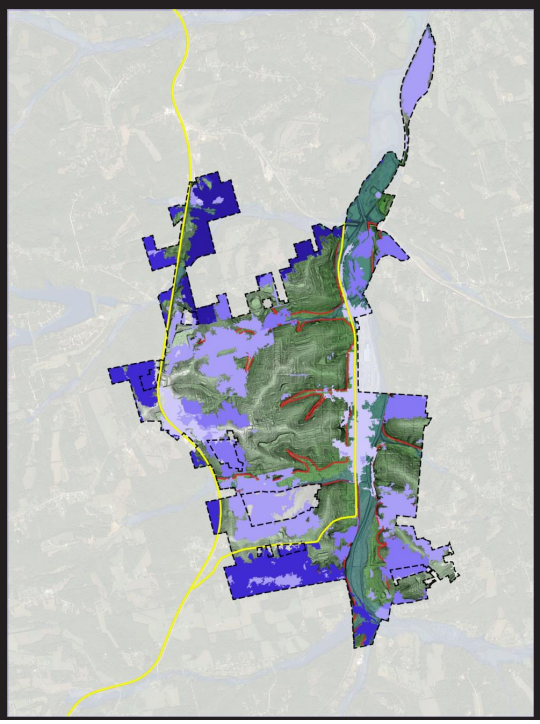
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- Increased commercial development along highway 21 in Desoto will intensify the effects on the Joachim tributaries like the Tanyard and County Branches expanding the extent of the flood plain and overall water levels during flood events.
- The areas of greatest ecological significance in De Soto are located along highway 21 and at the southwestern part of the city. The County Road Tributary and Tanyard Branch Tributaries also have ecologically significant landscapes where potentially resilient landscapes can be developed to hold and control water more efficiently.

Data acquired from Desoto GIS, APA Resiliency Report, and EW Gateway



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Economic Market Analysis

FLOOD RESILIENCY SOCIO-ECONOMIC MARKET ANALYSIS

DE SOTO, MISSOURI

CHALLENGES AND OPPORTUNITIES FOR ECONOMIC RESOURCES

MAY 9, 2023

PREPARED FOR

H3 Studio
St. Louis, Missouri

SAINT LOUIS UNIVERSITY
Department of Earth & Atmospheric Sciences
COMMUNITY PLANNING LAB

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EXECUTIVE SUMMARY AND FINDINGS

De Soto, Missouri, is a relatively large city in Jefferson County. With some 6,500 residents, it ranks as the third largest municipality in the county behind only Arnold (20,900) and Festus (12,700). But De Soto has experienced much slower socio-economic growth in recent years and is well behind its peer cities in the county in many socio-economic measures. These circumstances raise concerns about the city's ability to marshal sufficient (maybe substantial) resources to address flood resiliency. Broadly speaking, the benefits of growth have not extended into De Soto for more than a decade, though such benefits are evident in cities within the I-55 and Mississippi River corridor. A litany of challenges faces De Soto in the context of Jefferson County and the St. Louis metropolitan area.

- The city's population growth rate was just 0.8 percent between 2010 and 2020, compared to 3.7 percent for Jefferson County. Still, its growth rate was not too dissimilar to the paltry metropolitan area growth of about one percent.

- Housing vacancy rates in De Soto are quite high compared to its several peer cities in Jefferson County, reflecting the city's inability to attract net new residents. That said, there could be ample available units in the city to accommodate flood-impacted relocated households, though the conditions of those vacant units are not yet known.

- The homeownership rate in De Soto is somewhat low at about 60 percent, but not significantly out of line with regional rates. But housing values are much lower than in peer cities, again reflecting a lack of growth and lethargic demand. This also discourages construction of new units and perhaps discourages significant investments in many existing homes to sustain their values. This can have a further negative impact on property tax assessments and local government revenues.

- Renter occupancy, likewise, is not out of line with regional patterns though renters are more frequent than in peer cities. This is partly attributable to lower incomes and lower paying jobs. Contract rents, however, are also lower than regional averages which discourages landlords from making property improvements and depresses development of newer rental housing.

- Lack of growth and housing investment also means that the housing stock in De Soto is considerably older than in its peer cities throughout the county. Again, a sluggish increase in housing investment can manifest itself in lower property values which diminishes property tax potential.

- Annual household incomes also fall well below peer cities and Jefferson County. Lower incomes hinder the ability to afford housing investments and rents while also reducing consumer purchasing power that supports local businesses and sales tax revenues.

- Over half of the city's renter households are "cost burdened" (according to the U.S. Department of Housing & Urban Development) and half of these are "severely cost burdened." Cost burdened is when expenses for rent and utilities exceed 30 percent of a household's income; severely cost burdened households pay more than half of their incomes for rent and utilities.

- Homeowners in De Soto are less cost burdened, but still about one-fifth pay more than 30 percent of their incomes for occupancy expenses defined as mortgage payments, property taxes, insurance, and utilities. A third of these homeowners are severely cost burdened.

- Relatively low-paying economic sectors dominate the jobs economy of De Soto, so there could be room for attracting higher paying and higher value jobs. More than eight out of ten De Soto residents with jobs, however, commute elsewhere for work while almost 85 percent of the jobs in De Soto are held by outsiders. There is a great deal of out-commuting and a great deal of in-commuting each day. That said, De Soto's out-commuting residents generally bring home higher earnings than those holding jobs in the city.

- But even that is not enough to make up for relatively meek household incomes in the city. Moreover, earnings from work for residents of the city also fall well below earnings of residents in the other cities of Jefferson County.

While this litany of challenges seems daunting, De Soto is still the third most populated city in Jefferson County with a rich heritage and a past that includes higher incomes, housing values, and personal wealth than is evident today. Building on that heritage and on the growth forces in Jefferson County will be crucial in coming years to revitalize the city's socio-economic characteristics. This will also increase the city's public and private resources to address the expenses and preparedness to better manage flooding conditions and to minimize property and human costs resulting from flooding. Meanwhile, however, De Soto must struggle with reduced resources.

POPULATION TRENDS AND PATTERNS

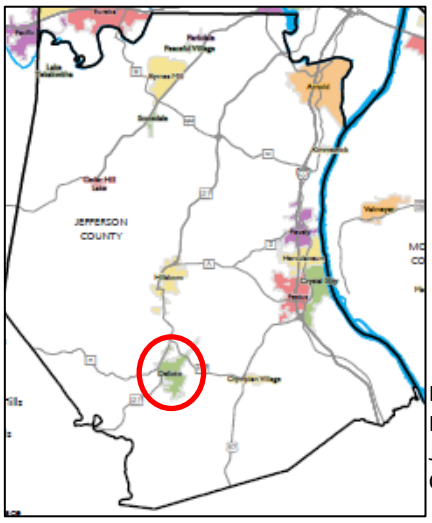
De Soto's location was first settled by the Van Metre family in 1803. The city was formally incorporated in 1869 and today is a third class city in Missouri. The city is in southern Jefferson County which, in turn, is part of the 15-county, bi-state St. Louis metropolitan area, one of 382 metro areas in the United States.

With a 2020 population of 226,700, Jefferson County is the sixth most populated of the metro area's 15 counties. The metro area as a whole had 2.82 million residents in 2020, the 20th largest metro area in the U.S.

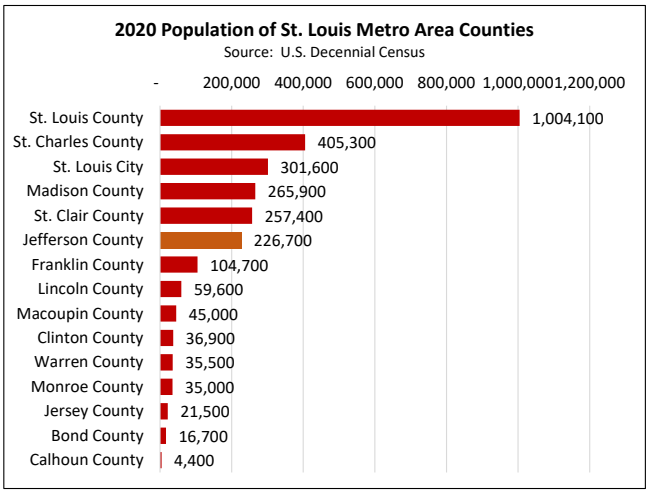


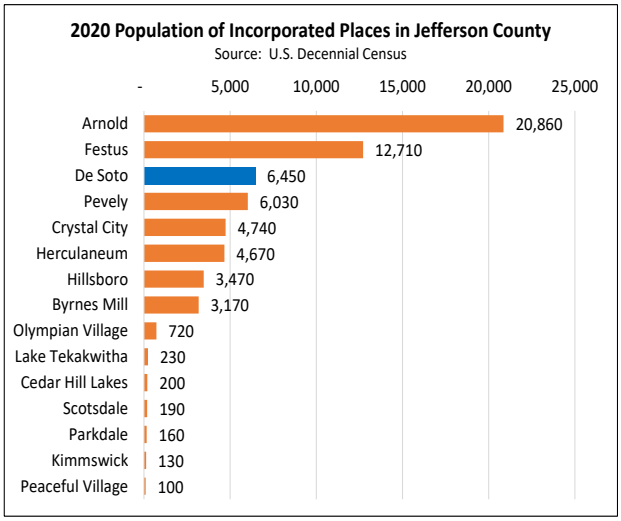
Source of Map:
Greater St. Louis, Inc.

15-County
St. Louis Metropolitan Area



Location of De Soto in Jefferson County



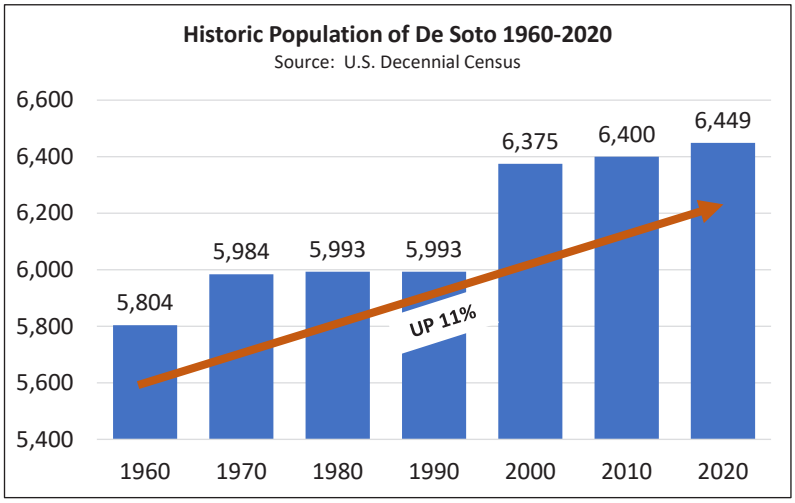


Even with sluggish recent population growth, De Soto remained the third largest incorporated city in Jefferson County in 2020. Arnold is the largest by far with almost 21,000 residents, followed by Festus with over 12,700 residents.

Following closely behind DeSoto is Pevely, then Crystal City and Herculaneum. Jefferson County is also the location of a half dozen or so very small, incorporated places though, as shown above, these are scattered widely around the county.

Population Trends in the City of De Soto

The population of De Soto was counted at 6,449 as of the 2020 Census, up less than one percent from 2010 and only 11 percent from as far back as 1960.



Meanwhile, Jefferson County has been no slouch in long-term population growth. Its overall population increased by 242% from 1960 to 2020 (264% outside of De Soto). Festus, the second largest city in Jefferson County, added 81% more residents. Arnold, the county's largest city, was incorporated between 1970 and 1980 and added just nine percent more residents between 1980 and 2020 but has more than three times the population of De Soto. De Soto grew almost eight percent between 1980 and 2020, while Festus grew 68 percent.

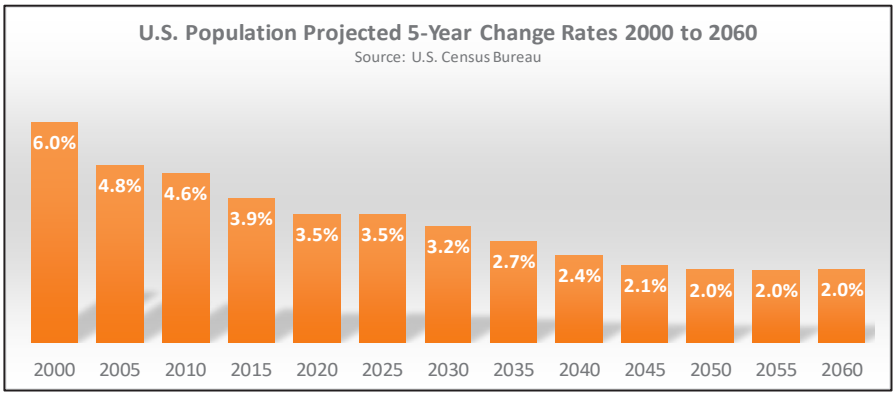
But Jefferson County growth was just 3.7 percent between the 2010 and 2020 Census counts. Even so, this was well ahead of the 0.8 percent population growth of De Soto. Still, JeffCo's growth rate outdistanced the metro area's collective growth of only about one percent between the most recent Census years.

While Jefferson County experienced 242 percent population growth between 1960 and 2020, the *unincorporated* portions of the county (that is, outside of the various cities) expanded 249 percent while incorporated cities combined for 225 percent long-term growth. Meanwhile, the population of the 15-county metropolitan area increased only 25 percent from 1960 to 2020.

Unfortunately, De Soto has not shared in this growth, most of which has been in the northern part of the county and along the I-55/Mississippi River corridor. Between 2010 and 2020, unincorporated places added 2.7 percent more residents while incorporated places added 6.3 percent. Again, incorporated De Soto added just 0.8 percent. Much of the growth in the incorporated cities and villages, of course, resulted from annexation of already-populated areas, so unincorporated growth is a substantial contributor to the county's residential expansion.

Slow National Growth May Affect Greater St. Louis

The most recent national population projections by the U.S. Census Bureau date from 2016 (so they do not yet reflect the 2020 Census). Unfortunately, they show dramatic decreases in the rate of national growth over the next 40 years.

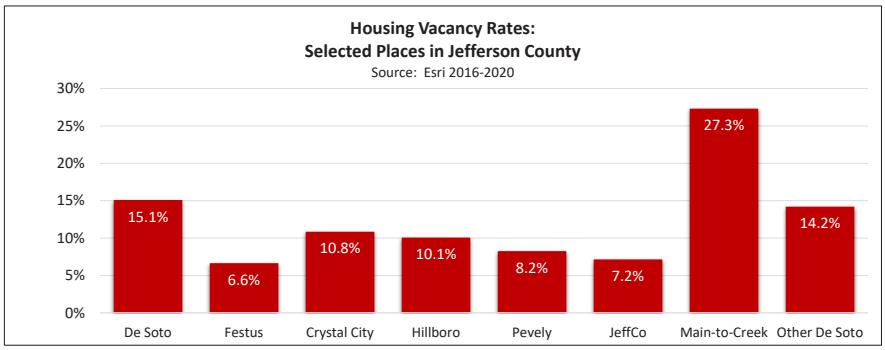


Declining fertility rates, increasing death rates (think aging Baby Boomers), and steady net migration all contribute to much slower rates of growth which have averaged about ten percent per decade for over 200 years, but will decline to as little as four percent per decade. The highest growth rates in U.S. history were the 1950s and 1990s, but national projections that combine both natural increase and net migration to the year 2060 show dramatically slower population expansion. Midwest metro areas and all rural areas are anticipated to have the greatest struggles to attract growth from this "smaller pie."

HOUSING TRENDS AND FORCES

VACANT HOUSING OPPORTUNITIES, 2020

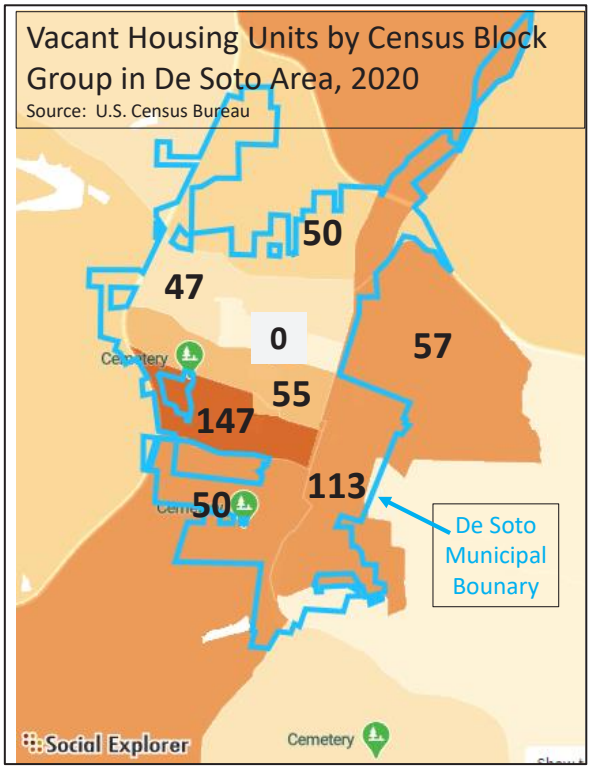
De Soto has a relatively high housing vacancy rate compared to several of its Jefferson County peers. The Main Street-to-Joachim Creek corridor has almost double the city's vacancy rate. There are an estimated 205 housing units in the that corridor, over a quarter of which are vacant, compared to about 14 percent vacant in the rest of the city. All those rates are higher than in peer cities and the county as a whole.





In other words, De Soto appears to have a relatively large number of available housing units in the city but, as shown earlier, is having difficulty attracting population to occupy that housing. Its municipal peers have been growing more strongly with resulting lower vacancy rates. Still, looked at another way, vacant and available housing in De Soto could offer people now living in the flood-prone corridor significant options for relocation while remaining residents of the city.

Latest Census data on housing in De Soto indicate a total of 3,056 housing units, 15.1 percent of which are vacant. This amounts to 461 vacant units. Using the same source, there are 205 housing units in the Main-to-Creek corridor, 27.3 percent of which are vacant. This means that there are 56 vacant units in the corridor but, more importantly, there should be 149 occupied units, or 149 households that may be in danger of persistent flooding in the corridor. Again, these are 2020 Census estimates so further reductions in occupied housing in the flood-prone corridor may have taken place.

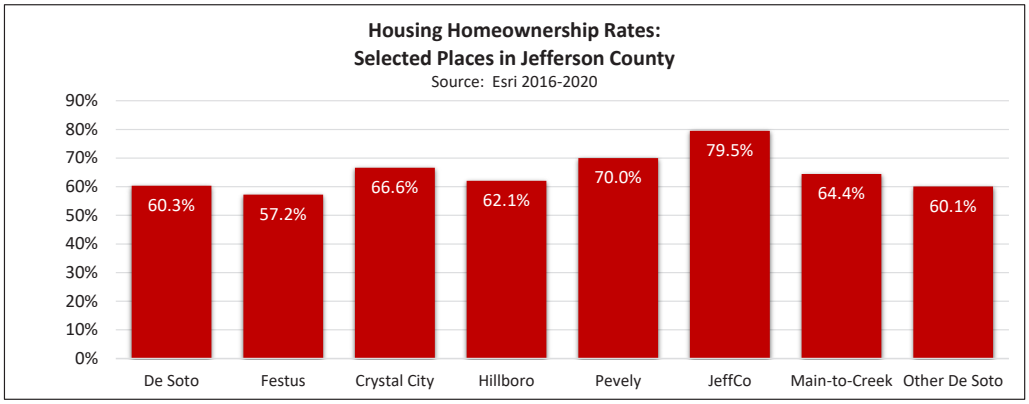


Thus, outside of the Main-to-Creek corridor, De Soto has about 2,851 housing units, 405 of which are vacant. In theory, the 149 households in the Main-to-Creek area could relocate to a wide choice of available vacant housing elsewhere in the city, thus reducing the number of vacant units elsewhere in the city from 405 to 256. If all the housing in the Main-to-Creek corridor is thereby eliminated for flood protection purposes, the number of housing units remaining citywide would be 2,851, 256 of which would be vacant for a vacancy rate of 8.9 percent. This vacancy rate is much more normal in suburban communities and would be far more consistent with De Soto's peer cities.

In other words, there very well could be sufficient existing housing in De Soto to enable flood-prone households to find suitable housing while being able to remain in the city. A present challenge, however, is that there is no known data base on the conditions or circumstances of those vacant units nor of their specific locations. Given the apparent number of such units, a local initiative to work with local realtors to create an inventory would be in order.

Homeownership Rates, 2020

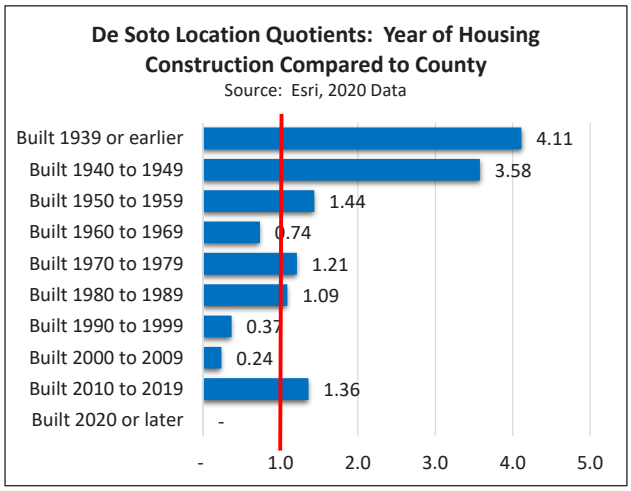
Despite high vacancy rates, De Soto—and even the Main-to-Creek corridor—had a strong homeownership rate of 60.3 percent as of the 2020 Census. This measures the share of housing units that are occupied by their owners, unlike dwelling units occupied by renters. In fact, the study corridor had a higher owner-occupancy rate (64.4%) than the rest of the city in 2020. The county as a whole has a very high homeownership rate of almost 80 percent. . .the national average is about 66 percent.



With such a high homeownership rate in the Main Street-to-Joachim Creek area, buy-outs and other relocation actions that move such households elsewhere in De Soto could reinforce the social and economic benefits of homeownership throughout the city. But renter-occupancy (the opposite of owner-occupancy) is also strong in De Soto, so there should be ample prospects in the city for all households who choose to move from flood-prone areas to other neighborhoods.

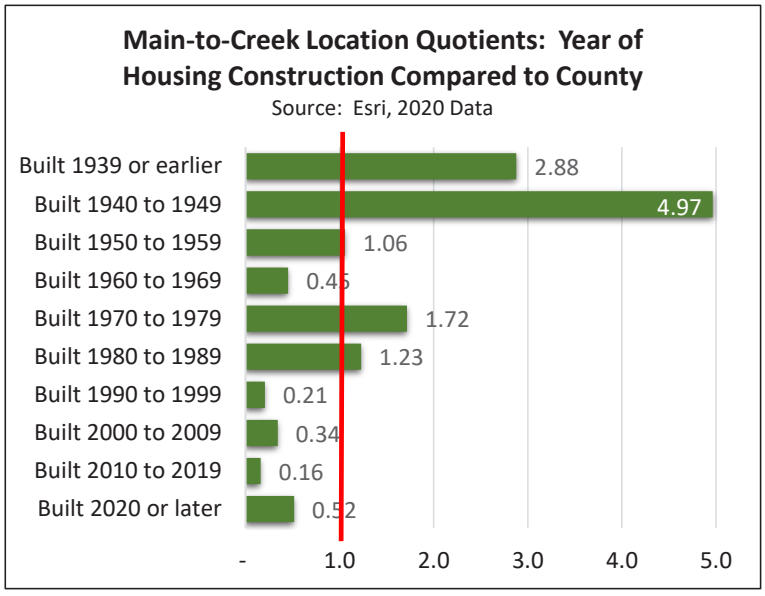
Age of De Soto's Housing, 2020

De Soto's housing stock is comparatively old when compared to all of Jefferson County, reflecting slower population growth. De Soto's housing is dominated by structures built before 1960. The graph depicts the location quotient of the city within the county. A value of "1.0" means that the percent of housing in De Soto constructed during that time period is the same as the county's percent. Higher LQs reflect higher shares than the county.



Four out of ten De Soto housing units (41.3%) were built before 1960, compared to 15.3% in the county and 27.0% in the entire U.S.A. The median year built of all housing in De Soto is 1970, compared to 1984 in Jefferson County and 1977 for the entire country.

The Main-to-Creek corridor's housing stock is also comparatively old when compared to the County, but slightly "younger" than in the rest of the city. The corridor's housing is dominated by structures built before 1950.

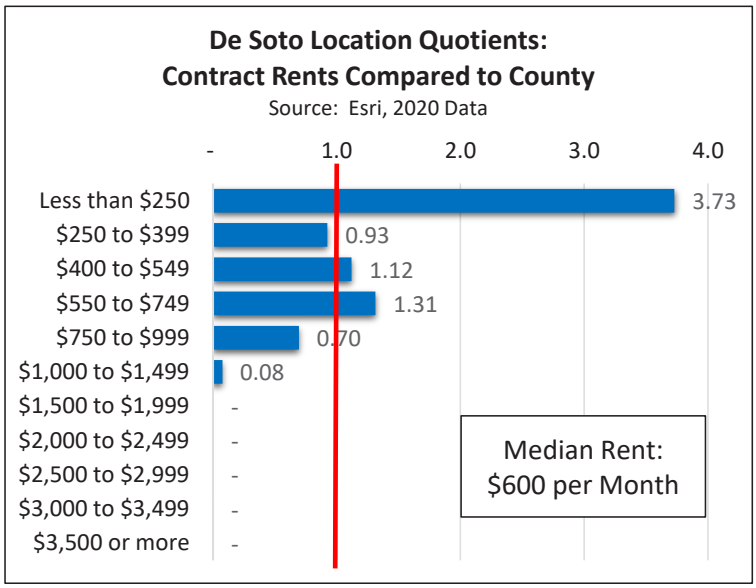


Almost four out of ten corridor housing units (37.6%) were built before 1960, compared to 15.3% in the county and 41.3% in De Soto as a whole.
The median year built of all housing in Main-to-Creek Corridor is 1973, compared to 1970 in De Soto and 1977 for the county.

A conclusion is that De Soto could benefit from an increase in housing construction—if population can be attracted. New housing could also be created to support potential relocated households from the flood-prone areas, a factor which would contribute to the city's reduction in the average housing age. That said, as noted earlier, the city already has an over-abundance of vacant units that could accommodate internal movements—or even in attracting new residents. Programs to substantially upgrade (or even replace) many vacant units to make the city more attractive in the market would also help to increase those units' life span, effectively reducing the perceptions of aging housing.

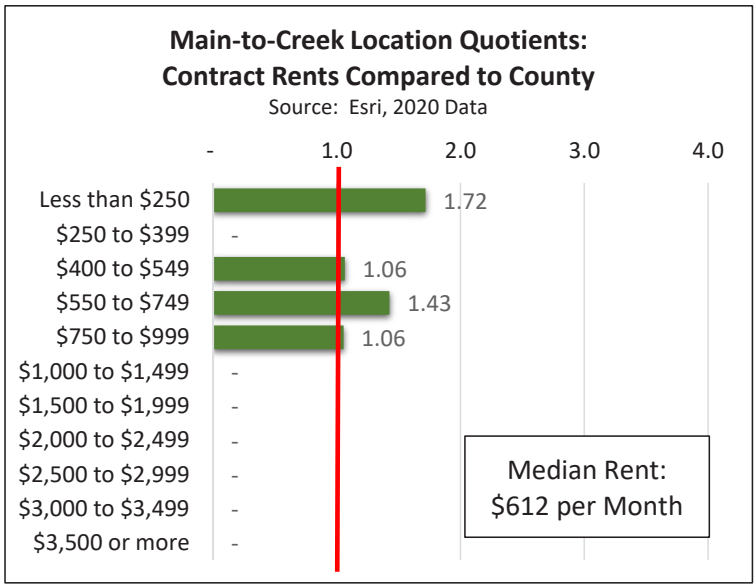
Contract Rents in De Soto, 2020

De Soto's contract rent for renter-occupied housing is comparatively low when compared to all of Jefferson County. Contract rent is the amount of money charged by landlords for a rented housing unit before adding in other costs for, say, utilities and other housing expenses.



Measured against the county, De Soto's rental housing, comprising two out of five occupied units, is dominated by monthly rents between $550 and $749, but the city has a much higher share of units rented below $250 when compared to the county. In today's housing market, monthly rents of $250 or less are indicators of poverty conditions even though such units are "affordable" to very low income households. Low rents also discourage landlords from investing in the properties (e.g., upgraded systems, new roofs, etc.) which allows the units to physically decline.

De Soto has a median contract of just $600 per month. Median rent in Jefferson County is $677, almost 13% higher than in De Soto. Moreover, De Soto's median is also lower than in the Main-to-Creek Corridor at $612. Again, Low rents contribute to an inability or unwillingness of landlords to invest in such properties.



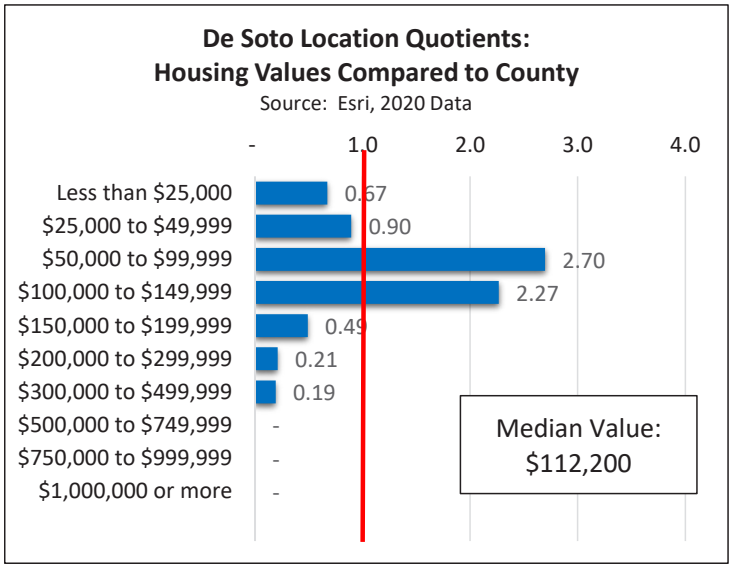
Rents in the Main-to-Creek study corridor are also comparatively low, but the concentration is such that the median is slightly higher at $612 per month than in the city of as a whole ($600).

Almost half (48.7%) of the units in the corridor that have contract rents fall between $550 and $749, about 43% higher than in the county as a whole. Still, the corridor has a substantially higher location quotient for the "less than $250" category, which keeps the median rent about ten percent lower than throughout the county.

Again, a preponderance of low rents discourages landlords from investing in their properties because little to no financial rate of return can be anticipated. This contributes to declines in property conditions and attracts lower income households in higher proportions than is likely desirable in De Soto. Lower rents also decrease property values which reduces potential property tax revenues, further stressing fiscal resources for city government, the public schools, and other taxing jurisdictions.

Housing Values as of 2020

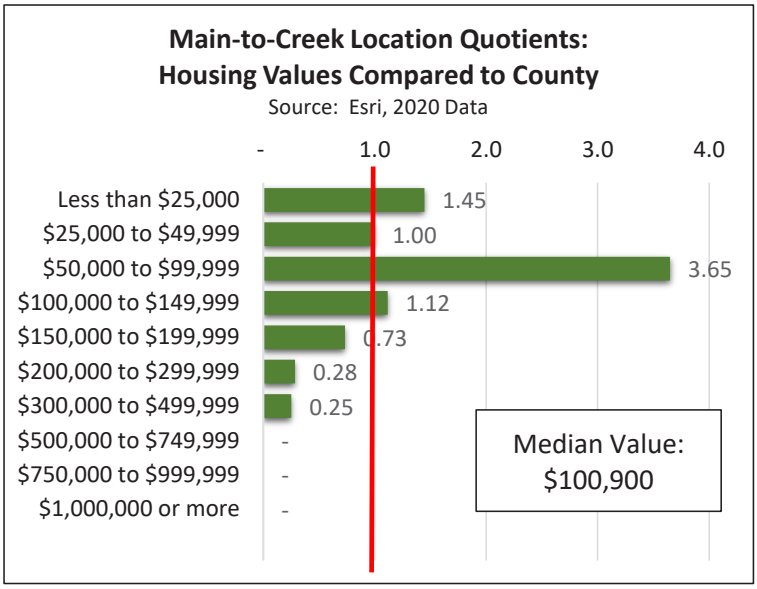
De Soto has much higher shares of owner-occupied housing units that are valued between $50,000 and $150,000 than in Jefferson County as a whole. Location quotients in these two value ranges significantly exceed 2.0 while all other LQs fall below 1.0.



Three quarters (75.0%) of all owner-occupied housing in the city falls into that $50,000 to $150,000 range, compared to less than a third in the county. This keeps the median value relatively low in De Soto at about $112,200, about two thirds of the county's median of $167,700. The city has no housing with values exceeding a half million dollars, while the rest of Jefferson County has almost 1,300 units in this range.

Lower housing values are a deterrent to housing developers, and even homeowners themselves, to invest in new or upgraded housing. They also contribute to lower property tax assessments which, in turn, limits fiscal resources of local governments to address important infrastructure and public services.

The median housing value is markedly lower in the Main Street-to-Joachim Creek corridor at $100,900, some ten percent less than throughout De Soto, and is just 60 percent of the county median. This should not be surprising given likely market reactions to flooding problems, if not other factors as well.



Four out of ten (39.2%) of the 96 owner-occupied housing units in the Main-to-Creek corridor fall in the value range of $50,000 to $100,000. This is 3.65 times the percentage for the entire county in this value range. Almost another quarter (22.7%) of the corridor's owner-occupied units fall in the $100,000 to $150,000 range. The corridor has no units with values exceeding a half million dollars.

Aggregate Housing Values in the Main-to-Creek Corridor

The *average* housing value for the 96 units that are recorded as having values in the Main Street-to-Joachim Creek corridor is estimated by Esri to have been $114,200 in 2020, a small amount higher than the median of $100,900. This suggests that the corridor has a few more highly valued housing units which increases the average over the median.







An average of $114,200 indicates that the overall value of the 96 housing units is approximately $11 million. In 2023, given inflation over the intervening three years, that aggregate value is probably closer to $12.7 million, or an average of $132,300.

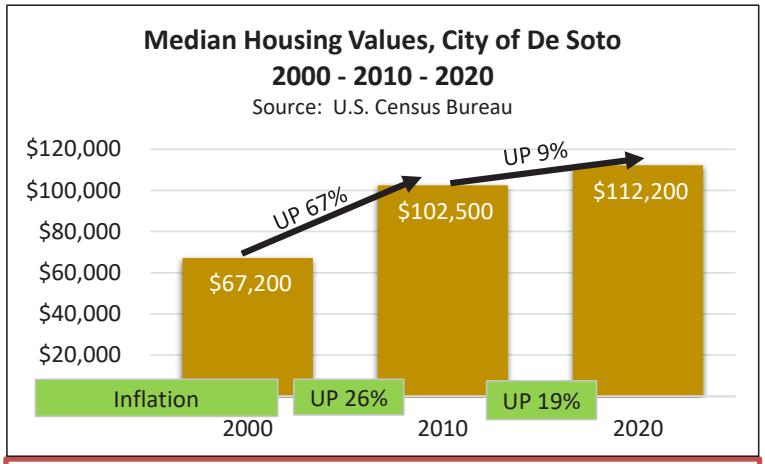
On a topside assumption that all other housing units in the corridor have the same average market value (that is, those that are presently renter-occupied plus those that are vacant), the aggregate value of all housing in the Main-to-Creek corridor would be about $27 million. A full buy-out program may require roughly that amount if implemented.

Trends and Comparisons in Median Housing Values

The median value of owner-occupied housing in the city of Desoto increased from $67,200 in the year 2000 (Census data) to $102,500 in 2010, then much more weakly to $112,200 in 2020.

Median value increases strongly exceeded the rate of inflation between 2000 and 2010. The median value in De Soto increased by 67% while inflation advanced only 26%.

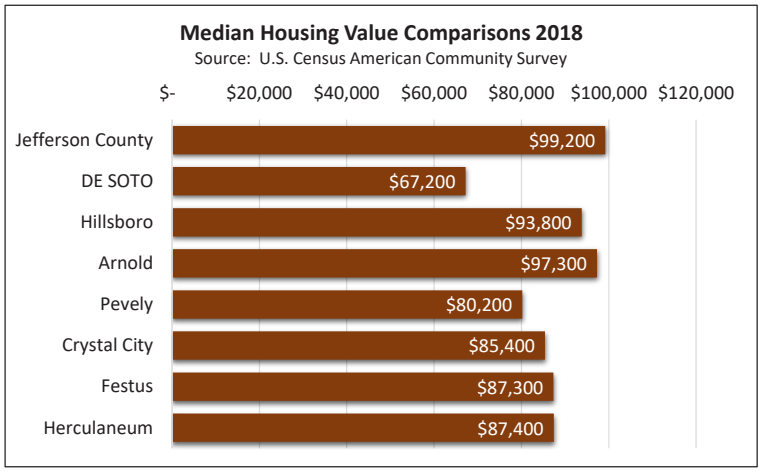
Fortunes reversed in the subsequent decade. The median value of homes in De Soto grew just nine percent over the most recent ten years but inflation was roughly double that. In effect, housing in De Soto lost relative value during the 2010s, again an indicator of the city's inability to attract population growth that was experienced in other Jefferson County cities, and an indicator of increasing stress on local property tax resources compared to likely rising costs of operating city and other local governments.



Reminder: Median value means that half of the housing units have values above that number and half have values below the median. The median is not the average.

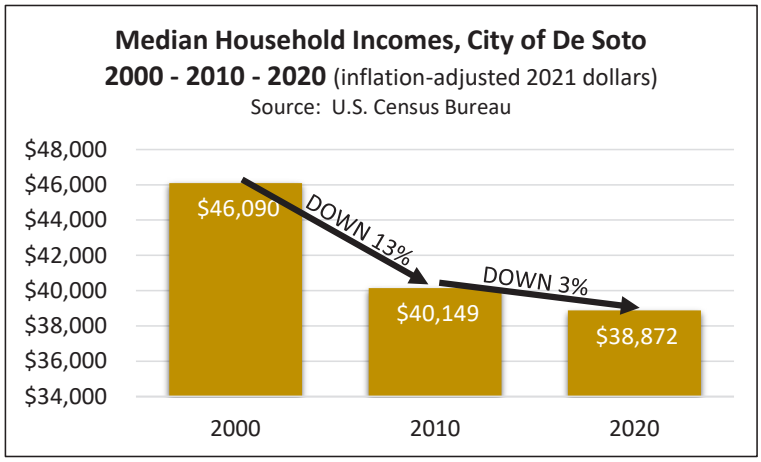
American Community Survey (ACS) data from the U.S. Census Bureau for 2018 show that De Soto had a substantially lower median housing value than its larger peer cities in Jefferson County.

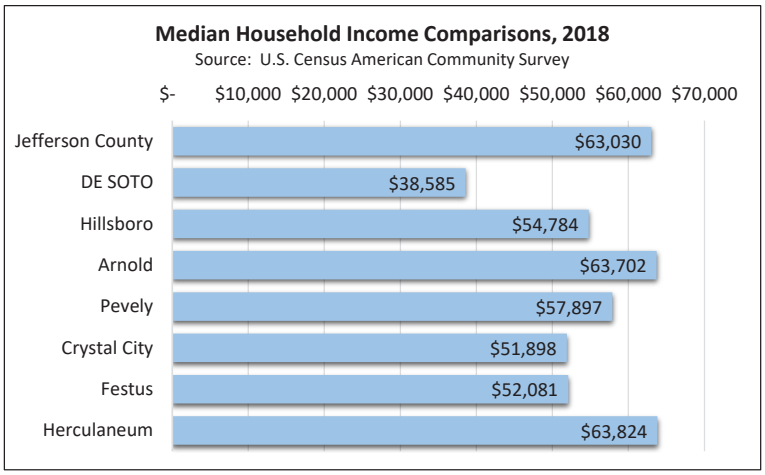
At a median of just $67,200, De Soto's value was just 68% of the county-wide median. Closest to De Soto was Pevely with a median of $80,200, but this was still one-fifth higher than in De Soto.



Trends and Comparisons in Median Household Incomes

Probably a major contributing factor to the relatively slow increase in median housing value between 2010 and 2020 was a three percent *net decline* in median household income among De Soto residents during that time—even accounting for inflation. Adjusted to 2021 dollar values, De Soto's median household income was not quite $38,900 in 2020, down three per cent from 2010.
But median household incomes decreased even more sharply between 2000 and 2010. The inflation-adjusted median income in De Soto decreased by 13% in that decade. Reduced real household incomes (i.e., inflation-adjusted) contribute to an inability to afford higher prices or rents in the housing market. This results in depressed prices and rents as the market adjusts over time, and to diminished property taxes as well as reduced buying power for retail shopping with lower sale tax revenues as a result.





Adding fuel to these flames, De Soto's median household income in 2018 was substantially below the other larger cities in Jefferson County. At $38,585 in 2018, De Soto was at just 60 percent of the county-wide median. Closest to De Soto was Crystal City at $51,898, yet this was still one-third more than in De Soto.

COMPREHENSIVE HOUSING AFFORDABILITY DATA

De Soto's relatively declining household incomes, buying power, and housing values hinder the city's ability to raise local fiscal resources to address flood resiliency. But these may also be indicators of challenges to housing affordability, though, as suggested by the data, the housing "market" may be already adapting to declining incomes (and other factors) by reducing values and rents to more affordable ranges.

Still, it is relevant to look at independent sources of information on the challenges of affordability—challenges which extend not only to individual households but also to fiscal sustainability in local government. An excellent resource is the Comprehensive Housing Affordability Strategy (CHAS) data provided by the U.S. Department of Housing and Urban Development (HUD), in conjunction with the Census Bureau, for cities across the nation. This section of the report discusses CHAS data and its implications for De Soto.

There are four housing "problems" addressed by the CHAS data (Source: "Definitions"-- https://www.huduser.gov/portal/datasets/cp/CHAS/bg_chas.html):

1) housing units that lack complete kitchen facilities;
2) housing units that lack complete plumbing facilities;
3) households that are overcrowded; and
4) households that have "cost burdens" greater than 30 percent of monthly incomes.

A household is said to have a *housing problem* if it has any one or more of these four problems. But a household is said to have a *severe housing problem* if it meets a fifth criterion:

5) households that have "cost burdens" greater than 50 percent of monthly incomes.

Housing costs in the CHAS data are separated between owner-occupants and renter-occupants.

- Housing costs for homeowners are considered the total of mortgage payments, utilities, association fees, insurance, and real estate taxes.
- Housing costs for renters are considered "gross rent," which is the sum of the contract rent (what the household pays the landlord) plus utilities. If some or all the utilities are paid through the rent, gross rent becomes either the overall rent payment or that payment plus other utilities.

Income is measured at the household level against the HAMFI, or the H.U.D Area Median Family Income. This is the median family income calculated by HUD for each jurisdiction to determine Fair Market Rents (FMRs) and income limits for HUD programs.

The Income Distribution Overview charts, on the next page, compare the household incomes in De Soto renter and owner households with the household incomes of the renters and owners in Jefferson County and the State of Missouri between 2015 and 2019 (the latest years available from HUD). The income conditions are very similar for homeowners in Jefferson County and in Missouri as a whole, while income conditions are significantly lower in De Soto.

HUD counted 1,135 renter households in De Soto (the sum of the blue bars in the top graph) as the annual average for the 2015-2019 period. 765 of these renters (545 + 220) had household incomes of less than half of the HAMFI, or two thirds of all renters (67%). This was much higher than in Jefferson County (47% of renters below half the HAMFI) and in Missouri as a whole (45%)

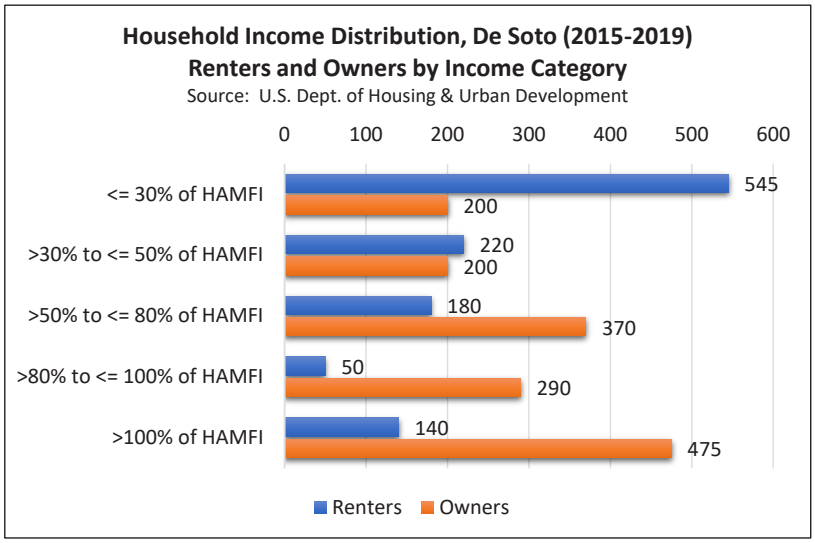
HUD counted 1,535 owner-occupied households in De Soto (the sum of the orange bars in the top graph) as the annual average for the 2015-2019 period. 400 of these homeowners (200 + 200) had household incomes of less than half of the HAMFI, or one quarter of all owners (26%).

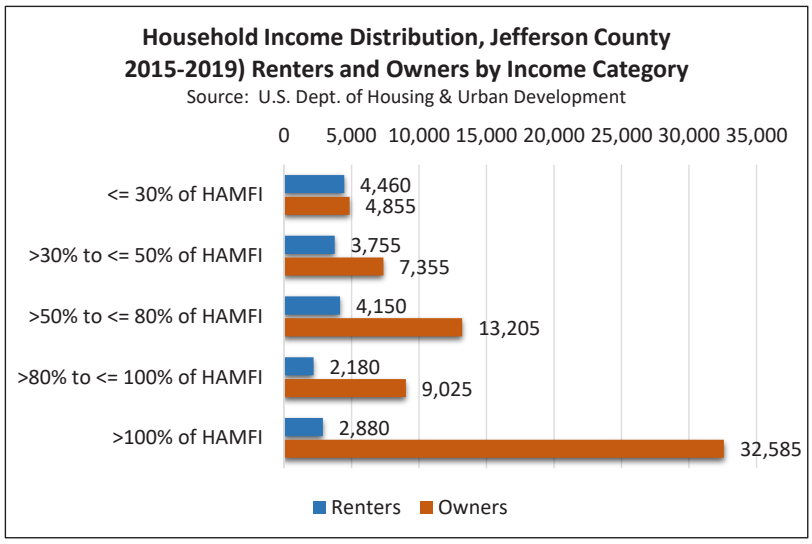
This, too, was much higher than in Jefferson County (18% of homeowners below half the HAMFI) and in Missouri as a whole (16%).

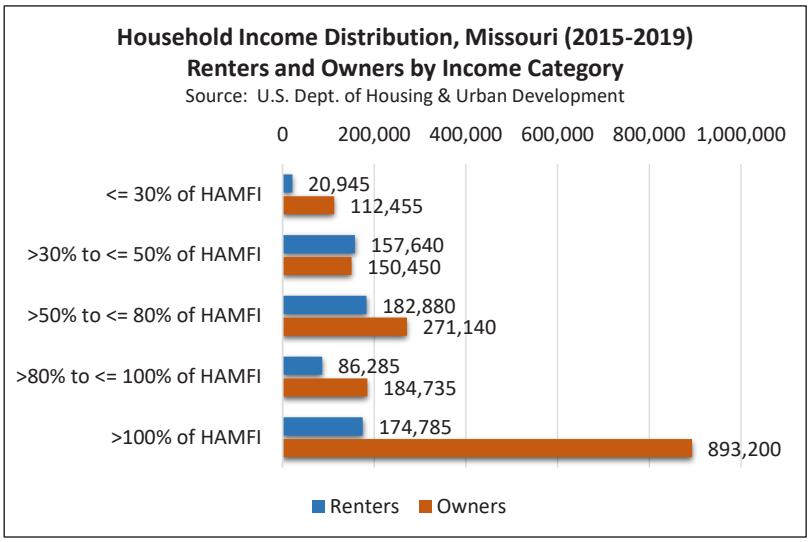
It is once again clear that De Soto has relative concerns about households with sufficient incomes to address housing costs, let alone costs of flood resiliency or even relocation.

Next, the topic turns to challenges that De Soto renters and homeowners face about the ability to afford normal housing occupancy costs. Recall that renters are "cost burdened" when the expenses of contract rent and utilities exceed 30 percent of their incomes and are "severely cost burdened) if such costs exceed 50 percent of their incomes.

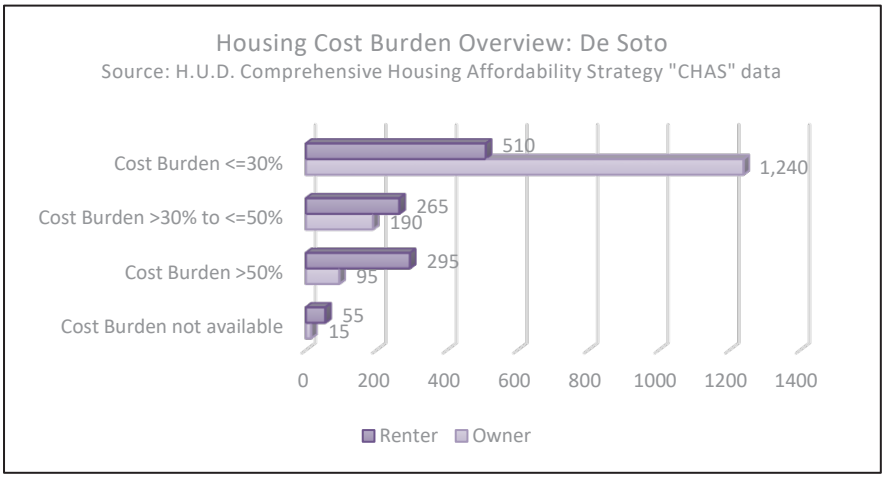
Likewise, homeowners are cost burdened when the expenses of mortgage payments, insurance, property taxes, and utilities exceed 30 percent of their incomes; and they are severely cost burdened when such expenses exceed half of their incomes.



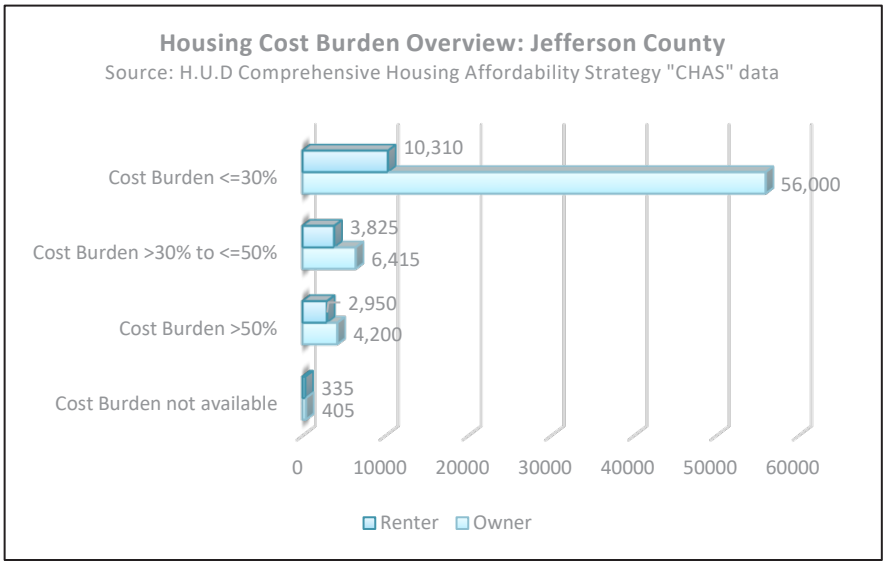




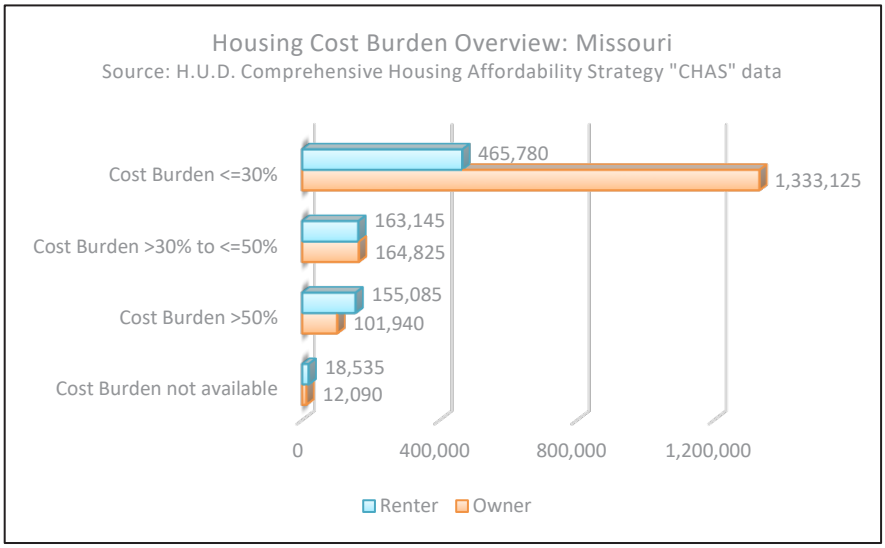
As shown to the right, HUD estimated housing cost burdens for 1,070 renter-occupied households (first three top bars). 265 of these households (one quarter, or 25%) had cost burdens of between 30% and 50% of their annual incomes. Another 295 renters (27%) had severe cost burdens exceeding half of their incomes. All-in-all, over half of the renters in De Soto (52%) were cost burdened when it comes to comfortably affording housing occupancy costs.



The equivalent percentage in Jefferson County was 40 percent, and 41 percent in Missouri.



Shifting to cost burdens among owner-occupants, the top graph indicates that HUD estimated cost burdens for 1,525 De Soto homeowners, only 19 percent of whom had cost burdens or severe cost burdens, much lower than for renters. In fact, De Soto's homeowner cost burden was essentially equivalent to Jefferson County (16%) and Missouri as a whole (17%).

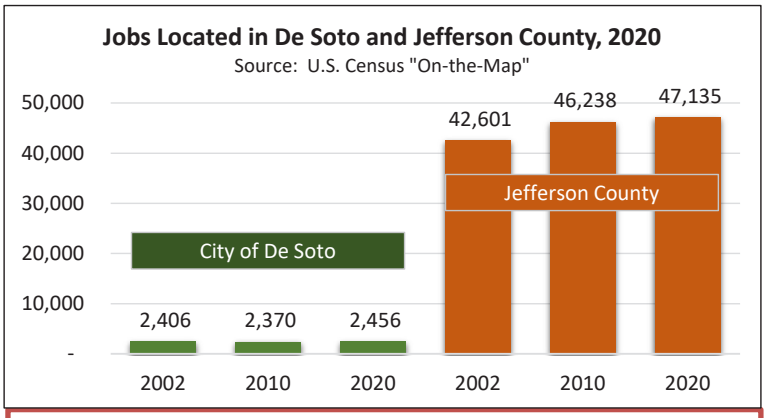


The particular strains on affording housing in De Soto, therefore, are among renters, but there is still no small number of homeowners facing important difficulties in affording housing occupancy costs. Where these costs might also involve flooding issues, the extremes lead to an inability to resist major damages.

JOBS AND THE ECONOMY

JOBS IN DE SOTO AND JEFFERSON COUNTY, 2020

The Census Bureau's "On-the-Map" data series shows 2,456 jobs located in De Soto as of calendar year 2020, the latest year for this data series. Unfortunately, this "city data" excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.

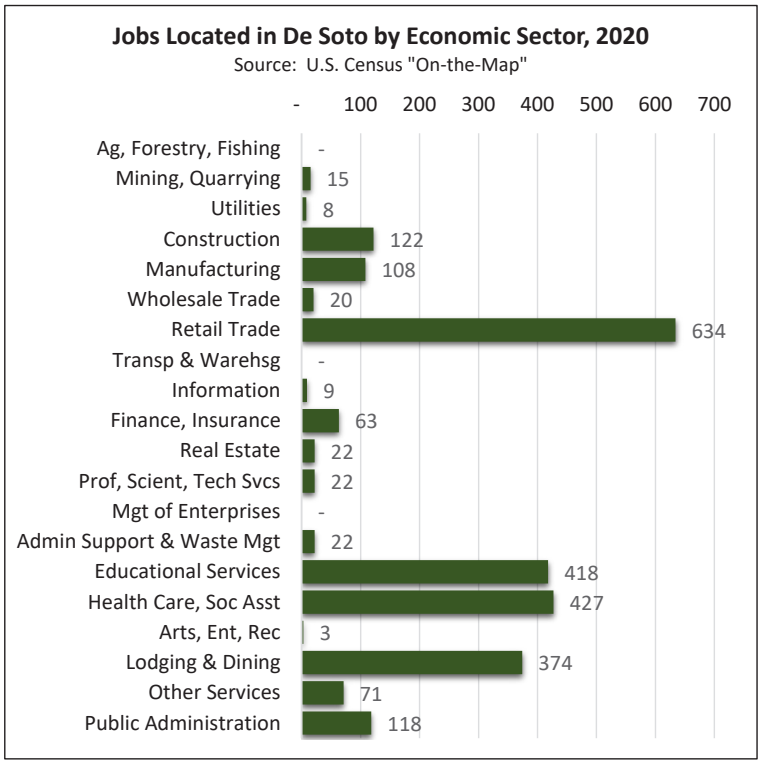


Note: These numbers are almost certainly an undercount based on how the data are compiled, but the proportion of jobs by economic sector is quite valid. The data rely on jobs where the addresses of both the workers and their employers are known, so it is mostly payroll-based and not accounting for as many as 20% additional kinds of jobs.

There has been net growth of only 50 jobs in the city since 2002 (up 2.1%), the beginning of this data series, though the rate of increase since 2010 was 3.6 percent. Meanwhile, Jefferson County added about 4,530 jobs from 2002 to 2020, up 10.6%. This pace outperformed the 2.4% growth in metropolitan area jobs.

JOBS BY ECONOMIC SECTOR IN DE SOTO, 2020

De Soto's largest job sector is retail trade where over a quarter (25.8%) of all jobs are found. Unfortunately, this "city data" as provided by the U.S. Census Bureau excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.



De Soto also has a relatively high number of educational services jobs (17.0% of all jobs), health care and social assistance jobs (17.4%), and lodging and dining jobs (15.2%). These four sectors are also noted for generally low average wages and salaries with some important exceptions in health care.

De Soto captured 5.6% of all Jefferson County jobs in 2002 but this dropped to 5.2% by 2020 given the county's more robust growth and De Soto's relative stability.

Employment and Workforce Location Quotients in De Soto, 2020

A jobs location quotient compares the percent of jobs by sector in De Soto to the percentages in the same sectors in a larger economy—in this case, the St. Louis metro area. A quotient of 1.0 means the percentages are the same. Higher LQs suggest "export sectors" while LQs lower than 1.0 suggest local service sectors.

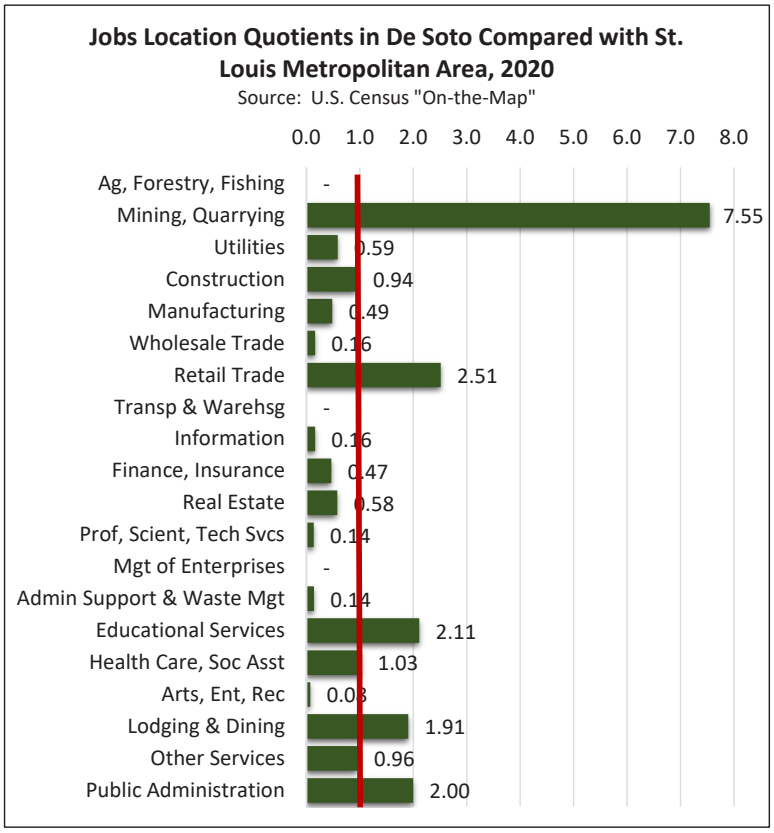
The mining and quarrying sector shows up as a particular advantage in De Soto, but keep in mind that this sector has only 15 jobs in the city. Still, this is a much higher percentage than in the metro area as a whole.

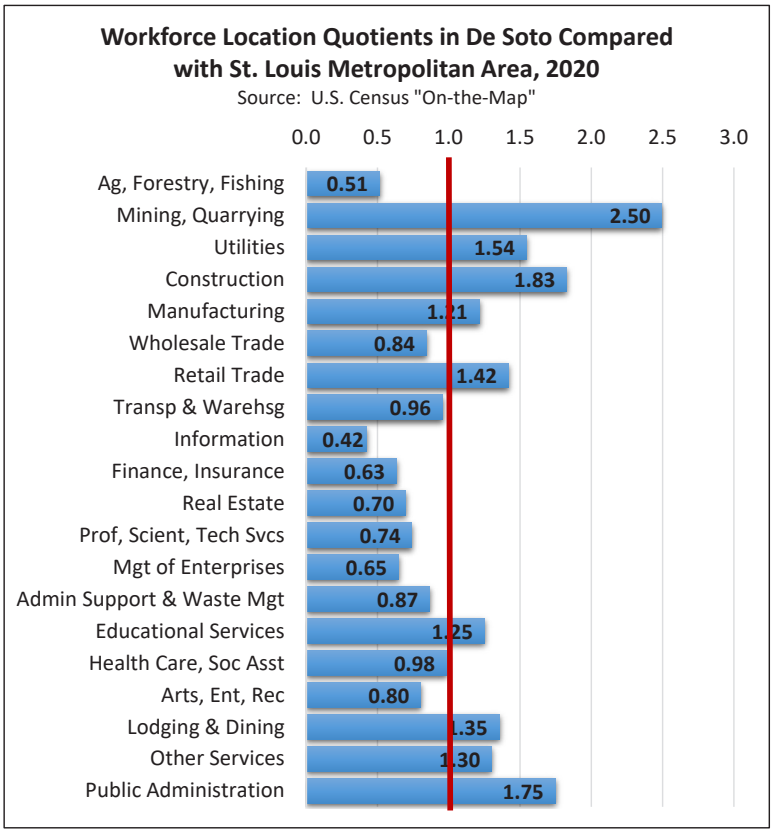
More informative are the rather high (much greater than 1.0) LQs for retail trade and educational services. These ratios are based on jobs located in the city regardless of where the workers live. Other strengths of note are in the lodging and dining sector and in public administration.

But a great many sectors have LQs of less than 1.0. This is indicative of a less-than-resilient economy with relatively few "export industry" jobs (again, however, excluding UP's jobs).

The subsequent graph shows location quotients for De Soto's workforce, or those residents of the city who have jobs regardless of where they work. Again, mining and quarrying is a relative strength for the local workforce, but this is a very small sector in the metro area.

De Soto's residents have notably higher than average percentages of jobs in construction, utilities, retail trade, and public administration (i.e., government). Lesser strengths are also in retail trade, manufacturing, lodging and dining, and other private sector services.

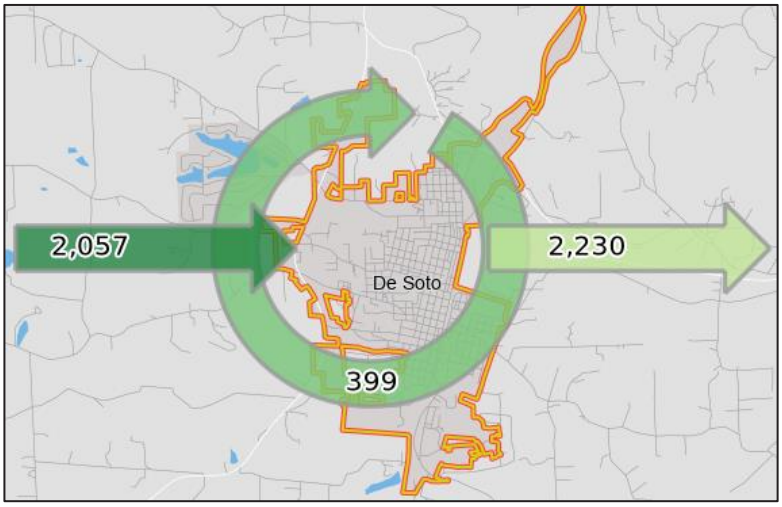




There is a balanced distribution of job sectors among the resident workforce, but the "spreads" are wider than is probably desirable. More population employed in the other sectors, which tend to have higher earnings potential than most of the above, might be an economic development goal for De Soto.

De Soto Commuting Patterns, 2020

De Soto is slightly a "net bedroom community." More residents leave the city for jobs elsewhere than commute into the city for jobs. But the differences in commuting aren't particularly large. That said, 84.8 percent of the employed residents of De Soto work outside the city. Some 2,230 De Soto residents commuted to jobs in other places in 2020. They were not quite replaced by 2,057 in-commuters taking jobs in De Soto (again excluding jobs at Union Pacific). The "daytime" population of De Soto was smaller than its "nighttime" population.

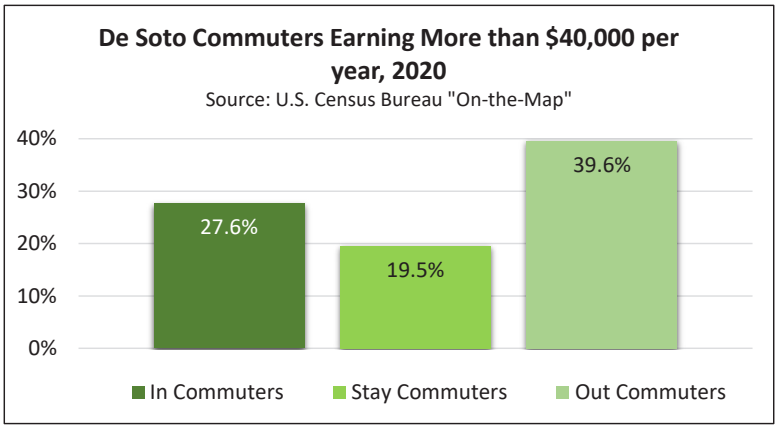


Using these data, there were 2,456 jobs in the city in 2020 (2,057 + 399). Of these jobs in De Soto, 399 were held by De Soto residents (16.2%) while 2,057 were held by outsiders (83.8%). On the other hand, there were 2,629 residents of De Soto holding jobs in 2020 (2,230 + 399). Of these, 399, or 15.2 percent, stayed in the city for work while 84.8 percent commuted elsewhere.

This "bedroom community" imbalance is more pronounced for the entire county. About 78,790 JeffCo residents left the county for jobs in 2020 on an average day, compared to 22,700 commuting into the county from other places. That is, in-commuters were the equivalent of only 29 percent of the county's out-commuters, while De Soto's in-commuters were the equivalent of 92 percent of the out-commuters.

Earnings of De Soto Commuters

Out-commuters from De Soto brought home higher earnings in 2020, on average, than those who work in De Soto. Almost four in ten (39.6%) out-commuters earned more than $40,000 per year from their jobs, the highest of three earning categories of this Census Bureau database.



But only just over a quarter (27.6%) of the people commuting into De Soto for jobs earned over $40,000, while only about a fifth (19.5%) of those who both live and work in De Soto earned that much. In short, jobs in De Soto are relatively low paying (again, excluding the UP jobs) while De Soto residents who work elsewhere bring home higher incomes from their jobs.

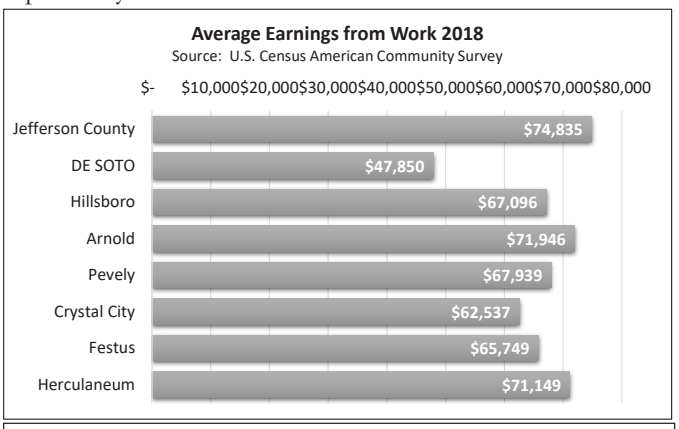
This suggests at least one benefit and one opportunity for De Soto. While household incomes are generally relatively low among the residents (see median household income, above), the incomes of the out-commuters add tremendously to the buying power of local residents, helping to support the city's strong retail sector. But this benefit might be greatly improved if more jobs in higher paying economic sectors could be attracted. Some of these could be filled by local residents who presently must commute elsewhere.

Average Earnings from Work Comparisons 2018

Even with relatively higher wages of the out-commuters from De Soto vs. jobs in the city, the Census Bureau's American Community Survey in 2018 found that De Soto residents earn substantially less than residents of peer cities in Jefferson County.

At an average of $47,850 per year (2018 dollars), the average employed resident of De Soto had earnings of only 64% of the county-wide average. The nearest average to De Soto was in Crystal City, but even this was almost one-third more than in De Soto.

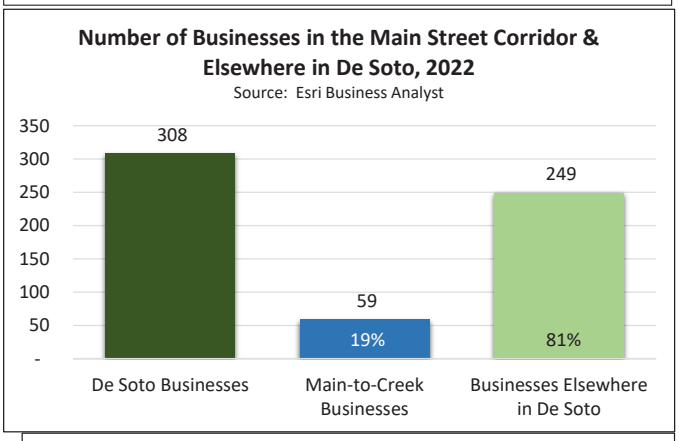
Unfortunately, these findings continue to confirm that De Soto probably falls behind its peers in local wealth, income, and related resources to readily afford more public investment in infrastructure and other flood resilience initiatives.

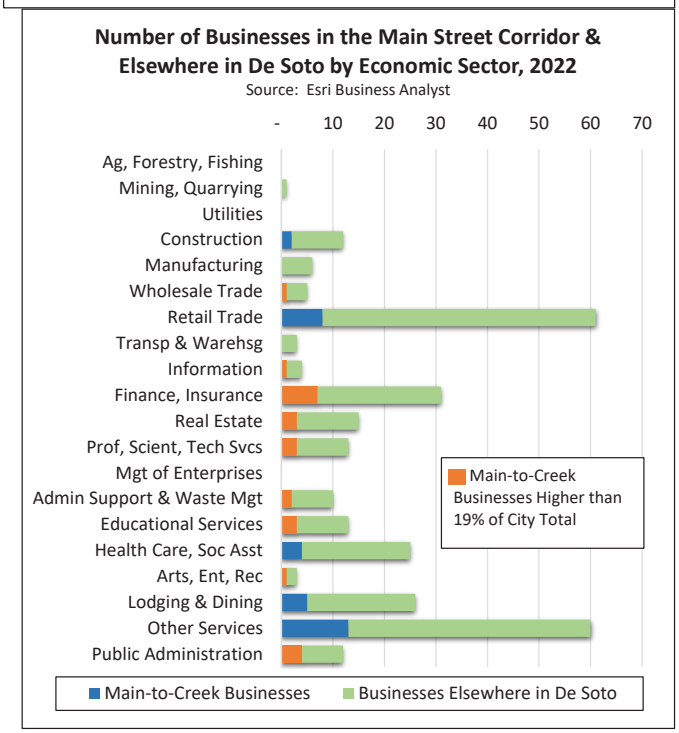


Number of Businesses in De Soto

The Esri Business Analyst database estimates that there are 308 business establishments in the city of De Soto. This excludes, of course, Union Pacific which is located outside the city limits. It does include, however, public and governmental establishments like city hall and the library. There are 12 such public establishments in De Soto, four of which are in the Main Street-to-Joachim Creek corridor.

Of the 308 businesses throughout the city, 59, or 19 percent, are located in the Main Street-to-Joachim Creek Corridor. The rest of the city contains the other 249 businesses, or 81 percent.





The next graph shows that nine of the 17 (over half) economic sectors with businesses in the city of De Soto have higher percentage representations in the Main-to-Creek corridor than the overall average of 19 percent citywide. The numbers may not be substantial in each case (e.g., one out of five is 20%, which is higher than 19%), but they nevertheless are indicative of important strengths that the downtown area brings to De Soto's economy.

Number of Employees per Business

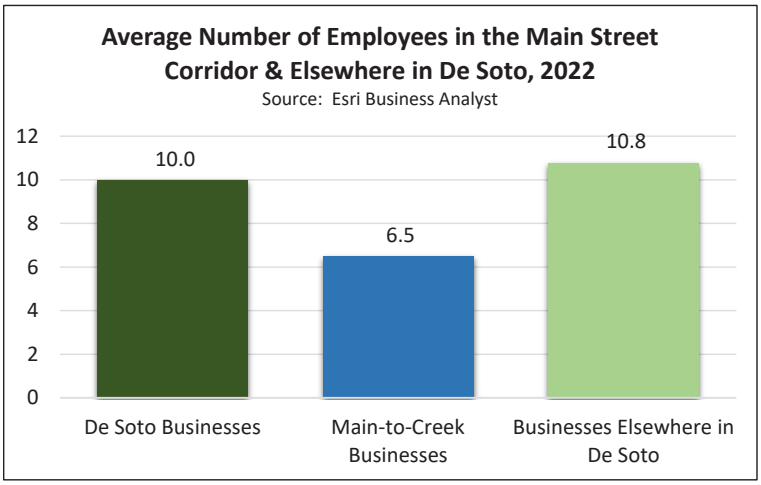
The average business in the Main-to-Creek corridor is considerably smaller than elsewhere in the city. Main-to-Creek corridor businesses average 6.5 employees, about 60 percent the size of the average business elsewhere in the city where the typical business has 10.8 employees.

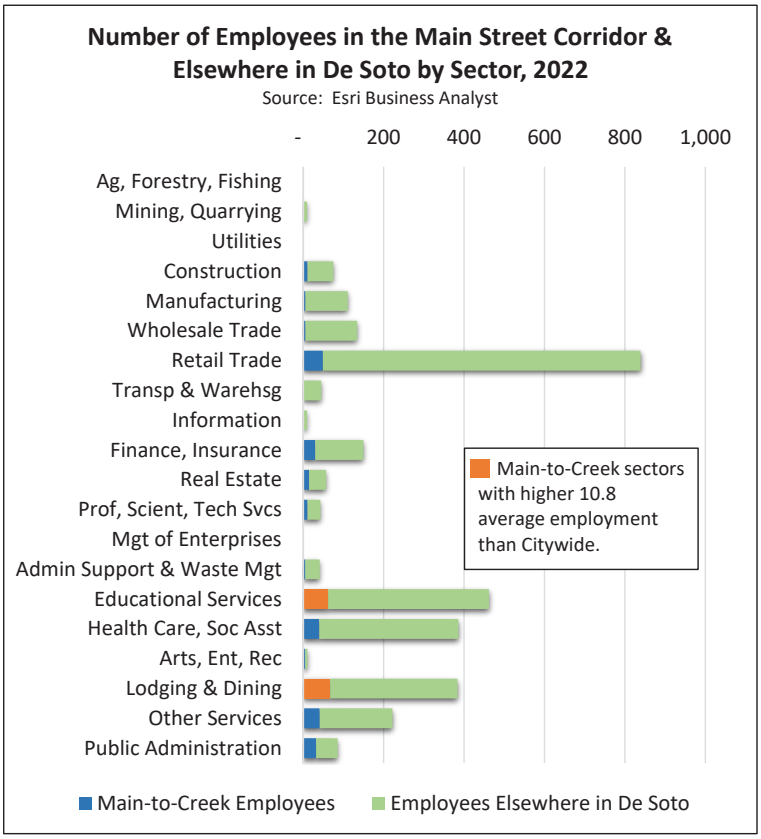
The overall average for the entire city of De Soto is 10.0 employees per establishment. This overall average is only slightly smaller than the county-wide average of 11.2 employees per business establishment.

This partly suggests that the downtown area is a place for small businesses. While many of the non-downtown businesses are also "small," the citywide average is increased by relatively large employers such as Walmart and the public schools. Again, these numbers exclude Union Pacific in the downtown area.

Only two economic sectors represented in the Main-to-Creek corridor have average employees per business greater than the 10.8 average number of employees outside of the corridor:

- The three educational services establishments in the downtown area average 20.7 employees.
- The five lodging and dining places average 13.4 employees.





The four health care and social services establishments in the Main-to-Creek area come close by averaging 10.0 employees, which is equal to the overall city average.

De Soto contains 5.9 percent of Jefferson County's businesses and 5.3 percent of the county's employment in those businesses.

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E

Voluntary Buy Out Plan

Resilient De Soto: Voluntary Buyout Plan

Prepared for the City of De Soto, MO in partnership with:

Citizens Committee for Flood Relief
H3 Studios
St. Louis University Community Planning Lab

Prepared by:

Kelly Leilani Main, Buy-In Community Planning

Executive Summary

Flash flooding of the Joachim Creek presents substantial risks to residents and businesses in the floodplain and challenges the City of De Soto's desires to achieve community-wide resilience. Minimizing or eliminating the threat to life and property in the floodway remains one of the most critical tasks facing the city today.

Although in some cases, structural measures such levees or berms can accomplish flood protection for structures and people, multiple flood studies have identified that these are not feasible given regional geomorphology, hydraulic and hydrological analyses, and prohibitive costs. Thus, a Voluntary Home Buyout Program (Buyout Program) remains one of the most feasible and recommended solutions. A Buyout Program can support at-risk residents to relocate out of the Joachim Creek Floodway and into safer and more secure housing of their choice. It can also enable the restoration of the floodway into publicly accessible open space to improve overall quality of life for residents throughout De Soto and its neighboring communities.

Ongoing survey and outreach initiatives led by the Citizens Committee for Flood Relief and Buy-In Community Planning to floodway residents have highlighted their desire for a voluntary buyout program. The following memorandum lays out an overview of how buyout programs work including case studies from other buyout programs in Missouri and the United States; the hazards facing De Soto that a buyout program will mitigate, findings from household-level surveying on resident perceptions of buyouts, an overview of different funding streams available, and recommendations for the creation of an ongoing buyout and floodway restoration program that will make De Soto more resilient in the years to come..

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1. Introduction

Buyout Basics

A floodplain buyout is a property acquisition in which the government purchases private property, relocates or demolishes any structures on it, and preserves the land as open space in perpetuity to restore and conserve natural floodplain functions.

How does the process work?

When residents impacted by flooding no longer feel safe or have experienced a flood event, they can ask their local government to apply for public funding such as FEMA's Hazard Mitigation Assistance grant program (HMA) or HUD's Community Development Block Grant program (CDBG). Local government (subapplicants) prepare applications to state agencies, who then submit to the relevant federal agency (FEMA or HUD). If the state agency approves the application, the local government can make an offer to acquire residents' property. If residents accept that offer, they receive compensation and assistance relocating away from that flood-prone site. Then, any buildings at the site are removed. Depending on which funding source is used and the desires of the community, the land can be permanently conserved (restricted from being redeveloped) or transformed into another type of community asset like a park. This process eliminates the risks and costs associated with flooding and rebuilding on that property, and can even save lives by allowing residents to move out of harm's way.

How much does it cost?

If a buyout program is locally run, local government officials can decide what compensation and support they provide as part of a buyout offer, but most successful buyout programs provide homeowners the pre-storm, Fair Market Value (FMV) of their property. Guidance from the Missouri State Emergency Management Agency (SEMA) recommends that buyout award estimates use the assessed value of the property + 30%. If the buyout award is funded by FEMA, the property will have a formal appraisal process conducted with the homeowners to determine either the pre-event value of the property or the current value, whichever is higher. Homeowners who disagree with the appraised value have the right to challenge the appraisal until an agreement can be reached. If homeowners still believe the offer is unfair or inadequate, they can drop out of the program at any time.

Why do some homeowners reject buyout offers?

Unfortunately, the FMV of flood-prone homes is often less than what is required to find replacement housing in less hazardous areas. Identifying what it will reasonably cost to move into nearby,

comparable housing outside of high-risk areas is an important part of making sure that people who want relocation assistance are actually able to move. People with disabilities, living on fixed income, or who have taken on debt to recover from flooding may face substantial financial constraints to participate, even if they want to get out of their current situation. If they are unable to afford a new place to live, they are likely to drop out of the program.

How can I increase the likelihood of buyout success?

Some buyout programs provide households with additional funding to help them relocate, as well as legal and social support services. For example, current policy from FEMA allows up to $31,000 as a rehousing supplement to help households find comparable housing. The Missouri Department of Economic Development Voluntary Home Buyout Program (DED VHBOP) provides up to $50,000. Local governments can also come up with creative solutions, like establishing a property swap program, rehousing floodway residents into refurbished properties, or providing dedicated case management to help people understand their options.

What about rental properties?

Renters cannot receive a buyout because they do not own their residence, but owners who are landlords can. Renters are guaranteed relocation assistance if their landlord accepts a buyout offer under a federal law called the Uniform Relocation Assistance and Real Property Acquisition Act (URA). This law requires – at minimum – relocation advisory services to displaced tenants and owner occupants, 90 days written notice to vacate, reimbursement for moving expenses, and payments for up to 42 months of the added cost of renting comparable replacement housing. Replacement housing is decent, safe, sanitary, adequately sized for that number of occupants, affordable (costing 30% or less of their income), and with a location that is as accessible/desirable as their previous home.

Buyout Best Practices

Integrate Buy-Outs With Other Community Development Goals

Despite the numerous benefits that buy-outs can provide, communicating about voluntary relocations as a potential opportunity for families dealing with chronic flood risk is still a rare practice. In order to get this “buy-in”, real solutions that meet people’s needs must be co-developed and delivered on. The Resilient De Soto Plan in conjunction with buyouts can be a model program for many other communities seeking to deal with chronic flood risk by integrating flood mitigation, economic development, and open space planning together. The key is to bring the public, especially buy-out participants, into that conversation so that they see themselves as part of the solution and provide

them with feasible solutions to improve the quality of their own lives and the lives of their families, friends, and neighbors.

Communicate Early and Often

In many locations, residents are offered buy-outs before the local government has effectively engaged local perspectives and perceptions. Working with Buy-In and the Citizens Committee for Flood Relief, the City of De Soto has laid a strong foundation for a truly community-led buyout process. However, there is still a lot of work to do in De Soto to contact households and businesses who have not yet been surveyed. An engaged public and good data are essential to flood resilience, and residents need good information to help them decide whether or not relocation is a good option for them. Beyond initial outreach, communication is essential along every step of the process, from when people first express interest to when their application moves through the formal federal funding process.

Work with Community Organizations

The Citizens Committee for Flood Relief has been a powerful partner for finding resources for flood resilience in De Soto. However, having only one partner buys a tremendous amount of responsibility and pressure on that organization to deliver. Different stakeholders may have different perspectives and approaches for engaging with people living in the floodway. Building broader coalitions of citizen stakeholder groups, community service organizations, business groups, religious groups, and others, is essential to maximizing reach regarding the benefits of the program.

Incorporate Buy-Outs in Community Open Space Planning

Communities that have open space plans are more likely to readily incorporate buy-out properties into a strategic vision for community development and recovery (Zavar and Hagelman, 2016). Including participants in the planning process for end-use may not only ease residents' lingering concerns over end-use planning (Binder et. al, 2018), but also reduce some of the pain of flood experience by building a community amenity that residents feel proud of and have ownership of. Thus, while guidance on best practices is likely to play an important role in identifying possibilities for post-buyout properties, alternative tools and techniques for helping communities envision what to do with vacant parcels given their local needs is perhaps even more important. Some best practices include the US EPA's Getting in Step (US EPA, 2010) outreach guidelines. The City of Houston already has great practices for incorporating this - for example, the Bayou Greenway program is rekindling public interest in, awareness of, and support of our riparian areas and how they can be valuable green space amenities. Open space planning is an element of the Resilient Houston plan.

Utilize Partnerships

Due to limitations and competition for limited public funding available for relocation and floodplain restoration projects, partnerships with private entities and non profit organizations to provide funding, capacity, and expertise create useful opportunities for collaboration. Resilient De Soto will be more successful based on the number of stakeholders who can Buy-In to the vision. That means working with citizen and public sector programs across social work, public health, education, conservation, recreation, and resilience. Start conversations early with potential partners to secure resources that can help the City realize a vision for a more resilient De Soto along every stage of the project.

Build Flexible Program Timelines

Time is one of the major challenges of existing buyout programs, not just in terms of long timelines and waiting, but also because the calendar of federal grant deadlines often does not sync up well with the calendar of people's lives. Households who have kids in school, who are almost done paying off the mortgage, or who are close to retirement, may be interested in a buy-out in the long run, even if it isn't *right now.* Forming relationships with those homeowners to give them a flexible timeline for relocation may increase willingness to participate and reduce the stress and anxiety of program deadlines. For example, pursuing novel strategies such as life estates for "hold outs" or residents who are reluctant to leave could be one way to ensure that properties are incorporated into a longer-term vision for floodplain restoration and climate adaptation without forcing older residents to relocate in their remaining years.

Use Local Funds to Increase Flexibility

Since federally-funded buy-out programs can take years to implement, developing local revenues for acquisitions can speed up the process and improve participant experience. Since 2003, the Charlotte-Mecklenburg County Stormwater Services department established a "rainy day fund" to set aside funding to purchase damaged or distressed properties before any repairs are made. This "Quick Buy" program has added increased speed and flexibility for acquisitions based on the local needs and priorities outside of federal funding guidelines (See Charlotte Mecklenburg Case Study, Chapter 4).

Be Transparent

Buyout programs can cause significant distrust amongst residents due to a perceived lack of clear program guidelines, confusion around eligibility requirements, designated buyout areas, and a lack of communication. It cannot be understated how important clear and frequent communication about program goals, processes, and parameters for participation are. Empowering residents to be part of the design of the program can also build trust - but if the program choses alternatives from what the

community has proposed, transparent communication about why the recommendations are not implemented will be essential.

Streamline the Process

Reducing confusion for participants by streamlining and simplifying the intake process will likely improve participant satisfaction with the program. A centralized, shared data management system to keep people's applications on file will not only reduce the amount of paperwork that residents have to complete but also limit the possibility of lost documentation, especially if they have recently experienced a flooding event or have previously taken support from other recovery programs such as Individual Assistance. Increasing these efficiencies will not only reduce participant frustration but also hopefully speed up the process and prevent missed deadlines.

Offer Wrap Around Services

Wrap-around services include a variety of services to people considering or going through a buy-out related relocation. As summarized in a recent Urban Land Institute report (Sheppard, 2021): Services can include support identifying temporary or permanent residences, moving, identifying schools and transportation methods, and meeting other needs. Entering into an agreement for a buy-out may cause hesitation among homeowners because of challenges related to displacement and relocation. Offering these wraparound services can put homeowners in a better position to consider a buy-out. For example, the New Jersey Blue Acres program provides social and relocation assistance to property owners and tenants in flood-prone areas. Additional wrap around services may include relocation assistance, job seeking assistance, rental assistance, mental health services, legal aid, financial counseling, and similar services. The nature and extent of wrap around services offered and provided will differ among housing typologies.

Seek Participant Feedback and Monitor Outcomes

Although buyout programs have been implemented for more than four decades across the United states, there is still limited institutional learning and reform due to a lack of forums for sharing best practices and the one-off, post-disaster nature of programs. The city should consider investing in resources or partnerships that can implement feedback and monitoring processes that can improve the program over time and build accountability for participant well-being.

Buyouts in Missouri:

Quick Stats:

- Missouri has the highest number of FEMA-bought properties of any state
- More than 5,100 property owners in Missouri have taken buyouts since 1990

- Buyouts can be accessed through the Federal Emergency Management Agency (FEMA) via the Missouri State Emergency Management Agency (SEMA) or the Federal Department of Housing and Urban Development (HUD) via the Missouri Department of Economic Development (DED).

Buyouts in the Great Flood of 1993

About 80% of the buyouts in Missouri to date took place after the Great Flood of 1993, when the Mississippi and Missouri rivers overflowed their banks, killing 50 and causing $15 billion in damages. The Federal effort to help Missouri residents and businesses recover in many ways shaped the evolution of the FEMA buyout program by rethinking federal, state, and local cooperation to invest in long-term flood mitigation efforts that break the cycle of destruction and reconstruction. .

In 2002, FEMA began requiring local governments to produce reports every three years that detail how buyout properties are used and provide audits to ensure that deed restrictions mandating open space in perpetuity are upheld. However, more than 90% of buyouts in Missouri took place before 2002, meaning the vast majority are not subject to FEMA compliance. However, a number of communities have converted these properties to public use.

Examples:

- University City demolished 26 houses along Wilson Avenue for a cost of $4 million, of which FEMA paid $3 million. A state grant covered $461,000 of the cost, and the city drew the remaining $539,000 from its reserves.
- After the 1993 flood, more than 60 homes on River Drive in the town of Valley Park have been converted into a bike path in Meramec Landing Park. In other areas, communities have allowed the properties to renaturalize without intervention, leading to spontaneous reforestation.

However, flooding has continued to affect communities across Missouri to this day. The two case studies below highlight more recent buyout programs - one funded by FEMA and one funded by HUD. A comprehensive overview of the successes of the buyout program after the Great Flood of 1993 can be viewed in the report "Successes from the Missouri Buyout Program", published by FEMA in 2002.

St. Charles County, 2019[1]

Between April 29 and July 5, 2019, more than 90,000 acres across St. Charles County were inundated by floodwater. The county was offered a grant agreement by the Missouri Department of Economic Development under its federal disaster action plan, but the funding did not arrive until 2022. the County Council has approved obtaining a more than $15.7 million grant from the Missouri Department of Economic Development to assist with floodplain buyouts and relocation of affected homeowners through the development of a Local Voluntary Buyout Program (LVBOP)

[1] Source: https://www.midriversnewsmagazine.com/news/county-approves-grant-agreement-with-state-for-2019-flooding-recovery-and-buyouts/article_ae8969c0-6526-11ed-9023-6f0e512a62c9.html

The grant, which totals $15,780,460, will fund program delivery, administration and planning activities, with a minimum of 70% of program delivery funding to serve low-to-moderate income individuals. The action plan specifically seeks the voluntary purchase of owner-occupied dwellings within flood hazard zones, as the primary eligible activity within St. Charles County. The budget includes $10,000,000 for the local voluntary buyout, $4,924,090 for housing incentive for replacement assistance, $250,000 for planning, and $606,370 for administration (max. 4% of project activities).

2022 St. Louis County Floods[2]

In an unprecedented rainfall event in St Louis County in July 2022, more than 11" of rain fell over the course of 8 hours. On July 28, the St. Louis Metropolitan Airport led to a new all-time record for daily precipitation of 8.64". Extensive damage and two fatalities were reported, both of them involving people drowning in or in attempts to escape their cars. By October of 2022, more than $101.2 million in state and federal assistance was approved via a combination of individual assistance, National Flood Insurance Program (NFIP) claims, and disaster loans for renters and businesses through the US Small Business Administration. As early as September of 2022, 5 cities in St. Louis County were seeking at least $16 million to buy out more than 60 homes and apartments. The cities include Hazelwood, Webster Groves (12 homes), Ladue (11 homes), Maryland Heights, University City (24 homes and 1 apartment complex) and St. Louis County (16 properties in Lemay). If awarded, FEMA will cover 75% of the grant and jurisdictions are required to provide 25%.

As a result, officials in places like University City had to scale back their original goal of $40 million to buy 300 homes and condemned apartment buildings, but they had to scale back their request due to the mandatory 25% matching requirement.

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2. Why Does De Soto Need a Buyout Program?

Since major flooding events in 2013 and 2016, the City of De Soto has invested energy and time into a number of studies and plans including the *Floodplain Management Plan, the Emergency Management Plan,* and the *2D Hydraulic Study of the Lower Joachim Creek Watershed*. Each of these plans serves a different function for the overall resilience of De Soto and each alludes to the potential benefits of a

[2] Source: https://www.stltoday.com/news/local/govt-and-politics/flood-buyouts-grow-to-5-cities-in-st-louis-county/article_6805b684-263a-5a3f-9d16-b577df735a33.html

buyout program. This section summarizes the findings and recommendations of other studies that support the creation of a buyout program in De Soto.

Hazard Identification: Flash Flooding

De Soto has historically been prone to flash flooding of the Joachim Creek but has experienced an increase in both frequency and intensity in recent years. Flood depths and the rate of flood-waters inundating the community have increased over time. The city has experienced 6 historic flood events in the last 10 years and has had 4 fatalities associated with flooding as emergency services were unable to reach those in need due to inundated roads and one death of an elderly woman who had a heart attack while being evacuated from her home. If trends and literature studies are accurate, the Upper Joachim Creek watershed will see increased precipitation in the coming decades, worsening the threat of rapid and high velocity flash flooding, which poses significant risk to life and property. According to the De Soto Emergency Action Plan and Evacuation Plan, almost 100 structures, representing 224 residents, are at risk during a 25 year storm (a storm that has a 4% chance of happening in any given year). Including the 100 year and 500 year events 527 structures representing almost 1000 residents are at risk. About 10% are above 65.

Table 5. City of De Soto Population and Property at Risk

Population and Property at Risk							
Floodplain	Daytime Population			Nighttime Population			Structures
	Under 65	Over 65	Total	Under 65	Over 65	Total	
25 Year	87	28	115	191	33	224	98
100 Year	421	77	498	479	81	560	288
500 Year	590	103	693	619	103	722	398
General	991	143	1134	833	143	976	527
*All values are cumulative							
*General floodplain includes structures within 100 ft of the 500 year floodplain							

From the City of De Soto Emergency Management Plan

The six most recent flood events from 2013-2017, all of which were considered historic flood events that resulted in evacuations, property damage, and even loss of life, ranged from a 1-year event to a 25-year event. As little as 3 inches of rain over a few hours can cause Major flooding in De Soto, due to its location at the bottom of the Upper Joachim Creek watershed (See table 2) Residents have very little time to get out of their homes due to the speed at which water in the Joachim rises and begins to overtake properties. A 100-year event in De Soto would be catastrophic.

Integration with Existing Plans

Local Resilience plans must align with regional and state goals in order to access funding. Thankfully, buyouts are recognized as essential in both. For example, Missouri's Hazard Mitigation strategy identifies buyouts in the following sections:

- Voluntary Property Acquisitions (M4) are recognized as "SEMA's most important mitigation action, and usually most cost-effective, because the people and property are totally and permanently removed from the path of flooding and danger (page 4.7)
- Voluntary Property Acquisitions (M4) are listed as a high priority action category on page 4.14

If the City Council adopts the *Resilient De Soto* plan, it will only improve the chance of winning state and federal dollars to implement the proposed projects.

St. Louis Regional Hazard Mitigation Plan 2020 – 2025

De Soto participates in the St. Louis Regional Hazard Mitigation Plan, which includes St. Louis City, Franklin, Jefferson, St. Charles, and St. Louis Counties, 135 municipalities, and 50 school districts. The City of De Soto adopted the St. Louis Regional Hazard Mitigation Plan for 2020-2025 on DATE. Section 5.3.6 Mitigation Needed to Prepare for Floods (p. 271), states:

"Because flood risk areas are identified, communities can move to reduce risk both for humans and property by effective advance planning. In addition to mapping flood risk areas, educating citizens about the nature of the risk and the appropriate actions to reduce risk is a critical part of the plan. An area that is flood prone, but where a flood has not occurred in recent years can be especially high risk because property owners can become complacent and unprepared should a flood occur. Flash flooding on small streams is also a serious risk, because there are many properties next to streams where development has already taken place and where flood waters are rarely seen. Another risk lies in areas protected by dams or levees, where the public assumes property is safe because it is protected by these structures. Failure of a dam or levee can create a very high hazard, due to the speed with which water can inundate a previously protected area." (St. Louis Regional Hazard Mitigation Plan 2020-2025, p. 271)

- Section A6: identified buyouts of frequently flooded properties to mitigate floods. The plan recognizes that buyouts are a high cost solution, but that buyouts reduce the costs of serving homeowners during a flood.
- The St. Louis Regional Hazard Mitigation Plan 2020-2025 does not include data on floods in De Soto because the flood gauge was not installed by USGS on Joachim (USGS 07019500) until July 17, 2018.

Upper Joachim Creek Floodplain Management Plan

The Upper Joachim Creek Floodplain Management Plan for the City of De Soto & Jefferson County was produced by the US Army Corps of Engineers Silver Jackets in September 2019. The FMP was prepared in accordance with federal standards originating from Executive Order (EO) 11988. EO 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

The De Soto City Council adopted a resolution agreeing to participate in the Floodplain Management Planning effort on 18 December 2017 (Figure 3). Although the Jefferson County Council did not adopt a resolution agreeing to participate in the Floodplain Management Planning effort, County officials provided input and participated throughout the process (P.12). The Final plan was presented to the public on June 20, 2019. The FPM lists a number of potential actions and features that the City of De Soto and Jefferson County can use to reduce flood risk in the Upper Joachim watershed. These are listed in the table below (from the FPM Info Sheet, see Appendix).

UPPER JOACHIM CREEK
FLOODPLAIN MANAGEMENT PLAN

TOOLS		
Land Use Policies and Regulations	EFFECTIVE	RECOMMENDED
Public Alert Flood Warning System	EFFECTIVE	RECOMMENDED
Warning Dissemination, Multi-Media	EFFECTIVE	RECOMMENDED
Flood Emergency Preparedness Plans (or EAP)	EFFECTIVE	RECOMMENDED
Development Policies – Moratorium	EFFECTIVE	NOT RECOMMENDED
Structure Elevations	EFFECTIVE	RECOMMENDED
Buyouts (Structure and Land Acquisition)	EFFECTIVE	RECOMMENDED
Flood proofing (Wet & Dry)	EFFECTIVE	RECOMMENDED
Community Education and Advocacy	EFFECTIVE	RECOMMENDED
Temporary Flood Risk Adaptive Measures	EFFECTIVE	RECOMMENDED
Information and Education	EFFECTIVE	RECOMMENDED
Flood Insurance	EFFECTIVE	RECOMMENDED
Community Rating System (CRS)	EFFECTIVE	RECOMMENDED
Local Drainage and Utility Protection	EFFECTIVE	FURTHER EVALUATION NEEDED
Tax Adjustments	EFFECTIVE	FURTHER EVALUATION NEEDED
Post-Flood Recovery Processes	EFFECTIVE	RECOMMENDED
Wetlands, Stream, and Riparian Protection and Restoration	EFFECTIVE	RECOMMENDED
Enhancement of Recreation and Education Opportunities	EFFECTIVE	RECOMMENDED
Dredging of Joachim Creek to Increase Channel Capacity	NOT EFFECTIVE	NOT RECOMMENDED
Accumulated Sediment Deposit/Debris Removal from Joachim Creek	EFFECTIVE	FURTHER EVALUATION NEEDED
National Guard Involvement	EFFECTIVE	FURTHER EVALUATION NEEDED
Bridge and Highway (re) Construction	----	ANALYSIS NOT PERFORMED
Detention/Retention Basins	EFFECTIVE	FURTHER EVALUATION NEEDED
Levees and Floodwalls	EFFECTIVE	FURTHER EVALUATION NEEDED

Source: Upper Joachim Creek Floodplain Management Plan, USACE Silver Jackets

Of the structures located within the 1% ACE floodplain in De Soto, 41% are recommended to be elevated, 31% to be acquired, 17% to be floodproofed, and the rest (11%) had inundation below the first floor, and therefore only required either a sewer check valve or relocation of utilities. The rationale for acquisition was based on identification of acquisition as the least cost mitigation approach. Some structures were also identified for acquisition where acquisition was not the least cost mitigation approach. In these situations, acquisition was selected if the structure met any of the following criteria:

- Located in the floodway and the cost was lower than elevation
- Total cost within 25% of other nonstructural measures

The study found that the average structure in De Soto is over 50 years old and may not be a viable candidate for traditional nonstructural mitigation measures such as elevation or relocation. It was assumed that since acquisition completely removes the flood hazard into perpetuity, that the property owner and city would elect to acquire the structure rather than paying marginally more for a

mitigation measure that does not fully remove the risk of damage, especially for more infrequent flooding larger than the 1% ACE event. (from FMP, Appendix G-6).

To supplement the recommendations of the Floodplain Management Plan (FMP) Individual assessments with residents living in the floodway also find that the most vulnerable residents are elderly and cannot live in elevated homes due to limited mobility. As low income residents, most also cannot afford to pay for elevation. Since Missouri SEMA does not fund elevations, acquisitions remain the most feasible alternative, and are considered to be both effective and recommended in section 7.1.7 of the Floodplain Management Plan.

Other considerations:

Dam Failure
In addition to risks from flash flooding, De Soto residents are at high risk from dam failure. There are 15 dams located upstream of the City, most of which were constructed during the period of 1950 - 1970. They are all classified as high hazard dams, due to a probable loss of human life if the dam fails or is operated inappropriately. They are all privately owned and range in height from 20 to 59 feet. The potential for catastrophic damage from dam failure remains a critical issue for the overall safety, well-being, and resilience of residents of De Soto, particularly those living in the floodway.

Health Impacts
Although the risks from flash flood and dam failure hazards are high, basement flooding and high water levels are a chronic challenge that plagues nearly all structures located in this area. When it rains, even well below flood stage, culverts are unable to drain and many structures see inundation of their basements. While most residents with flood experience have since elevated their appliances and removed precious items from basements, consistent moisture from the high water table has led to reporting of black mold and mildew, which is leading to serious negative health impacts for many residents currently on the city's waiting list. Likewise, the rate of rentals in the floodway is higher than average, as many owners who have experienced flooding have decided not to live there anymore. Low income tenants, unaware of the risks, continue to cycle in and out of properties.

3. Current Initiatives

Ongoing Acquisition of Delinquent and Vacant Properties

The City of De Soto has begun an effort in earnest to acquire vacant, abandoned, dilapidated and tax delinquent properties from the floodway of the Joachim Creek, making substantial progress on properties that border the Joachim Creek itself. Continuing this program of acquiring properties from homeowners who are delinquent on taxes or as they become available for sale to prevent turnover is critical for a number of reasons. Not only does eliminating property turnover prevent the likelihood of unaware owners and renters from moving into a high risk area, but it also signals to the broader community that investments in reducing blight from abandoned, damaged, and dilapidated properties are cleaning up the flooday and making it more of a community assets to the people who still live there as well as the community at large.

Community Engagement

The Citizens Committee for Flood Relief, a citizens group started after the 2016 floods to try to reduce flood risk for residents in De Soto, began working with Buy-In Community Planning (Buy-In) in 2020 to survey the floodway and gather resident perspectives on flooding and interest in a buyout program.

Beginning in Spring of 2021, the Citizens Committee for Flood Relief, the City of De Soto, and Buy-In have conducted significant outreach, door to door canvassing, event tabling, mailers, and phone calls, to determine the level of interest in a voluntary buyout program for floodway residents. A summary of survey responses to date are highlighted on the following page. Since then, the following has occurred:

- 2020: First community survey: 53 households surveyed
- 2021: Application of 23 households to HMGP (Unsuccessful)
- 2021: Application to CDBG-MIT Planning (Successful)
- 2022: Follow up with SEMA for feedback
- 2022: Application to HMGP (NOI Submitted for 5 Priority properties)
- 2022: CDBG-MIT Planning kicks off
- 2022 - December: HMGP Application put on “stacked” list
- 2023 - Feb 1 2023 - April 1 2023: Buy-In supports full development of application.
- March 2023: Buy-In Executive Director visits De Soto

    - Worked with Citizens Committee for Flood Relief and H3 to distribute 50 surveys to floodway homes and businesses
    - Neighborhood focus group meeting #1: "drop-in" hours at Be Kind Cafe
    - Neighborhood focus group meeting #2: Community meeting at Pogolino's Restaurant
- May 16-18, 2023: Buy-In Executive Director visits De Soto
    - Four one-on-one interviews with households regarding flood stories and housing preferences, distribution of $50 Visa Gift Cards
    - Attendance at Community Meeting #2
    - Meeting with City Manager at City Hall to Discuss Next Steps
- May 31, 2023: Delivery of Resilient De Soto Voluntary Buyout Program plan

Surveying and Survey Results

Goals

Starting in 2020, Buy-In Community Planning worked with the Citizens Committee for Flood Relief to survey De Soto floodway residents. The goals of the survey included:

- To better understand residents' experiences with flooding
- To understand the impacts that flooding has had on people's well being
- To better understand the financial, psychological, and physical barriers people face to moving.
- To understand people's interest in relocation as an option for improving their resilience to flooding.

Results from the 2021 Survey

Survey results are anonymized and aggregated to protect residents' privacy. Data is maintained by Buy-In Community Planning and is shared for the purposes of reporting and grant applications only. If you have any questions or comments regarding survey data, please email info@buy-in.org

- The average age of survey respondents was 60 years old. The oldest respondent was 82 and the youngest was 28.
- Over half indicated they or someone in their household lived with disabilities.
- Two-thirds had been living in their current home for more than five years, with 40% having been there for twenty years or more.
- Eight out of the 53 households had one or more children.
- 53% of respondents felt that their homes were not safe places for the elderly or disabled.
- 26 out of 53 respondents said that they had left their home due to flood events.
- 28 out of 53 respondents said that their homes had been damaged due to flooding.
- Of 25 respondents who reported flooding,
    - 14 had experienced flooding twice.
    - Four had experienced flooding three times

    - Five had experienced flooding once
    - And two had experienced flooding 4 or more times.
- 21 out of 53 reported purchasing flood insurance for their properties (not all respondents live in the floodplain).
- The most common experiences with flooding included experiencing stress and losing a vehicle. Almost 25% of respondents had lost or damaged vehicles due to flooding in the past. Additional losses reported include:
    - "Electrical outages during storm and sump pump in basement couldn't operate"
    - "Financial losses for clean up both times with professional service, and the loss of everything downstairs"
    - "My husband had cancer and suffered emotional stress in the last days of his life."
- 73% of respondents do not feel they are physically prepared to deal with a major flooding event.
- Floodplain residents fear for life and safety in their current conditions and expect to flood again. 40% of respondents reported experiencing stress, anxiety, or emotional trauma due to flooding.
- 33% of respondents said that their concerns about flooding keep them up at night.
- 65% stated they believed that it would be likely or extremely likely that their current home would be damaged by flooding in the next 12 months.

Who was/is interested in participating in a voluntary floodplain buyout?

- 23 out of 53 respondents expressed interest in participating in a home buyout and relocation program if funding becomes available.
    - 20 homeowners were looking to have the government buy their current residences or a home they no longer live in but use as a rental unit.
    - Three were renters looking to relocate.
    - 12 additional respondents said they were interested in a buyout, but needed more information.

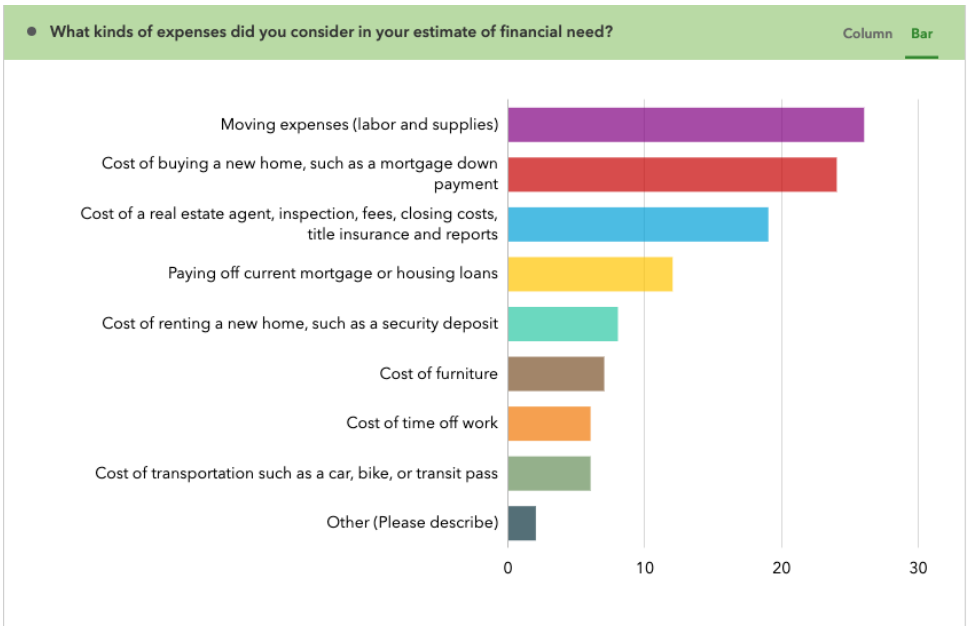
What kind of relocation assistance did households request?

- When taking the survey, 28 out of 41 respondents said that the amount of money they were offered was the most important factor in their decision to participate in a buyout. However, when respondents were asked how much financial assistance they thought they might need to receive in order to relocate to a home in a neighborhood that is less likely to flood, no respondents took this question as an opportunity to seek a huge sum of money. The average amount of financial assistance requested was around $80,000.
- Residents are financially constrained by their ability to move without support.
    - Limited or fixed incomes and outstanding mortgages: "I have a mortgage loan and would need enough to pay off the loan and a down payment for another home."

- People want to stay in Desoto or Jefferson County but safe, accessible, and affordable housing and employment opportunities are unmet demands.



Most seemed to ground their answers in their housing-related needs: respondents considered a wide range of expenses related to relocation in their estimate, but costs related to moving, securing new housing, and paying off home loans were cited most often.

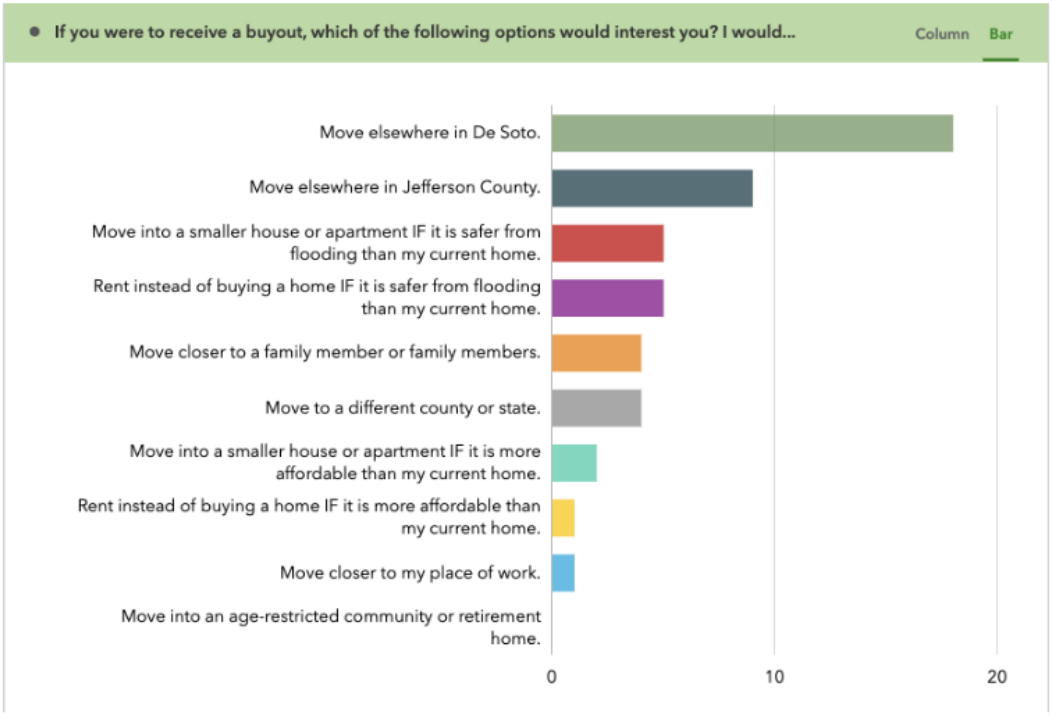


Additional Quotes From Survey Participants

- "As long as it is a fair offer. Hate living in a home that you worry every time it rains. Hate paying 250 a month for insurance"
- "At the time we bought our home, we were not fully explained the possibility of flooding. We aren't spring chickens anymore, my husband is basically deaf without his hearing aids in, therefore it causes a lot of stress at night waiting to get that call."
- "Don't think we would be offered enough."
- "Don't want to have to worry about myself every time it floods. Scared to go to sleep when it rains because of flooding. Can't replace stuff over and over again."
- "I am not concerned with a buyout for myself, but many other houses need it in order to better themselves and our town."
- "I have a mortgage loan and would need enough to pay off the loan and a down payment for another home."
- "I rent, if safer I would move..."
- "I rented it out. I own it but do not live there"
- "I would like enough to buy another house. I am always worried about the flooding. Worried about my car and where I would stay."
- "I would like to move to a more upscale area."
- "I'm ready to sell. I'm tired of being scared when it rains for a few days."
- "If I could get a fair price to be able to move my son and it would be safe for his family, that would be priceless."
- "I'm afraid these people are not going to get even close to what their homes are worth."
- "I'm not in a flood area. Not worried about being bought out."
- "Not taking a loss."
- "Own this home. Want to move and rent."
- "Right now our hope is not dying from a flood"
- "The offer would have to be sufficient for starting over"
- "We do not feel safe in our home due to flooding. We have had to evacuate in swiftly moving water, my spouse is disabled & unsteady on their feet. We fear being trapped in flood water. We have high anxiety & unable to sleep when creek is rising."
- "We want out with enough money to build us a small home away from flooding."
- "Would be interested only if given actual value of home"

Where would people want to go if they moved out of the floodplain?

When asked where they would move if they were to receive a buyout, residents often expressed interest in trying to move elsewhere in De Soto or, less frequently, within Jefferson County. Several respondents prioritized their household's safety from flooding over the size of their home, and were willing to consider renting instead of buying a home if it would help them move somewhere safer from flooding.



Results from 2021 Survey

Summary

Survey responses from people who live in, have lived in, or have loved ones who occupy homes in the floodway, show that residents believe that the floodway is not a safe place to live. Likewise, the majority of these residents are ready to participate in a buyout program or are interested but need more information. This is especially true for the elderly and people with fixed incomes who cannot afford flood insurance and for whom another flood event would result in severe financial burden.

Most residents who own property in the floodway are financially constrained with their current mortgage, living on fixed incomes, or have debt from previous flood repairs. Of serious concern, multiple residents report severe to life-threatening respiratory health issues due to chronic exposure to black mold and mildew which cannot be removed from their basements and HVAC systems.

For all of these reasons we recommend that the city make every effort to provide buyouts to residents who have participated in the survey and who now are effectively on a waitlist for support before the next major flood happens.

Additional Outreach Needed

Homeowners

Because there has been a lack of action for so long since flooding occurred first in 2013, many homeowners may be facing a feeling of hopelessness or cynicism that nothing will ever happen. Although participation rates may appear to be "patchwork" at first, momentum can build when residents see that buyouts are in fact occurring and/or they hear from their neighbors that the buyout has positively affected them by allowing them to move somewhere safer. For that reason, the program should be considered an ongoing, opt-in / opt-out program at any time, which will allow people to sign up on their own timelines.

It is important to note that many of the residents in the floodway are elderly residents or senior citizens for whom the prospect of moving and starting over seems daunting if not outright impossible. Fór those reasons, considering estate planning services or case management with family members to plan for the property in case of a person passing on may allow for residents to live out their days with dignity, rather than being forced into a decision they are not ready to make. Flexibility will be key for maximizing participation over the long run.

Rental Properties

One of the major challenges the city of De Soto may face in acquiring all of the properties in the floodway and converting the area to floodable open space is working with landlords. Of the 229 residential properties in the floodplain area, 117 properties are reported to be rental properties. Landlords may feel that they have little incentive to participate in a buyout program due to the recurring revenue that they gain from rental income. However, assumptions about landlord participation should not be made without targeted outreach, and they should be considered as invested in the overall resilience of the community.

Previous surveying has indicated that both renters and landlords are interested in participating in the buyout program. In some cases, homeowners who have experienced flooding may no longer want to live in the home that they own but cannot afford to pay taxes on the property without generating income from renting, as an example. Likewise, tenants have commented that they are not able to move somewhere else in De Soto due to the affordability of rent that they currently pay.

Although some landlords may be supportive of the program, it is possible that others will push back or not be interested in participating. Thus, if the city seeks to keep the program completely voluntary, identifying alternative incentives to facilitate involvement from landlords may be required. If a landlord does agree to participate and federal funding is used, renters are entitled to relocation assistance

under the Uniform Relocation Act (URA). Working with a team of dedicated consultants and URA professionals will ensure that the city is under compliance with all relevant federal laws under the URA when using these funds for implementing the buyout program.

The mobile home park at Tanyard Branch is located in one of the most dangerous areas along the creek. Working with the owner to identify a suitable location to move the park will be an important task to accomplish the goal of removing all residential structures from the floodway.

Vacant Properties

As reported in the housing analysis section of the Resilient De Soto plan, the Main Street to Creek corridor (the Joachim Creek floodway), faces significantly higher vacancy rates than the rest of the community. Although the team does not have exact details on all properties in terms of when they were abandoned, anecdotal evidence has shown that many homes have been left abandoned after the series of flooding events in 2013, 2016, and 2017.

The City has been working with vacant property owners on an ad hoc basis to acquire properties that become delinquent or which have back taxes and go to auction. Additionally, conversations with the City Manager have revealed that some owners have contacted the city with an expressed desire to redevelop the property but are constrained by the costs associated with meeting updated floodplain regulations. This highlights both the power of floodplain regulations to limit development in high risk areas, but also illuminates the need to develop targeted outreach and make sure that these owners have an opportunity to be made whole through the voluntary buyout program, which should be able to award them the pre storm fair market value of the properties.

A note about mental health:
One important and underappreciated element of floodway vacancy is related to the mental health of residents who may have experienced flooding and moved away. Many residents expressed feelings of trauma, stress, and anxiety pertaining to their experiences with flooding. Avoiding “dealing with” the property may be a trauma response that can be overcome with targeted outreach and resources to cope. For some people, finally getting rid of the property may be a way for them to move on with their lives. For others, they may be holding on to feelings of grief or loss and not want to give the property up. In either case, dedicated emotional support for flood survivors can and should be part of the buyout process. Many residents who have become trapped in place also report feelings of stress, trauma, and anxiety from flooding and the loss of invaluable family possessions or even the death and ill health of loved ones. We recommend developing a series of mental health and trauma support resources to distribute to floodway residents.

Commercial structures

Despite the large number of residential structures in the Joachim Creek floodway, much of the neighborhood is actually designated as Industrial, Light Industrial, and Commercial. A number of the properties are located next to the Union Pacific Rail Station. Conversations with the Citizens Committee for Flood Relief and the City of De Soto expressed frustration at the lack of engagement and communication from the Union Pacific Rail Station, which is not located within city limits, regarding flood resilience. The rail station has recently built a berm and detention pond to address contaminated runoff, but has not been a robust partner for other discussions regarding flood mitigation efforts on the neighboring properties.

Beyond the rail yard, a number of other smaller businesses line East Main Street, which runs parallel to the tracks. These businesses form an important stakeholder group which to date has not been responsive to requests for engagement from the Citizens Committee and from Buy-In. Thus, a targeted strategy for commercial properties that comes from the city in terms of economic development and support for small businesses may prove beneficial. In particular, the city should explore how joining the Missouri Main Streets Program could potentially incentivize small businesses to support a revitalization of the Main Street area.

With that in mind, it may not make sense for all of the properties to relocate. The historic Arlington Event Center is one such structure that may be better suited to adapt and build resilience in place. In some cases, such as the Arlington, the development of a floodable park area along the Joachim Creek could actually improve the economic performance and desirability of certain types of businesses that cater to recreation and leisure, especially if they had access to an expanded park space in their backyard. These businesses may also prove to be interested stakeholders for the bought out properties as leaseholders who would be responsible for maintenance. For this reason, a more detailed study of commercial properties and their roles in the Resilient De Soto plan, especially regarding buyouts, will be essential in the years to come.

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4. Funding

Buyout Program Costs

The proposed voluntary buyout program will require a wide range of resources to implement over a number of years. This report does not calculate a specific program cost because at this time, only the survey responses who have indicated an interest in participating would be calculated in the program cost, but that number may fluctuate from year to year. Advisors from the Missouri State Emergency Management Agency (SEMA) recommended submitting a smaller number of properties in years when

funding is available. The Missouri Department of Economic Development Local Voluntary Buyout Program (LVBPO), in contrast, would allow the City to establish a larger Buyout Area, which could include all floodway properties. This program would still have voluntary participation. For these reasons, working through a prioritization list with local funds may provide a way to make progress on the program over time while waiting for funding to come in.

Funding Sources

We recommend that the City continue to use a variety of different funding options to implement a buyout program, including but not limited to:

- The Missouri Department of Economic Development Local Voluntary Buyout Program (LVBPO), funded through CDBG-MIT federal funding.
- The local Stormwater and Parks half cent sales tax
- FEMA Funding (as available), including the HMGP Program, Hazard Mitigation Assistance Program, and Building Resilient Infrastructure and communities program (BRIC).
- Other funds as identified by the city and its partners

Federal Emergency Management Agency (FEMA)

FEMA's Hazard Mitigation Assistance (HMA) programs provide funding for eligible mitigation activities that protect life and property from future disaster damage to build a more resilient nation. FEMA released new program guidance for the Hazard Mitigation Assistance Program and Policy Guide (HMA Guide). The HMA Guide provides helpful information for prospective applicants and subapplicants from state, local, tribal and territorial governments on the application and grant processes for four hazard mitigation grant programs: Building Resilient Infrastructure and Communities (BRIC) program, Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP) and Hazard Mitigation Grant Program Post Fire (HMGP Post Fire).

FEMA funding can be accessed through the Missouri State Emergency Management Agency (SEMA). SEMA's Mitigation Management Section works with local communities to reduce or avoid the adverse impacts that disasters have on Missourians. SEMA defines hazard mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Mitigation Management administers grants which assist local government agencies and train their employees, much of the information they provide is about specialized training, worksheets, and guidance documents; therefore is not aimed at the general public. Thus, maintaining existing relationships that the City of De Soto has with SEMA staff as well as technical assistance partners are helpful for staying

up to date with funding opportunities and requirements. SEMA has three mitigation grants that are relevant to the buyout program. Each is outlined below.

Hazard Mitigation Grant Program (HMGP) - Post Disaster

FEMA's Hazard Mitigation Grant Program (HMGP) has traditionally been one of the primary federal funding sources for post-disaster property acquisitions. It provides funding to state, local, tribal and territorial governments to recover from disasters in a way that reduces or mitigates future disaster losses in their communities. When requested by an authorized representative, this grant funding is available after a presidentially declared disaster authorized by the Stafford Act. All state, local, tribal and territorial governments must develop and adopt hazard mitigation plans to receive funding for their hazard mitigation projects. In the case of an award, subapplicants (such as the City of De Soto) would be required to pay a 25% share of all proposed project costs, making it difficult to commit large amounts of funding at one time.

Flood Mitigation Assistance (FMA)

FEMA's The Flood Mitigation Assistance (FMA) program is another grant program for funding buyouts. The purpose of the FMA program is specifically to reduce losses to the National Flood Insurance Program (NFIP). Thus, the program generally only funds properties or projects that show benefit to reducing flood insurance payouts on properties that are enrolled in the National Flood Insurance Program. Repetitive Loss or Severe Repetitive Loss properties are prioritized and their local cost share obligations are reduced to 10% and 0% respectively. FMA has annual allocations from congress and is not considered a post-disaster recovery program.

Many of the households in the floodway did not have insurance at the time of flooding events experienced in 2013 and 2016. Although they may have enrolled since then, many have not experienced flooding and are therefore not technically considered RL or SRL properties. For example, At the time of the most recent inquiry to repetitive loss and repetitive loss properties in De Soto, only one household in the floodway was deemed competitive for the FMA program.

Building Resilient Infrastructure and Communities (BRIC)

The Building Resilient Infrastructure and Community Program also supports states, local communities, tribes and territories in increasing their resilience through hazard mitigation projects. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. Due to its ability to fund larger scale resilience efforts, the first few years of BRIC have been highly competitive. The program is also considered to be more favorable towards funding critical infrastructure resilience. Thus, we would recommend the City work with the

De Soto Rural Fire Department to consider an application for BRIC to relocate the fire department out of the Joachim Creek floodway.

Dept. of Housing and Urban Development (HUD)

Community Development Block Grant - Mitigation (CDBG-MIT)

In 2018, the U.S. Congress created Community Development Block Grant Mitigation (CDBG-MIT) funds to help states impacted by disasters that happened from 2015 to 2017. These grants assist local communities and other entities coordinate efforts in mitigation and resilience for future disasters. CDBG Mitigation assistance in areas impacted by recent disasters helps carry out long-term strategic and high-impact activities to ease disaster risks and reduce future losses.

Because of damage from storms like the 2017 floods, HUD made $41.5 million in CDBG-MIT funds available to Missouri. In 2021, the first round of funding ($18.8 million to 29 recipients) was released. A second round of applications are projected to be open in 2023, but no information has been released yet. During this SOW, Buy-in contacted DED to inquire about the program but has not received a response at the time of this deliverable. We recommend that the City of De Soto and its partners continue to reach out to DED and seek guidance on accessing the VHBOP.

Community Development Block Grant - Disaster Recovery (CDBG-DR)

These grants assist local communities and other entities with long-term recovery, restoration of infrastructure and economic revitalization related to specific Presidentially-declared disasters. Starting in 2021, DED authorized the creation of a new, Local Voluntary Buyout Program and supplemental housing program called the Community Rehousing Incentive for Buyouts. Full details of the programs can be found in the CDBG-DR Manual, Chapter 16 and Chapter 17. Summaries are provided below.

DED CDBG-DR Local Voluntary Buyout Program (LVBOP)
Used to provide property owners whose real property was affected by disaster the opportunity to receive a property buyout. Priority is given to low-to-moderate income (LMI) applicants and applicants representing vulnerable populations located in Most Impacted and Distressed areas (MIDs).
The program serves primary residences only, including owner-occupied single family homes and single family residential units.

LVBOP Process Overview:

1. Create Buyout Plan and Submit to DED
    a. Public Outreach and Engagement
    b. Buyout Plan Summary
    c. Prioritization of Buyout Properties
    d. Designate Buyout Zone
2. DED Review of Buyout Plan and Award
3. Post-Award Activities
    a. Case Management and Compliance Specialist
    b. Designation of Program Representative
    c. Outreach Activities
    d. Applications
    e. Eligibility Determination

CDBG-DR Community Rehousing Incentive for Buyouts (CRIB)

The Community Rehousing Incentive for Buyouts (CRIB) mobilizes CDBG-DR funds to be used as a means to bridge the potential funding gap between the cost of comparable replacement housing and a buyout award, not to exceed $50,000, for comparable replacement housing in disaster-affected communities and outside of the floodway, floodplain, and Disaster Risk Reduction Area (DRRA). CRIB is only applicable in the case of Local Voluntary Buyout (as defined in 49CFR 24.101(b)). Beneficiaries can receive up to $50,000 in CRIB funds including closing costs within one year of acquisition of their properties. Subrecipients determine what constitutes a comparable replacement property.

All eligible Local Voluntary Buyout Beneficiaries will be automatically enrolled into the CRIB program; however, any Beneficiary may opt out of CRIB program participation at any time. Beneficiaries must be income-qualified and choose to relocate within the Subrecipient's jurisdiction. Local Voluntary Buyout program beneficiaries who are not resuming homeownership after buyout are not eligible for CRIB funds. Eligible properties may not be located in a floodway, floodplain, or DRRA, and must be used as the primary residence.

Local Funding

Dedicated local funding is essential to secure funds from federal and external sources. Local match is required in almost all FEMA programs and matching funds often increase the likelihood of winning competitive grant programs, both public and private. Additionally, federal funds, while critical, can be sporadic and time intensive to comply with. As a result, local revenues can provide critical dollars without creating substantial overhead and compliance costs from federal awards.

Local funds are also more flexible and can be used more quickly than federal dollars. For example, local funds can be used as a "quick buy" program in the case that properties go up for sale or need to

happen more quickly than through the federal funding cycle. The City of De Soto has already begun to acquire floodway properties using general funds, which is an excellent, proactive approach. De Soto has also already made great strides through the passing of the half cent sales tax for Stormwater and Recreation. Dedicated revenue generated from the sales tax towards hazard mitigation efforts such as buyouts and expanded floodable park space along Joachim Creek will result in a more resilient De Soto overall.

Case Study: Charlotte-Mecklenburg County Stormwater Services Floodplain Buyout Program



Above left: Stormwater Services has created an extensive Greenway system on buyout properties, such as the Little Sugar Creek trail, which has a series of educational signs about the history of flooding and the role of buyouts in flood mitigation. Above Right: in addition to the trail system, the County created a series of retention ponds which capture stormwater runoff and let it filter through a series of phases before flowing out into the local river system.

The Charlotte-Mecklenburg Stormwater Services Floodplain Buyout Program is a great example of a comprehensive, coordinated approach to overhaul the County's floodplain management program. Rather than one major disaster leading to post-disaster buyouts, Stormwater Services responded to a series of multiple medium sized floods with a decision to improve community resilience and stormwater management overall. Today, a Greenway parks, bike, and trail system not only helps filter and clean stormwater runoff, but provides a recreational amenity throughout the region.

Quick Stats

- Purchased more than 450 homes since 1999
- Relocated more than 700 families and businesses to areas outside of the floodplain
- Avoided an estimated $25 million in losses so far
- 85% of property owners complete the process from start to finish

Funding
Charlotte-Mecklenburg County Stormwater Services has utilized FEMA funding after major flooding events starting in 1999, but has reduced its reliance on federal dollars by creating a number of different approaches to buyouts funded by their local stormwater fees and a network of partnerships. Details of these programs are highlighted below and taken directly from the Stormwater Services website.

- Local Risk-Based buyouts (2012-present): Storm Water Services funds all costs associated with these acquisitions and can therefore prioritize based on local risks and needs. These floodplain buyouts are funded entirely with money from local stormwater fees or other local partners.
- Quick Buys (2003-present): Storm Water Services established a "rainy day fund" to set aside funds to purchase damaged or distressed properties before substantial repairs are made. After a destructive flood, the Mecklenburg Board of County Commissioners can allocate rainy day funds to establish a Quick Buy program to purchase qualifying buildings with significant flood damage.

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5. Prioritization

When demand for buyouts exceeds the capacity and resources required to implement the program, prioritization becomes necessary. Prioritization may vary by the funding program as well as local needs.

DED VHBOP Program Prioritization

The LVBOP Program hasThe DED LVBOP Program Prioritization Index is as follows:

LMI Category	Geography	Vulnerable Population	Priority Score
Extremely Low (0-30% AMI)	*Floodway*	Yes	1
		No	2
	FloodPlain	Yes	3
		No	4
	Disaster Risk Reduction Area	Yes	5
		No	6
Very Low (31%-50% AMI)	*Floodway*	Yes	7
		No	8

	FloodPlain	Yes	9
		No	10
	Disaster Risk Reduction Area	Yes	11
		No	12
Low (51%-80%AMI)	*Floodway*	Yes	13
		No	14
	FloodPlain	Yes	15
		No	16
	Disaster Risk Reduction Area	Yes	17
		No	18
Urgent Need (Above 80% AMI)	*All Areas*	All Populations	19
Commercial Properties	*All Areas*	All Populations	20

Local Prioritization

Many of the households seeking buyout support from the city fall under DED's Highest priority score of 1 given their location in the floodway, the fact that they are categorized as vulnerable populations, and that they have very low incomes. Because many of them fall under DED's highest priorities, additional efforts to develop a local prioritization scheme may be necessary.

1. Significant or immediate threat to safety and well being due to age (elderly or children), disability, mental health, physical health & respiratory illness, or other negative impacts felt due to experience with flooding, including recent or unresolved flood damage
2. Proximity to high velocity floodwaters and/or Joachim creek flood channel.
3. Length of time on the waitlist (months)
4. Unoccupied/vacant properties up for sale
5. Proximity to existing open space or other buyout applicants (to promote contiguous open space and re-use)
6. Inability to resolve flood mitigation through other means (such as Veteran's Drive / MODOT culvert placement
7. Recommendation of acquisition by USACE
8. Depth of flooding

These prioritizatoin recommendations are provided as a reference. Prioritization should be discussed and investigated further before adopting an official prioritization policy.

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6. Recommendations and Implementation Timeline

Ongoing Actions:

Because the City of De Soto is already taking great strides in its partnerships and local action, we begin by encouraging the city to continue the following actions and commend their work to date:

- Keep the Resilient De Soto Flood Affected Households Buyout Survey and voluntary sign up form available online, and on the city's website (www.buy-in.org/resilientdesoto). Continue to accept and encourage applications from floodway residents and businesses.
- Continue to monitor properties as they go up for sale or become delinquent and acquire them using general local funds when feasible.
- Continue to work with partners such as the Citizens Committee for Flood Relief and Buy-In Community Planning to reach out to and support flood affected households and buyout participants

Short Term (0-3 years):

- Seek funding from state and federal agencies to secure funding for all households on the buyout waitlist
    - Continue working relationship with SEMA and utilize FEMA funding as available
    - Apply for the DED-funded VHBOP and use CDBG-MIT/DR funds if/when available
    - Explore relationship with Missouri Department of Natural Resources (DNR) and pursue the use of DNR funds for acquisitions and restoration as/if possible
- Explore private funding options such as philanthropic charities or conservation groups and develop relationships with potential funders for supplemental funding
- Develop a targeted outreach plan for landlords and renters living in the floodway
    - Familiarize yourself with Uniform Relocation Act (URA) requirements and obligations.
    - Consider developing an incentives program to get landlords to use buyout funding to reinvest in vacant, abandoned or for sale properties in other parts of De Soto.

    - Support renters who would like down payment assistance under the URA and provide resources to help them invest in refurbishing properties.
    - Work with relevant realtors and other stakeholders as available to facilitate opportunities to acquire and convert distressed properties into rehousing options.
    - Work with local local realtors to help households find rehousing that suits their needs and budget.
    - Support the creation of new, affordable housing in other parts of De Soto to attract and retain renters in the community.
    - Create a mandatory occupancy / information notice for renters to include with the existing renters and new residents welcome package available at City Hall.
    - Use recommendations from the Resilient De Soto Rehousing Assessment provided as part of this planning effort to increase the availability of housing options for floodway residents seeking a buyout as well as renters.
- Develop a targeted outreach plan for Vacant/Abandoned/Blighted Properties
    - Develop a suite of educational materials informing vacant or abandoned properties on updated floodplain regulations and work with property owners to help them understand their options.
    - Encourage the donation of properties when possible
    - Acquire and demolish dilapidated structures as soon as possible
- Develop a targeted outreach plan for Commercial Properties
    - Write a letter from the City of De Soto to business owners informing them of the Resilient De Soto Plan (if/when city council adopts it) and let them know that this is a voluntary program that could provide added benefits to their businesses.
    - Develop an incentives program to support small businesses relocating to Main Street whenever possible.
    - Ensure remaining businesses have the resources they need to adopt higher floodplain management standards and become resilient in place.
- Develop and publicize a strategy for the use current city-owned floodway parcels
    - Keep the public informed of the city's goals and progress, especially for the parcels that have been recently acquired by the city.
    - Build community support for local investment in buyouts and generate interest in a larger environmental restoration and recreation plan.
    - Work with current and potential partners to find funding for the development of a landscape plan
    - Connect with remaining owners in the floodway and explore an interim leasing program to maintain or reuse bought out lots while a larger end use vision is developed

Medium Term (3-7 years):

- Encourage donations of floodway properties by creating a Joachim Creek Park Legacy Fund, storytelling initiative, and memorial that honors the histories of floodway families that can be provided as public signage throughout the park.
- Adopt an end-use plan to reimagine buyout parcels in the floodway as a quality open space and ecological amenity
    - Secure funding and hire a landscape architecture or planning firm
    - Conduct engineering studies on how detention systems could reduce flood risk for remaining properties, especially Main Street
    - Explore options for reconfiguring Walther Park parking and circulation to utilize Veterans Drive properties if/when funding is secured.
- Commercial Properties
    - Continue to incentivize businesses to relocate to the Main Street side of the tracks when possible
    - Consider incentivizing the relocation of some businesses such as Hardin Auto Services to a more suitable location elsewhere in De Soto to maintain contiguity of the Joachim Creek restoration area.
    - Encourage floodplain ordinance updates to all commercial properties
    - Provide resources to become more resilient in place as appropriate and enforce floodplain regulations.

Long Term (7+ years):

- Continue to seek and implement federally, state, and locally-funded buyouts
- Seek Funding to Implement End Use Plan
- Work with Jefferson County to relocate the De Soto Rural Fire Department
- Improve drainage and detention options to reduce flood risk on Main Street and explore the installation of back pumps or flood walls to protect Main Street.
- Develop the Joachim Creek recreation area as a regional amenity that is visited by people from across the county, boosting De Soto's local economy and contributing to overall financial, social, and environmental resilience.
- Utilize local and regional partnerships, as well as programs such as Missouri Main Street, to create a vibrant downtown.

7. Conclusion

This report provided an overview of a recommendations to establish a Voluntary Buyout Program in the City of De Soto, MO. A local buyout program, especially for floodway residential structures, is a powerful and proactive way to build resilience before another major flood hits. Current floodway residents are interested in participating, and a significant local amenity can be created to boost De Soto's reputation as a regional destination for recreation at the Joachim Creek. Coupled with building the resilience of Main Street, the Main to Creek area has the potential to be a vibrant asset for people from the surrounding areas. Thus, rather than see a buyout program as a loss of residents or opportunity, a buyout program in De Soto can not only improve the health and well being of residents, but create a valuable open space amenity that can revitalize the downtown area and protect households who chose to remain in place in the years to come.

Buy-In Community Planning has been honored to work with the City of De Soto and its residents on their resilience planning, including the creation and implementation of a voluntary buyout program. We look forward to continue working with the City and its partners on helping to create a more Resilient De Soto.

Survey results and information on interested buyouts can be provided to the City of De Soto upon request.

Email: info@buy-in.org
Website: www.buy-in.org

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Housing and Relocation Strategies Report

FLOOD RESILIENCY HOUSING RELOCATION AND AFFORDABILITY STRATEGIES

DE SOTO, MISSOURI

MAY 19, 2023

PREPARED FOR

H3 Studio
St. Louis, Missouri

SAINT LOUIS UNIVERSITY
Department of Earth & Atmospheric Sciences
COMMUNITY PLANNING LAB

Relocation/Buy-out criteria-

1. Purely voluntary. Property owners do not have to agree to a buy-out. But they can lose their ability to obtain government assistance if too many flood events affect them directly. Alternatively, the local government (see item 8, below) could theoretically declare the property blighted for public purposes and declare a purchase by eminent domain. But that would require a formal planning process under enabling laws of the state.
2. Eligible properties are those suffering from severe, repetitive losses with a history of either two losses exceeding the value of the structure or at least four losses with cumulative claims payments in excess of $20,000.
3. Acquired property must be deeded to the local government or another acceptable entity, such as a land trust. While this isn't a criterion for eligibility, this requirement should probably be considered by the property owner before the buy-out. In short, the relocated owner/occupant cannot retain ownership of the property even if they do not live there anymore. Buy-out means buy-out in fee simple. Selling just the structure but retaining ownership of the land is not an option.
4. Sellers of the property can be bought out for the pre-disaster value of the property. The government cannot claim that the property is much less valuable because of the flood disaster. That said, the market value of that property might already be depressed because of previous flood events or presence in the flood plain. But the government also has the power to offer dollar amounts exceeding fair market value as an inducement for reluctant sellers to close the deal.
5. Sellers must agree to the results of a cost-benefits analysis to determine if the buy-out does not cost the government more than the value of the property.
6. Buy-outs necessarily are a decision by the property owners. If the property is presently occupied by renters, those renters do not have a voice other than for certain relocation expenses. Terms of leases, however, should be taken into consideration as to the value of relocation expenses.
7. Criteria should prioritize under-resourced applicants. Those least able to afford relocation, for instance, should rank higher in priority when there are insufficient funds for all recommended buy-out locations. A means test, in other words, might be in order.
8. It is up to the local agency (City of De Soto) to ultimately decide who is eligible for buy-out. Ideally, the criteria should focus first on the most troubled or vulnerable areas and people first ("targeted) as well as on those least able to afford relocation on their own.

Preferences of Affected Home Owners-

Surveys of De Soto residents who are living in homes which have sustained flood damage in the past have indicated their anxiety over the threat of future flooding, the threats to their health and that of their family from the presence of mold, and their desire to relocate from their homes. However, these homeowners feel that they are unable to leave their current house due to it’s value being decreased due to the flooding, age or deterioration. They are unwilling to sell their homes and put someone else in harms way.

Many of these homeowners purchased homes that they didn’t know flooded, inherited homes that hadn’t previously flooded for 60 years, or purchased homes that once were dry and now flood. To a homeowner, they are suffering from severe anxiety over the weather and the threat of flooding. Many

have family who have suffered health problems from the aftermath of the flooding, from PTSD to anaphylaxis due to black mold.

While the city can't afford to conduct all the buyouts themselves, doing everything to empower the buyouts going through is imperative. This includes forming and keeping the right state, local, federal and non-profit partnerships in order to know what paperwork to file and when to follow up.

Number of Affected Households

Previous plans have concluded that the floodplain effects 354 homes, however, not all are occupied. De Soto should plan for the ultimate future removal of all homes in the floodplain, however, since buyouts are voluntary and rely on the participation of the homeowners, how and when they occur will continue in a sporadic fashion without more robust participation. We reference Strategy 3: Flood Park + Main Street in the "*Nature Based and Green Infrastructure Flood Resiliency Framework Plan*" which recommends removing 94 houses between East Main Street/DeWitt St. and Veterans Blvd. south of Boyd. in order to create a flood park for recreation and to handle future flooding. This study estimates that up to 149 occupied houses are located in "Main-to-Creek" corridor of study, leaving them most vulnerable and should be slated for immediate buy-out and re-housing. However, it is estimated that up to 267 occupied houses are in the 500-year floodplain. These should all ultimately be considered for buy-outs to prevent future property losses and dangers to residents.

Continued buy-in from the city and increased participation in city led buyouts could stem from more funding. We would strongly encourage applying for the CDBG-MIT grant.

Current Housing Market Conditions: De Soto-

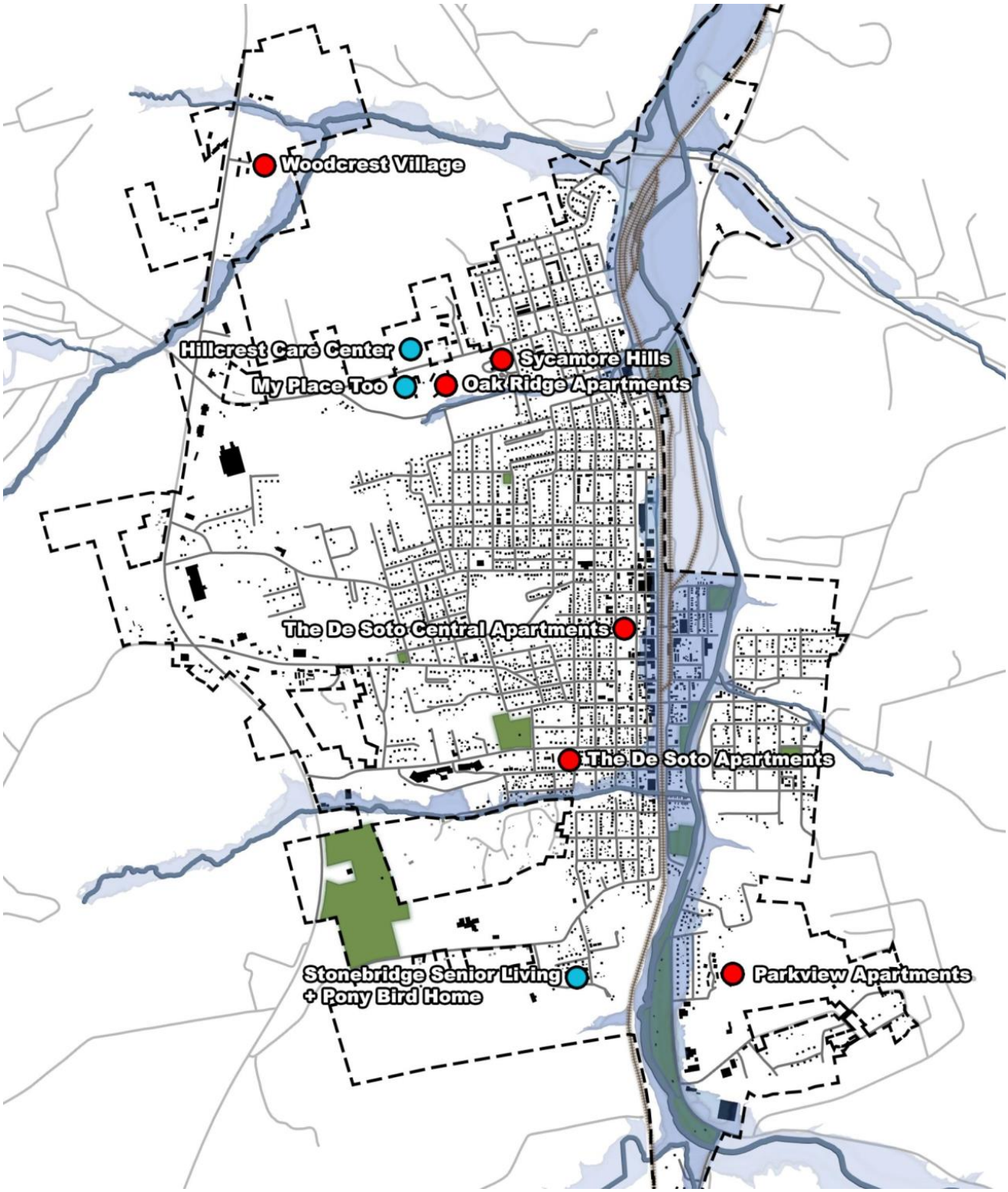
We know from earlier in this report that De Soto's housing tends to be somewhat older with a median home value of $112,200, and that homes in the floodway, or the Main-to-Creek corridor, have a lower median home value of around $100,900. Homes in De Soto also tend to be on the smaller side, with 95% having less than 3 bedrooms.[1]

According to Rocket Homes, the current median home price in De Soto is $159,900, up 14.2% above 2022 prices. There are currently around 24 homes for sale in De Soto city limits, the some of which, are listed for sale in the floodway. These range in price from $30,000 to $110,000. The remaining homes for sale on the hills of De Soto range in price from $209,000 to $449,000.

Therefore, buyouts would have to offer above 200% of a homes appraised value in order to offer the opportunity to purchase a newer home in De Soto.

As illustrated in the map below, De Soto has two dedicated senior living apartments centers and three skilled nursing facilities, indicated with blue dots, however there is limited bed space available and only one of these options is dedicated as being affordable. De Soto offers seven apartment buildings,

[1] Source: https://data.census.gov/vizwidget?g=160XX00US2919252&infoSection=Physical+Characteristics



indicated with red dots, two of which are dedicated as affordable and two more offer reduced rent based on income.

Therefore, De Soto will be facing a housing shortage once the buyouts begin in earnest, leaving it with a few options: 1. Asses and renovate appropriate vacant homes, 2. Construct new multiple-family or single-family, affordable housing for the newly displaced residents. 3. Do not try to accommodate the displaced residents in De Soto.

Vacant Housing and Rehabilitation-

As stated earlier in the report, the low-hanging fruit might very well be in taking inventory[2] of vacant homes in De Soto for consideration as a re-housing option for those homeowners looking to take advantage of the buyout and leave the floodway. De Soto currently has 405 vacant houses, more than adequate to accommodate re-housing needs.

Applying to the Missouri Department of Economic Development for a Community Development Block Grant-Mitigation CDBG-MIT written to include money for buyouts of properties in the floodway, but additionally for the construction or rehabilitation of affordable housing per the funding guidelines.[3] This could cover some to all of the costs of rehabilitating the vacant housing to livable standards. This would also allow for rapid re-housing, while new construction of affordable housing can be a delayed process.

Affordable Housing:

Can be defined as housing affordable for households making less than 60% of the Area Median Income. America faces an affordable housing crisis. Currently for every 100 extremely low income households, there are only 29 available and affordable rental units adequate for them.[4]

Examples of Affordable Housing in De Soto:

There are currently two fixed income housing options in De Soto, Sycamore Hills and Woodcrest Village, neither of which is located in the floodway, although Sycamore Hills is limited to those over 62 or with a disability. Sycamore Hills consists of 1-to-3-bedroom units ranging in size from 533 to 843 sqft. The rents range from a low of $748/mo up to $977/mo. Woodcrest Village is a complex of 2 and 3 bedroom units which is income restricted to families of 6 or less making $68,580/year or less depending on household size.

The closest low-income housing outside of De Soto is located in Festus, Crystal City, or Pevely. These complexes, and in some cases, single-family homes, are located at least 15 miles away from De Soto and often have waiting lists of up to one year.

[2] Consider this source for creating a vacant property inventory: https://localhousingsolutions.org/housing-policy-library/creating-and-managing-vacant-property-inventories/
[3] https://ded2.mo.gov/programs/cdbg/mitigation
[4] Source: https://apps.urban.org/features/cost-of-affordable-housing/

Construction Costs:

The cost of new construction on a three story, 2-6 unit, Infill[5] apartment building is nationally $95-$205/sqft. [6]however, Missouri skews below the national average for costs.

New home construction costs in the state of Missouri for Class 5: Average Standard Single-family Homes range between $77.86 and $119.24 with an average cost of $91.81/sqft while costs for Class 6: Minimum Standard Single-family Homes range from $61.41 to $94.13 with an average cost of $72.44/sqft.[7] De Soto is located close enough to Farmington, the cheapest place to build in Missouri, to assume building costs on the lower end of the range.[8] The costs of home construction can be broken down into “hard costs” and “soft costs”.

Cost Reductions-

There are ways to reduce costs in home building, some more forward-thinking then others and adopted to different frequencies by different developers in different locations.

1. Use alternative building materials: think re-purposed shipping containers. This could be a place to look for potential local partners in Union Pacific, or other local companies that might have used shipping containers.

2. Think outside the box in construction types: think panelized construction. Look at modular components from prefabricated structural insulated panels (SIP) and other pieces pre built in a factory then transported and assembled on-site.

3. Build on city owned land instead of purchasing new land for the project. Land acquisition costs can be up to 20% of the total project cost.

4. Reduce regulatory barriers by making sure that the land is or can be easily zoned for the project.

5. Build smaller homes. Reduce the footprint of the house and you can reduce costs.

6. Creative home designs like open floor plans can make small homes feel larger and less corners reduces costs.

7. Use reclaimed or recycled materials like cabinets. Habitat for Humanity ReStore is an excellent source for affordable finishes like cabinetry, flooring, and tiles.

[5] An infill apartment building is a general term for stick-built apartment homes, including duplexes, triplexes, six-packs, and walk-up apartments. These apartment buildings typically resemble single-family homes in architecture and style and are timber-built. Source: https://www.fixr.com/costs/build-apartment
[6] Source: https://www.fixr.com/costs/build-apartment
[7] Source: https://estimationqs.com/building-costs-per-square-foot-in-the-state-of-missouri-usa/
[8] Source: https://estimationqs.com/building-costs-per-square-foot-in-the-state-of-missouri-usa/

Additional Funding Sources and Programs-

LIHTC-Low Income Housing Tax Credits-Federal and state tax credits good for 10 years that developers apply for and can use or sell in order to finance the construction, purchase or rehabilitation of affordable housing projects.

https://mhdc.com/programs/asset-management/program-compliance/housing-programs/low-income-housing-tax-credit-lihtc-compliance/

Affordable Housing Assistance Program-State program administered by the Missouri Housing Development Commission, it provides tax credits to non-profit, community-based organizations for the purpose of providing affordable housing assistance activities or market rate housing in distressed communities.[9]

https://mhdc.com/programs/community-programs/missouri-affordable-housing-assistance-program-ahap/

HOME Programs-Federal funding that developers can apply for through the Missouri Housing Development Commission in order to finance projects that will lead to more affordable housing for low and very low income households.

https://mhdc.com/programs/hud-programs/home/

Recommended Partnerships-

The Jefferson Franklin Community Action Corporation, https://www.jfcac.org, might be a good resource to partner with. Their goal is to provide programs to help Jefferson County families living in poverty with resources. They might know how to go about renovating vacant homes or know developers and contractors who could help with the process. They are certainly a great resource for finding any available low income housing in De Soto that is not in the floodway.

The Festus Housing Authority, http://www.festusha.com/index.html, manages the Rolling Greens subdivision, 56 two and three bedroom single-family homes for low-income families. This could help guide De Soto in deciding on developing a similar community.

[9] Source: https://ded.mo.gov/community/community-development

Missouri Department of Economic Development community redevelopment resources:

Resources:

Historic Preservation Tax Credit

Provides incentives for the redevelopment of commercial and residential historic structures across the state.

Downtown Preservation

Facilitates the redevelopment of downtown areas and the creation of jobs by providing essential public infrastructure.

Chapter 353 Tax Abatement

Permits real property tax abatement to encourage the redevelopment of local blighted areas.

Brownfield Redevelopment Program

Provides incentives for the redevelopment of abandoned or underutilized commercial/industrial sites that are contaminated with hazardous substances.

Missouri Main Street Connection

Seeks to enhance the economic, social, cultural, and environmental well-being of downtown business districts through historic preservation.

Local Tax Increment Financing (TIF)

Permits the use of a portion of local property and sales taxes to assist in funding the redevelopment of designated areas within a community.

State Supplemental Tax Increment Financing (TIF)

This program can fill the financing gap for local TIF redevelopment projects and can be used for land acquisition, construction of public works, studies and surveys, and professional services.

Neighborhood Assistance Program (NAP)

Provides assistance to community-based organizations that enables them to implement community or neighborhood projects in the areas of service, education, crime prevention, job training and physical revitalization.

Neighborhood Preservation Act

Provides incentives for the rehabilitation or construction of owner-occupied homes in eligible areas of the state.

Community Development Block Grants

From addressing local health and safety concerns to improving local facilities such as senior centers and community centers, CDBG programs are designed to support your community's wellbeing and greater capacity for growth. Grants are available in a variety of categories and can be utilized for a variety of community development initiatives.

Small Business Disaster Loan Program

Provides financial assistance and access to capital to businesses located in any county that has been declared a federal disaster area or identified by the United States Small Business Administration as a county impacted by a natural disaster.

Community Development Resources:

Certified Work Ready Communities
A voluntary initiative led by community leaders that seeks to strengthen and grow local businesses by aligning the economic development needs of communities.

Youth Opportunity Program (YOP)
Provides assistance to organizations administering positive youth development or crime prevention projects.

AmeriCorps
Also known as "the domestic Peace Corps," this National Service program engages Americans of all ages and backgrounds in team-based, results-driven service. The Missouri Community Service Commission (MCSC) also provides **grants** to eligible organizations interested in operating AmeriCorps programs, an initiative that helps strengthen local communities through national service. Eligible organizations include public or private nonprofit organizations, faith-based organizations, educational institutions, and state or local government entities.

Missouri Arts Council Grants
Provides funding to nonprofit organizations to increase participation in Missouri arts, strengthen arts education, and grow the economy through the arts by financing costs to pay local artists or bring in outside talent.

Division of Tourism Marketing Training
Used in conjunction with MDT's Cooperative Marketing Program, this information will help you maximize the benefits you see from the program, and in turn will help increase visitation and tourism spending.

Cultural Facility Revenue Bond Program

Provides tax-exempt bonds to finance cultural facilities for charitable organizations that are qualified 501(c)(3) entities.

Business Specialists

Missouri's business incentive programs can help communities attract new business as well as retain their current companies that are crucial to sustaining the local economy. From retention programs to expansions and attraction, our business specialists can help your community utilize state tools in the overall proposal when negotiating business projects.

Missouri Building Entrepreneurial Capacity

The Missouri Technology Corporation makes strategic investments in public and private non-profit research institutions (including higher-ed) and non-profit entrepreneurial support organizations to expand the state's innovation ecosystem that help entrepreneurs commercialize new technologies and create next-generation jobs.

Missouri Certified Sites Program

Help lure new business to your community by having your commercial or industrial development sites pre-qualified by an established Review Team. By having your site certified, information can be readily available to potential buyers and businesses.

Family Development Account Tax Credit Program

Community-based organizations can access financing to administer a family Development Account project to help low-income residents participate in matched savings programs. These savings programs will help families in your community pay for school, purchase a new house, make home improvements, or start up a small business.

Small Business Incubator Tax Credit Program

This program helps small business incubators leverage funds to use for working capital and other non-operating expenditures that support new business creation in communities.





G

Engagement Materials and Reports

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

Public Meeting #1 Report

De Soto Flood Resiliency Plan

Public Meeting Overview

Public Meeting #1 was held at De Soto City Hall on Tuesday March 7th, 2023 from 6:30 PM to 8:30PM with 11 members in attendance. The purpose of this workshop was to filter the results of our analysis and the strategies that have been proposed to the city to date through the lens of the public. The goal was to ensure that the analysis and key takeaways we presented incorporated all of the needs and concerns of the community to ensure a holistic and comprehensive approach to the problem. After the presentations and takeaways, the community was asked to review a series of strategies and prioritize what they believed would be most important, effective, and achievable to improve their safety and quality of life during flood events further addressing the flooding problem determined through the analysis and feedback received.

Key Pad Polling Exercise (Full polling report was sent as a pdf attachment)

At the onset of the meeting H3 Studio and Team conducted a key pad polling exercise to determine the distribution of community members at the meeting and their experiences with flooding. Based on the questions we posed to community members:

- The representation of city areas with strong with at least one major person living in each of the main city quadrants.
- 67% of the attendees have lived in De Soto for more than 5 years with only a third living in the city between 1 and 5 years.
- 62% of meeting attendees were older than 65 and only 37% of attendees were under 65.
- 100% of attendees owned their home. There was no representation of renter households or landlords at the meeting.
- 56% of respondents reported their homes have been affected by flooding at least 1 to 3 times in the last 10 years with one person having experienced displacement from flooding.
- 62% of attendees felt prepared or very well prepared to deal with flooding.

While the meeting had diverse community representation from all areas of the city, there was little diversity in age and homeownership of the attendees.

Key Takeaways

After the review of the analysis and keypad polling exercise the team presented their key takeaways to the community. The goal was to ensure the community didn't feel there were any gaps missing in the data and that all of their concerns/priorities were addressed. The team received no written comments or additions on the worksheet and the community felt the takeaways captures the largest problems faced by the community. These are the 9 key takeaways developed:

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

1. Given the amount of water impacting Desoto from upstream county land the multijurisdictional management of upstream development, dams, and reservoirs becomes a critical component for flash-flood mitigation and reduction.

2. Development in Desoto is challenging the capacity of the shallow bedrock tributary streams and ultimately the Joachim Creek which also contains debris disrupting the flow of water and holding capacity.

3. From an emergency management and services perspective rescues and resource movement becomes more challenging to provide as critical roads and buildings become flooded.

4. De Soto's lack of significant medical facilities increases risks to life safety when flooding begins affecting key roads in and out of the city.

5. A majority of people affected in the flood plain are low-income rental residents.

6. Many of the homes in the floodplain are low value properties at risk of repetitive damages with little residual value for repairs, flood-proofing and/or elevation.

7. Residents of the floodplain neighborhoods feel increasingly unsafe, unprepared, and uninformed regarding the floodplain risks and conditions causing undue anxiety, stress, and loss of life.

8. De Soto has an outdated housing stock with few to no opportunities for residents to relocate into safe, available and accessible affordable units.

9. A bulk of Main St. business operations in De Soto are shut down at stream gauge 12'.

Strategies Workshop

After the review and discussion of the key takeaways the community was engaged in a workshop to review the strategies provided by previous plans to the city. H3 compiled a list of all the strategies proposed to date derived from the Army Corps of Engineers Plan, The USGS 2D Study, The Emergency Action and Evacuation Plan, Stakeholder Interviews, and Consultant team discussions. We took these strategies and categorized them into the following key areas:

1. ***Community Livability and Development***
2. ***Emergency Preparedness and Response***
3. ***Education and Engagement***
4. ***Environment and Hydrology***
5. ***Infrastructure***
6. ***Policy and Regulation***

The key six areas were qualified by a list of strategies compiled of all major flood mitigation and resiliency plans and studies developed for the city. Community members were asked to review the

categories and strategies and encouraged to edit, add, delete, and comment on them as they saw fit. The following are the results of the exercise and comments *(in red)* received by community members per category in each strategy:

Community Livability and Development:

- Create opportunities for the development of affordable housing to continue providing assistance to homeowners in the floodplain.
    - Also consider that handicap accessibility requirements often limit De Soto to the construction of single-family homes.
- Property owners should take measure either dry or wet flood proof their properties.
- Existing homes and structures in danger of flooding should consider elevating above the base flood level.
- Build a levee to protect Main Street from flooding.
    - Too expensive not feasible to do
- Expand parks and green spaces adjacent to the Joachim creek.
- Provide a flood light warning system tied to the stream gage for drivers to avoid roads.

- Implement green infrastructure in multiple locations in the city.
    - Yes – where land is already available
- Explore applying to major philanthropic organizations to improve flood resiliency, fund buyouts when appropriate, and promote/develop green infrastructure.
    - Yes, important to achieving the overall vision is – where is the money coming from

Emergency Preparedness and Response:

- Expand Warning Dissemination/Multi-Media Flood Risk Communication Tools inclusive of a public alert flood warning system.
- Continue updating the flood emergency preparedness plan with formal public engagement methods.
- Advocate for the installation of an additional stream gage further upstream on the Joachim Creek.
- Formalize using private property for emergency access or flood fighting which can be done by entering a memorandum with the private landowner.
- Conduct regular inventory of flood fighting equipment, resources, and materials and invest in greater rescue resources like boats and expanded medical services.
- Host annual training for emergency response for both the emergency personnel, volunteers, and the public inclusive of scenario-based training.
- Sponsor a combined resource facility where items can be pooled by Desoto and used as needed in an emergency.
    - Which non-profit will take care of this facility?
- Implement evacuation route signage in Desoto.

Education and Engagement:

- Develop community wide education, outreach, and advocacy programs to educate the public on the impacts of flood plain hazards, prevention, and preparation.

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

- Make an accessible public record of risks and hazards for a properties, development, and overall community awareness.
    - How do you do this legally? Missouri realtors law makes it a challenge
- Create an accessible resource of the financial programs available to citizens impacted by flooding in Desoto.
    - Something like this has already been done.
- Develop educational signage in recreational areas accessible to the public.
    - Signage would be an easy achievable solution that inform people easily of the situation

Environment and Hydrology:

- Improve the flow of water through the creek by clearing the islands along the creek and accumulated sediment and debris deposits.
    - This would require a USACE permit which is very challenging to acquire.
- Take the opportunity to develop wetland, stream, and riparian protection and restoration measures.
- Support basic and applied research toward a better understanding of the particular flood conditions & nature of Joachim Creek.
    - Part of this needs to include underground studies for underground water.
- Look into vacant land that can be purchased/leased/easement by the city or used by the county for detention ponds, levees, and basins that can hold flood waters.
- Examine dam and reservoir management and operations throughout the Upper Joachim Watershed.
    - Extremely challenging there is no cooperation.
- Encourage National Weather Service to develop a precipitation based 24-to-48-hour prediction of flood water levels.
    - Really good idea implements this.
- Promote additional hydraulic studies to explore proposed creek management and infrastructure changes to reduce flooding in De Soto.
    - Need an underground hydraulic analysis which is very expensive.

Infrastructure:

- Consider the constructing of flood walls and levees along key inundation sites to protect neighborhoods.
    - Not feasible to do
- Relocate the Desoto Rural Fire Station out of the flood plain.
- Post Flood Recovery Processes – entities should continue to inspect homes ensuring they follow all regulations and become a repository of information on clean up, safety, mitigation, etc.
    - Very important part of the process
- Continue improving the condition of stormwater infrastructure inclusive of bridge and culvert reconstructions to widen channels.
    - Very important
- Modify key bridges to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.

- This has already been done, work continues

Policy and Regulation:

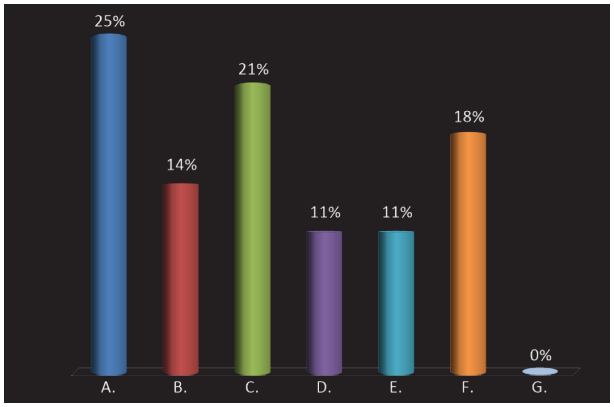
- Apply to be a part of the FEMA CRS program for flood insurance discounts
- Continue acquiring land via buyouts (Structure and Land Acquisitions)
- Develop Land Use Policies and Regulations at the county and city level that mitigate runoff and impacts of construction.
- Establish a multi-jurisdictional management/regulation board representing the entire watershed to implement regulations and policies to increase flood resiliency.
  - Unlikely to occur, too many people at play and very private developments/parties in charge.
- Update building codes based upon best practices for flood resiliency.
- Create a relocation policy and plan for people to leave the floodplain willingly.
  - Very important if we are going to have a successful buyout program

Prioritization Exercise (Full Polling Report was sent as a PDF attachment)

After the review of the categorized strategies community members were asked to rank the categories and strategies based on what they believed would be the most important things to address in the plan. The following are the results of this polling exercise per question:

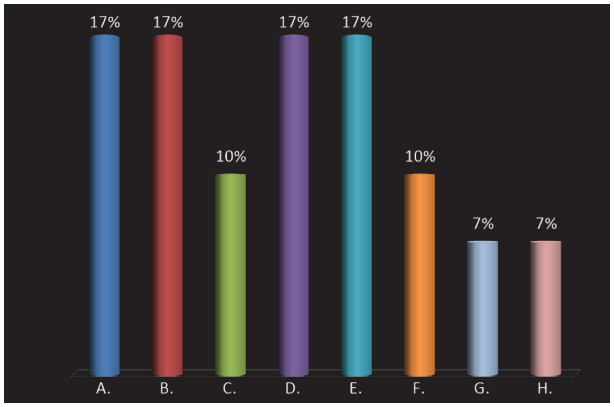
1. **Please rank your top three priorities for De Soto's Resiliency Plan.**

A. Community Development & Livability
B. Emergency Preparedness & Response
C. Education and Engagement
D. Environment & Hydrology
E. Infrastructure
F. Policy & Regulation
G. Other



2. **Under Community Livability and Development please identify your top three strategies.**

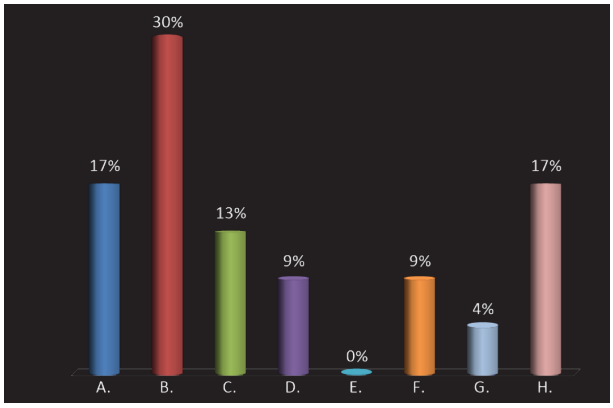
A. Developing affordable housing in or adjacent to De Soto.
B. Dry or wet floodproofing businesses and homes
C. Elevating structures above the base flood elevation.
D. Build a levee to protect main street
E. Expand parks & greenspace along the Joachim Creek.
F. Provide a floodlight warning system
G. Implement green infrastructure throughput the city.
H. Explore partnering with philanthropies to fund buyouts, improve resiliency, and develop infrastructure.



City of DeSoto Flood Resiliency Plan
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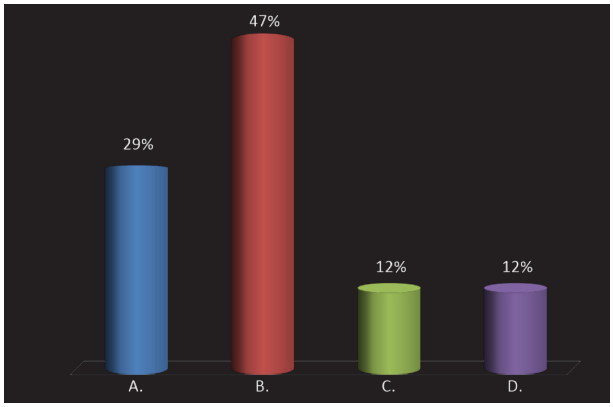
3. **Under emergency preparedness and response please identify your top three strategies.**

A. Expand warning system and flood risk communication tools.
B. Continue updating the emergency preparedness plan.
C. Advocate for the installment of a new stream gauge upstream.
D. Formalize using private property for emergency access or flood fighting.
E. Conduct regular inventory of flood fighting equipment and resources.
F. Host annual emergency response training for all.
G. Sponsor a combined resource facility to pool emergency response resources.
H. Implement evacuation route signage.



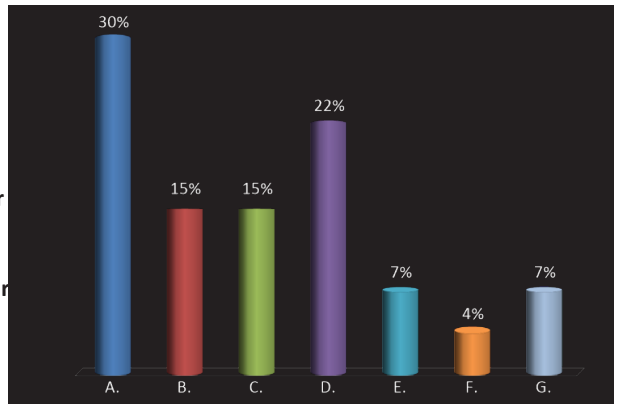
4. **Under education and engagement please identify your top two strategies.**

A. Develop community wide education, out-reach, and advocacy programs for the public.
B. Create and accessible public record of risks and hazards for properties, development, and community awareness.
C. Create an accessible resource of the financial programs available to citizens impacted by flooding.
D. Develop educational signage in recreational areas accessible to the public.



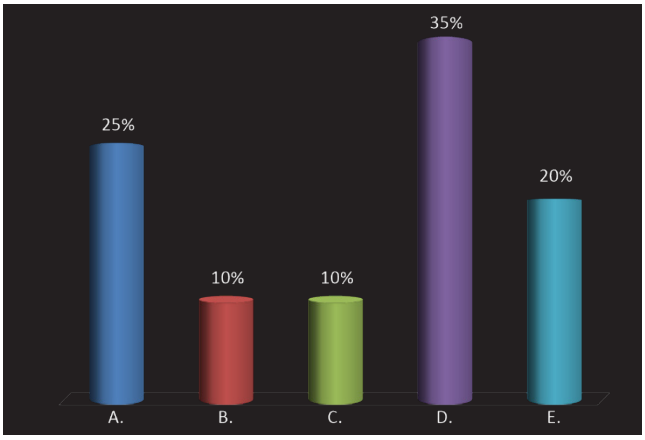
5. **Under environment and hydrology please identify your top three strategies.**

A. Improve water flow by clearing islands in the creek and accumulated debris/sediment.
B. Take the opportunity to develop wetland, stream, and riparian protection measures.
C. Support basic and applied research to support an understanding of the particular conditions of the Joachim Creek.
D. Look into vacant land that can be leased/purchased/easement by the city for detention ponds, levees, and basins.
E. Examine dam and reservoir management and operations in the watershed.
F. Encourage weather service to develop precipitation-based prediction models.
G. Promote additional hydraulic studies to explore proposed creek management and infrastructure changes.



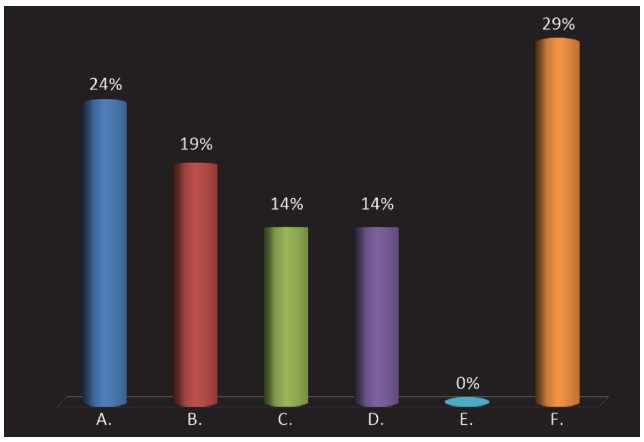
6. **Under infrastructure, please identify your top 2 strategies.**

A. Consider the construction of floodwalls and levees along key inundation sites.
B. Relocate the De Soto Rural Fire Station outside of the flood plain.
C. Continue the inspection of homes by city and county official to ensure homes are up to regulations and safe.
D. Continue improving the condition of stormwater infrastructure inclusive of bridges and culvert reconstructions.
E. Modify key bridges to be more hydraulically efficient and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek during flood events.



7. **Under policy and regulation please identify your top three strategies.**

A. Apply to be a part of the FEMA CRS program for flood insurance discounts.
B. Continue acquiring land via buyouts (Structure and Land Acquisitions)
C. Develop Land Use Policies and Regulations at the county and city level that mitigate runoff and impacts of construction.
D. Establish a multi-jurisdictional management/regulation board representing the entire watershed to implement regulations and policies to increase flood resiliency.
E. Update building codes based upon best practices for flood resiliency.
F. Create a relocation policy and plan for people to leave the floodplain willingly.



Based on the polling results from community members their biggest priorities are for community livability and development, education and engagement, and policy and regulation. These categories are consistent with discussion during the meeting that most people are unaware of the situation and don't care because they don't know or understand what is going on. Community members felt that solving the affordable housing issue was a priority strategy. They wanted to continue expanding the necessary infrastructure that protects their communities, homes, and assets. They want to expand all possible

education and advocacy avenues to inform people of the situation and they want to ensure the timely warning and response of emergency services and evacuation in the community equitably. They believe that holding back water to release slowly could be effective if done properly and continue exhibiting interest in a stronger buyout and relocation program that protects citizens providing them safe, affordable, places to live.

Cross Referencing Polling Results

When the polling data is analyzed on a respondent level there are certain patterns which began to emerge among respondents as follows:

- The respondents that responded yes to having been affected by flooding felt less prepared to deal with a flooding event overall than the respondents that indicated they had never been affected by flooding.
- On average those that indicated they felt less prepared had also lived in their homes and in De Soto less than five years and likely hadn't faced the severity of the first round of flooding.
- Respondents that had indicated they had not ben affected by flooding favored the priorities under community development and education while the respondents that had been affected by flooding favored community development and emergency response/preparedness.

Additional Comments/Discussion

The following are notes and comments made during the discussion of the flooding events in De Soto in the workshop. Community members asked us the team to consider the following:

- The development of this plan is not anti-development – but it needs to encourage development to occur responsibly. ALL development should be able to deal with their runoff directly on their site.
- For affordable housing development take a look at the Old Central School Campus which was converted into senior apartments. Are there other places/opportunities in De Soto to improve housing and make it up to par with the needs of the community.
    - The challenge is the regulations to accessibility and by the MHDC to get that work done.
- Funding for elevations of homes is not provided by the state, county, or city. The value of homes does not make the idea of elevations or flood proofing worthwhile endeavors to homeowners.
- Since the flooding events in De Soto are flash flood events and rise quickly maybe we should consider altering the door knocking policy to be enacted sooner than 8' gauge.
- People in the community aren't proactive often refusing to leave until it is too late. Increasing risks to their own life and safety and risking the life and safety of police and enforcement.
- Careful attention has to be paid when deciding to enact an emergency signal/begin the evacuation process. The city could run into the issue of the "boy who cried wolf" where residents having heard the emergency calls so many times begin to disregard the alerts and disregard police that come knocking/enact an evacuation.
- Consider a plan for the elderly citizens in De Soto – they don't all have access to technology the ways others do to see CodeRED alerts.

    - What is the system to alert them and others that don't have technology
- There are only 3 officers on duty in De Soto. In a flash flood condition that is not enough to knock on 229 properties and get citizens out and evacuated in a timely manner.
- When a flood is occurring, Spire comes in and takes out the gas meters meaning residents are left without some basic utilities and services in times of need.
- It is important to involve kids and youth early in as a method to increase awareness and safety in the community. Often kids take information they've learned home to their parents. This is a program that can be taught in school and resources in the community like Freddy's Pond can be used for it also.
- With environment – consider that cleaning the creek and develop growth and vegetation along it are strategies that can work in tandem. These methods must be developed in the appropriate places along the creek.
- Anything the city can do with the creation of a house or properties public record is extremely important. MO Realtors association and state law make disclosing information non mandatory and challenging to homeowners and renters that get blindsided. At the state level if a home goes into foreclosure and then gets repurchased then the history of the house is erased and people are unaware of their specific situation.

Key Conclusions & Next Steps

The following are the final conclusions drawn based on the work products and discussion points had at the public meeting:

- The community values the potential of a successful buyout and relocation plan. Several of the members at the meeting were there because of interest in the potential of a buyout. This leads to a priority for relocation and affordable housing strategies for the community.
- Many comments were made that people do not respond or take action because community members are uninformed about their properties and the situation at hand. Community members valued the strategies and concepts of outreach, workshops, and visibility in terms of signage for evacuations and flood plain education.
- Emergency Preparedness and response was another big focus of the meeting. Ensuring the city has the resources necessary but also ensuring the safety and access to people is important. Visibility and emergency management signage and warning system became focus topics of conversation.
- Community members recognize many challenges to environment and hydrology and policy and regulation given the multi-jurisdictional condition that many of the strategies require. Namely maintenance and operation of dams and cleaning out debris and land in Joachim Creek. These strategies require partnership with government organizations and private developments that will be challenging to acquire.

The most feasible paths for the community lie in improving housing, buyouts and relocations, education and advocacy, warnings, and an expanded response strategy. People agreed that regulation and policy would be necessary but recognized the challenges. As part of the next steps, H3 Studio will begin

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

establishing the draft strategies for the plan and then derive an achievable action and implementation plan draft for the city of De Soto and community to review at the next public meeting.

Example Key Takeaways Worksheet:

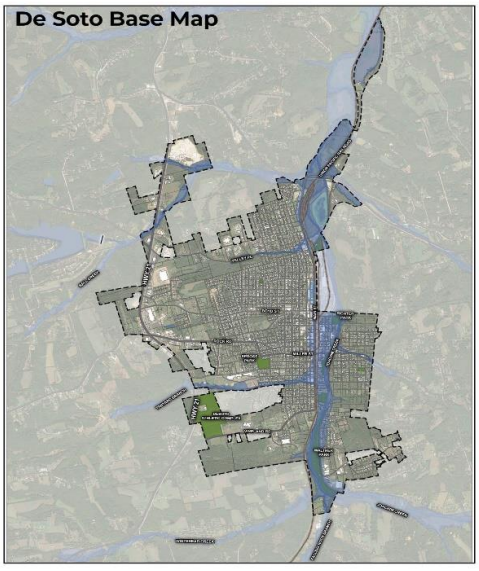
H3 STUDIO TEAM

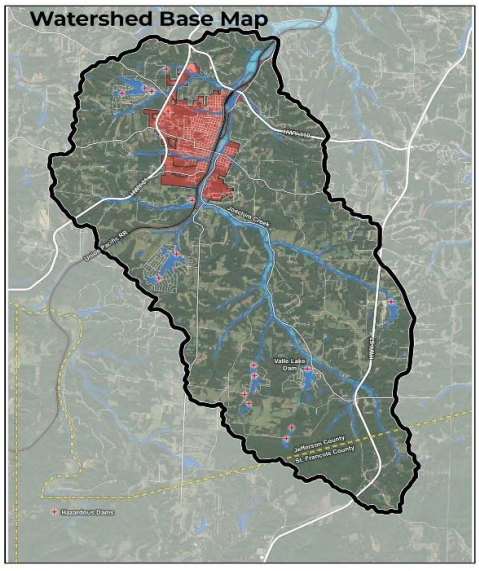
CITY OF DE SOTO
FLOOD RESILIENCY PLAN
PUBLIC MEETING #1
MARCH 7,2023

Key Takeaways Issues and Opportunities List

Please review the following takeaways adding to the list if you see anything important to note and consider missing! Use the maps to indicate any specific areas the team needs to explore/include in the planning process.

1. Given the **amount of water impacting Desoto from upstream county land** the multijurisdictional management of upstream development, dams, and reservoirs becomes a critical component for flash-flood mitigation and reduction.
2. **Development in Desoto** is challenging the capacity of the shallow bedrock tributary streams and ultimately the Joachim Creek which also contains debris disrupting the flow of water and holding capacity.
3. From an emergency management and services perspective **rescues and resource movement becomes more challenging to provide as critical roads and buildings become flooded.**
4. **De Soto's lack of significant medical facilities** increases risks to life safety when flooding begins affecting key roads in and out of the city.
5. **A majority of people affected in the flood plain are low income rental residents.**
6. Many of the homes in the floodplain are **low value properties at risk of repetitive damages** with little residual value for repairs, flood-proofing and/or elevation.
7. **Residents of the floodplain neighborhoods feel increasingly unsafe, unprepared, and uninformed** regarding the floodplain risks and conditions causing undue anxiety, stress, and loss of life.
8. De Soto has **an outdated housing stock** with **few to no opportunities for residents to relocate into safe, available** and accessible affordable units.
9. A bulk of **Main St. business operations in De Soto are shut down at stream gauge 12'.**
10.
11.
12.
13.
14.
15.





Example Meeting Strategies Workboard:

H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN
PUBLIC MEETING #1
MARCH 7th 2023

FLOOD RESILIENCY PLAN: STRATEGIES WORKSHOP

COMMUNITY DEVELOPMENT & LIVABILITY

- Create opportunities for the development of affordable housing to continue providing assistance to homeowners in the floodplain.

  Property owners should take measure either dry or wet flood proof their properties.
- Existing homes and structures in danger of flooding should consider elevating above the base flood level.
- Build a levee to protect Main Street from flooding.
- Expand parks and green spaces adjacent to the Joachim creek.
- Provide a flood light warning system tied to the stream gage for drivers to avoid roads.
- Implement green infrastructure in multiple locations in the city.
- Explore applying to major philanthropic organizations to improve flood resiliency, fund buyouts when appropriate, and promote/develop green infrastructure.

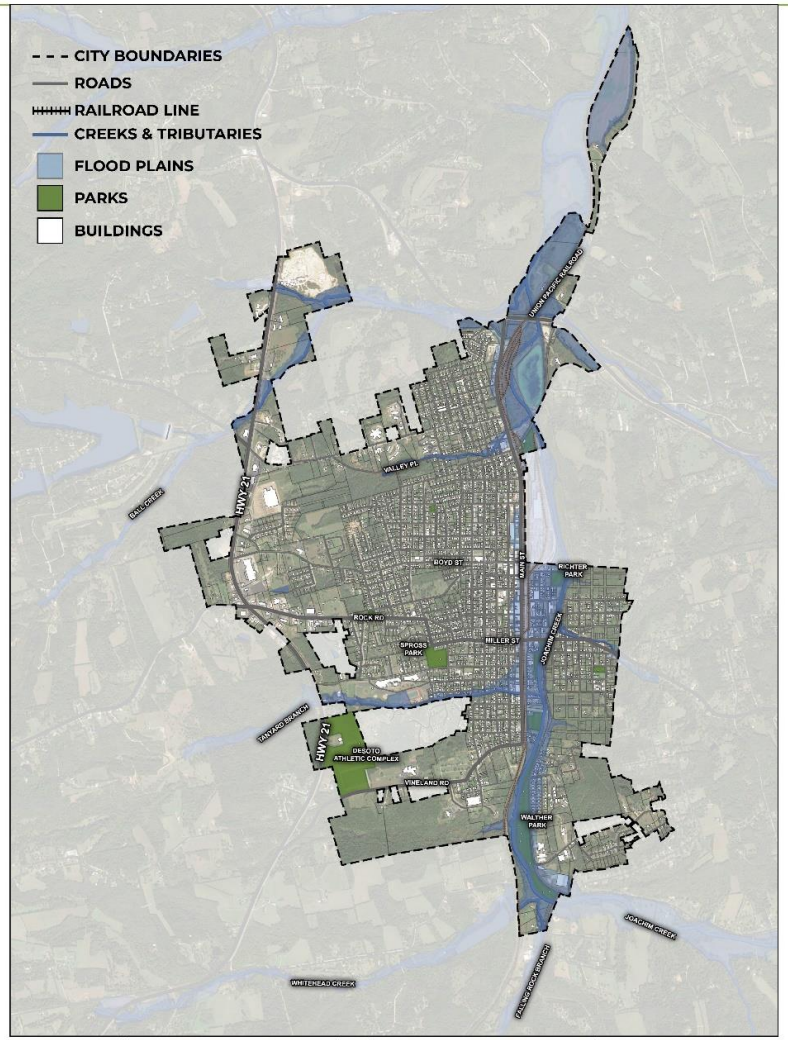
EMERGENCY PREPAREDNESS & RESPONSE

- Expand Warning Dissemination/Multi-Media Flood Risk Communication Tools inclusive of a public alert flood warning system.
- Continue updating the flood emergency preparedness plan with formal public engagement methods.
- Advocate for the installation of an additional stream gage further upstream on the Joachim Creek.
- Formalize using private property for emergency access or flood fighting which can be done by entering a memorandum with the private landowner.
- Conduct regular inventory of flood fighting equipment, resources, and materials and invest in greater rescue resources like boats and expanded medical services.
- Host annual training for emergency response for both the emergency personnel, volunteers, and the public inclusive of scenario-based training.
- Sponsor a combined resource facility where items can be pooled by De Soto and used as needed in an emergency.
- Implement evacuation route signage in De Soto.

EDUCATION & ENGAGEMENT

- Develop community wide education, outreach, and advocacy programs to educate the public on the impacts of flood plain hazards, prevention, and preparation.
- Make an accessible public record of risks and hazards for a properties, development, and overall community awareness.
- Create an accessible resource of the financial programs available to citizens impacted by flooding in De Soto.

  Develop educational signage in recreational areas accessible to the public.



Draw any ideas you have and highlight key areas of the city that should be emphasized throughout the flood resiliency planning process!

Corps of Engineers Plan | Emergency Action & Evacuation Plan | Stakeholder Engagement | Consultants

ENVIRONMENT & HYDROLOGY

- Improve the flow of water through the creek by clearing the islands along the creek and accumulated sediment and debris deposits.
- Take the opportunity to develop wetland, stream, and riparian protection and restoration measures.
- Support basic and applied research toward a better understanding of the particular flood conditions & nature of Joachim Creek.
- Look into vacant land that can be purchased/leased/ easement by the city or used by the county for detention ponds, levees, and basins that can hold flood waters.
- Examine dam and reservoir management and operations throughout the Upper Joachim Watershed.
- Encourage National Weather Service to develop a precipitation based 24 to 48 hour prediction of flood water levels.
- Promote additional hydraulic studies to explore proposed creek management and infrastructure changes to reduce flooding in De Soto.

INFRASTRUCTURE

- Consider the constructing of flood walls and levees along key inundation sites to protect neighborhoods.
- Relocate the De Soto Rural Fire Station out of the flood plain.
- Post Flood Recovery Processes – entities should continue to inspect homes ensuring they follow all regulations and become a repository of information on clean up, safety, mitigation, etc.
- Continue improving the condition of stormwater infrastructure inclusive of bridge and culvert reconstructions to widen channels.
- Modify key bridges to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.

POLICY & REGULATION

- Apply to be a part of the FEMA CRS program for flood insurance discounts
- Continue acquiring land via buyouts (Structure and Land Acquisitions)
- Develop Land Use Policies and Regulations at the county and city level that mitigate runoff and impacts of construction.
- Establish a multi-jurisdictional management/regulation board representing the entire watershed to implement regulations and policies to increase flood resiliency.
- Update building codes based upon best practices for flood resiliency.
- Create a relocation policy and plan for people to leave the floodplain willingly.

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| May 16th, 2023

Public Meeting #2 Report

De Soto Flood Resiliency Plan

Public Meeting Overview

Public Meeting #2 was held at the De Soto Community Center on Tuesday May 16th, 2023 from 6:30 PM to 8:30PM with 35 members in attendance. The purpose of this workshop was to vet the final development of the goals, objectives, and action items of the resiliency plan with the community members. To do so the team gave a presentation for approximately an hour which ran through the analysis, planning assumptions, goals, and objectives. The team then asked community members to break out into work stations to discuss the specific action items, goals, and objectives of the plan. They were asked to spend 20 minutes at one station and then rotate for another 20 minutes at a new station before reporting out at the conclusion of the meeting. The stations were as follows:

Station 1:

- Emergency Readiness + Response
- Education + Engagement

Station 2:

- Environmental Stewardship + Water Conservation
- Green and Blue Infrastructure + Services

Station 3:

- Policy + Regulation
- Funding, Partnerships, + Implementation

Community Goals, Objectives, and Action Items Workshop

The basis of the goals and objectives include a series of four planning assumptions derived from our analysis of the city its condition, capacity, flood issue, and history combined with stakeholder input and research of best practices and trends. These assumptions were presented to community members at the meeting as follows:

1. ***Living with Water***
    a. *The City of De Soto is a river town with a deep history of underground springs and intermittent flooding from the Joachim Creek.*
    b. *Extreme weather events leading to the Upper Joachim Creek flash-flooding within the downtown area of the City of De Soto will overtime gradually amplify in intensity and frequency.*
    c. *The exact nature of this amplified extreme weather increases is uncertain and unpredictable, however the risk to life and property is anticipated to increase over time.*

d. *There are significant flash-flood dangers from under-performing dams up-stream of the City of De Soto.*
e. *It is not feasible to retain sufficient of the Upper Joachim Creek flood waters within the watershed south of the City of De Soto such that no flooding will occur in downtown.*

2. ***Nature Based Solutions***
    a. *There is a need to increase the "Room for the River" and create additional floodable parks.*
    b. *There is a need to locally reduce the inflow of urban stormwater into the Joachim Creek in times of flood and stop the flood waters backing up through the sewer and stormwater system.*
    c. *There is a need to increase nature-based flood retention and absorption areas throughout the Upper Joachim Watershed.*
    d. *A Study on reducing urban flood risks found that:*
        i. *"Neighborhoods with blue green infrastructure (including stormwater detention ponds, green roofs, and swales) resulted in less flood damage compared to areas in the city having conventional stormwater management (i.e., combined or separate pipe networks)."*

3. ***Improving Quality of Life***
    a. *It is essential to increase public safety from flooding as well as providing transparent oversight of redevelopment post-flood conditions.*
    b. *There is a need to retain and grow the economic base of downtown and adjacent businesses as well as protecting key infrastructures.*
    c. *All new development in the Upper Joachim Watershed should provide increased storm-water retention to ensure no water discharge in times of flood.*
    d. *The residents of the neighborhoods adjacent to the Joachim Creek have expressed a desire to remain within the City of De Soto.*

4. ***Partnerships for Implementation***
    a. *There is a need for a heightened multi-jurisdictional community-based emergency prediction, notification and response system as well as forward-looking adaptation and mitigation planning.*
    b. *Implementation always requires matching local funds to access state, federal and philanthropic funding.*
    c. *Headwater Economics indicates:*
        i. *1. Funding applications and proposals are stronger when they include effective economic arguments.*
        ii. *2. The most successful mitigation projects have long-term predictable funding from a variety of sources.*

These planning assumptions set up the types of action items developed by the plan with the knowledge and understanding that flooding will not go away permanently, instead a series of incremental best

practice strategies are the recommended approach to better preparing and increasing the overall city capacity to combat flooding conditions. Community members had no objection to the premise of the planning assumptions.

Community Goals, Objectives, and Action Items Workshop

Each workshop station had two facilitators from the consultant team for the resiliency plan. Community members were asked if they agreed with the goals, objectives, and action items of the plan and were asked to provide any final feedback and comments which will be incorporated into the final plan. The following are the comments received at each of the stations per goal.

Station 1:

A. **Emergency Readiness + Response**

Objective 1: Strengthen the City and County's critical service and resiliency infrastructure including the response capacity of police, fire, and medical support during flood conditions.

a. *Consider phone call/texting emergency notifications over door knocking.*
b. *Use a city specific emergency response protocol, CODE RED has been inconsistent*
c. *Identify/enable senior/disabled or other residents who may need additional support to evacuate.*
d. *Support neighborhood mutual aid.*
e. *Police presence after flooding to prevent break ins.*
f. *J-98 radio station is a good source of communication to citizens*
g. *Consider using floodmap or floodbase subscription to predict and track flooding patterns in De Soto.*
h. *Can the stream gage have live cameras and aerials.*

Objective 2: Provide residents and businesses with the necessary information for their own flood readiness, protection, and evacuation.

a. *Provide guidance on emergency kits and instructions for evacuation.*
b. *Siren system, use tornado sirens for flooding.*

Objective 3: Regularly update the Emergency Action and Evacuation Plan for De Soto and encourage the county to develop a similar plan for The Upper Joachim Watershed.

a. *Use flood/stream gage data to improve flood prediction capabilities.*

B. **Education + Engagement**

Objective 1: Develop community wide education, outreach, and advocacy programs to educate the public on the history of flooding, flood plain hazards, prevention, and preparation.

a. *Learn from the knowledge of long-time residents who can 'read' the flood.*

b. *Sign a city mandated occupancy permit for renters and buyers*
c. *Realtors will send in violations to the city state/licensure – for rent by owner does not require disclosures but should*
d. *Vacancy has shifted since 2020 – market is stronger.*

Objective 2: Create targeted outreach and public safety program for floodway residents and create community service opportunities to support floodplain programs.

a. *Protect elderly residents from exploitative housing.*
b. *Encourage participation in flood meetings – meetings tend to be repetitive*
c. *Deliver notices for emergency kit evacuations*

Station 2:

A. **Environmental Stewardship + Water Conservation**

Objective 1: Support basic and applied research toward a specific understanding of the particular flood conditions and nature of Joachim Creek.

a. *Potential new gauge site at Valle Lake and Joachim Creek flow*

Objective 2: Promote and monitor watershed management throughout the Upper Joachim Creek Watershed to ensure increased public safety and to minimize property damage from flooding.

Objective 3: Enhance and preserve the natural landscape in and along the Joachim Creek.

B. **Green and Blue Infrastructure + Services**

Objective 1: Reduce flood damage to buildings and public infrastructure.

a. *Connect project funding to DNR*
b. *Lagoon on Mann to be optimized for water catchment (on 110)*
c. *Regulations overall should be uniform within the flood plains*

Objective 2: Improve the flow of the Joachim Creek through De Soto to limit the impact of flooding.

a. *Can dry creeks be used to catch runoff water.*
b. *Bring in Ryan Stack from Damns and Reservoirs program at DNR*
c. *Shoe factory to become floodable parks.*
d. *Hwy V new bridge curved floods*

Objective 3: Protect all emergency and critical service facilities in the floodplain.

Station 3:

A. **Policy + Regulation**

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Prepared by H3 Studio| May 16th, 2023

Objective 1: Promote higher development and design standards to protect buildings and limit the impact of runoff into the watershed.

a. *Better underground infrastructure to prevent groundwater flooding.*
b. *Dig out dry creeks to make reservoirs.*

Objective 2: Develop land use standards that promote the protection of the De Soto community from flood and stormwater impacts.

a. *DNR standards for development*

Objective 3: Create legal protections for floodplain affected residents to be protected and aided in times of need.

a. *Create more protections for renters, disclosures.*
b. *Voluntary allowable living in the floodway, no allowable resales*
c. *Required documents listing flooding that goes along with occupancy*

B. **Funding, Partnerships, + Implementation**

Objective 1: Expand city and county, organizational, financial, and development partnerships.

a. *Look into the methods of and potential partnerships with relocation companies.*

Objective 2: Assess the economic gaps and opportunities available to the City of De Soto.
Objective 3: Leverage local, state, and federal grant funding as well as non-traditional sources of funding to facilitate flood mitigation actions such as elevation, acquisition, or floodproofing.

a. *Is there a full-time city employee pushing this topic? Building these relationships, attending local and regional meetings.*

Workshop Conclusions:

Community members were accepting of the goals and objectives presented at the meeting placing particular focus on education, readiness and response, and funding. Community members consistently expressed that people just aren't aware of the issue. The more aware they can be made the better. Better and more accurate/consistent warning is also a priority for community members. A voluntary acquisition program (buyouts) is also super important to community members and many attendees would like to see greater progress on that front. Many of those in attendance were at the meetings to learn more about buyouts or because they are interested in acquiring a buyout themselves.

Workshop Boards and Images:

The following pages display some of the meeting's materials and session images.

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| May 16th, 2023

H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

COMMUNITY LIVABILITY + DEVELOPMENT

GOAL STATEMENT:

In conjunction with increasing the overall resilience of both people and property from flooding, improve the quality of life and public amenities in the historic downtown and neighborhoods adjacent to the Joachim Creek.

OBJECTIVES + ACTION ITEMS:

Objective 1: Create new flood detention opportunities and expand the floodable park area immediately adjacent to Joachim Creek and tributaries.

1.1 Facilitate **an on-going voluntary property acquisition (buy-out) program** in areas of high-flood probability and convert to floodable park space

1.2 Incrementally expand the opportunity for **an integrated system of floodable parks and open space** along the Joachim Creek and tributaries to create an expanded Joachim Parks and Trail system.

1.3 Create **an expansive Joachim Parks and Trail system** for walking, jogging, and bicycle riding.

1.4 Encourage the **pedestrian and bicycle linkage of Main St. as well as existing and future open space areas throughout the city** to the Joachim Park and Trail system.

1.5 Re-configure Walther Park, Richter Park, Shoe Factory site and Hopson Field into **floodable park spaces following floodable park best practices** that are still usable as recreational amenities when not flooding.

Objective 2: Promote the development of affordable housing and choice neighborhood development throughout the city.

2.1 Develop **a toolkit of diverse housing types and construction techniques** that increase the range of affordability and are incorporated into the city's land-use plan and zoning code.

2.2 Create **a land use and property ownership inventory** of possible development locations for a diverse range of affordable housing types.

2.3 Facilitate the acquisition of land for the purpose of **affordable housing developments.**

2.4 Develop **a "land swap" program** to facilitate relocation out of the flood way.

Objective 3: Strengthen and revitalize the historic downtown as a major community asset and defining feature of De Soto.

3.1 Work to register the De Soto Main Street and its relevant buildings into the National Register of Historic Places.

3.2 **Increase the protection of Main Street through back-flow preventors, culvert gates,** etc. and investigate the opportunity for a minor levee or berm adjacent to the rail line.

3.3 **Create an effective Main Street organization that coordinates activities, events, and business support** along Main Street while increasing Main Street's influence within the city and its economic structure.

3.4 **Create a strategic plan for Main Street economic development** that also includes "Main Street First" policies to limit relocation to other commercial corridors.

3.5 **Offer incentives to entice businesses** and restaurants to remain on Main Street and improve the aesthetics and functionality of their buildings.

3.6 **Encourage the East of the tracks Main Street business to relocate their store fronts onto Main St.** where they are safer and more accessible to community foot traffic.

3.7 Develop incubator business spaces along main street to act as **startup opportunities for small businesses.**

3.8 Continue advocating for the installment of **an Amtrak rail stop** in De Soto.

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| May 16th, 2023

H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

EMERGENCY READINESS + RESPONSE

GOAL STATEMENT:

Protect the health, safety, and welfare of residents as well as business profitability and visitorship in all emergency flood situations.

OBJECTIVES + ACTION ITEMS:

Objective 1: Strengthen the City and County's critical service and resiliency infrastructure including the response capacity of police, fire, and medical support during flood conditions.

1.1 Continue coordination with USGS, SEMA, and the county to **provide early warning systems** such as gage activated flood lights on dangerous roads and a public alert warning system/flood siren.

1.2 Request that the National Weather Service Advanced Hydrologic Prediction Service (AHPS-River Forecast Center) **lower the "action stage" for the Joachim Creek gage from 8 feet down to 6 feet,** or as low as feasible.

1.3 Sponsor **a combined resource facility for City's and County's departments** to pool resources to be used as needed in times of emergency.

1.4 Actively work to **recruit personnel for fire and police** inclusive of volunteer service men and women.

1.5 **Conduct regular inventories of flood fighting equipment, resources, and materials** in order to work toward investing and increasing the amount of rescue resources like rescue boats, medical supplies, tactical equipment, etc.

1.6 Lower the **action phase level for Code Red from 8ft to 6ft to give residents ample warning** of potential flooding effects.

1.7 Work with Jefferson County to **relocate the De Soto Rural Fire station** out of the floodplain.

1.8 Identify **another site for first responders West of the Joachim Creek** to allow consistent access to the community even in times of flooding.

Objective 2: Provide residents and businesses with the necessary information for their own flood readiness, protection, and evacuation.

2.1 Implement **a comprehensive signage system for evacuation** routes and safe site locations.

2.2 Formalize agreements to **use private property for emergency access** or as a floodway.

2.3 Educate and assist vulnerable populations in developing **personal preparedness plans.**

2.4 Support the development of **a small-scale clinic/medical facility in De Soto** to be used as an emergency location.

2.5 **Provide a database of financial resources** to dry and wet flood proof or raise homes in the floodplain.

2.6 **Test floodway properties for mold and mildew** and **provide financial support** to residents to treat mold as a major public health concern.

2.7 Require **mandatory flood disclosures and evacuation information** to renters in the Joachim Creek Floodway.

Objective 3: Regularly update the Emergency Action and Evacuation Plan for De Soto and encourage the county to develop a similar plan for The Upper Joachim Watershed.

3.1 Host an **annual review/training workshop** for all city and county staff and emergency response teams.

3.2 Comprehensively **update the Emergency Action and Evacuation Plan** every 5 years with a formal public engagement process.

3.3 Ensure the **plan to be readily available and accessible to the public** in print and web format.

3.4 Study and identify **all primary and secondary roadways** used by workforce and emergency service providers that flood and develop plans to **mitigate flood hazards and prioritize area evacuations.**

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| May 16th, 2023

H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

EDUCATION + ENGAGEMENT

GOAL STATEMENT:

Implement a city-wide education program to increase awareness of the flooding issues in De Soto and create a more informed, pro-active, and engaged, community.

OBJECTIVES + ACTION ITEMS:

Objective 1: Develop community wide education, outreach, and advocacy programs to educate the public on the history of flooding, flood plain hazards, prevention, and preparation.

1.1 Launch a social media and print campaign to **raise awareness and bring increased attention to the history of flooding** in De Soto and the impacts it has had on the community.

1.2 Periodically **survey the public to evaluate if public outreach efforts are effective** in identifying potential flood hazards, public concern, and ways to mitigate against hazards.

1.3 Encourage **residents to assume an appropriate level of responsibility** for their own flood readiness and protection.

1.4 Develop **educational signage** in recreational areas that are accessible to the public. This includes historic flood markers, historic impact images, safety and prevention education implemented throughout the city or in a similar way to the tree museum or exercise park that exist at Walther Park.

1.5 Distribute a **yearly community brochure** updating citizens on the city's progress towards flood resiliency, projects in the pipeline, and opportunities to stay informed and involved.

Objective 2: Create targeted outreach and public safety program for floodway residents and create community service opportunities to support floodplain programs.

2.1 Work with existing FEMA, SEMA, and City resources to **develop a "Homeowner's guide to living in a flood plain"** which is to be distributed to all flood plain residents detailing their risks, preparation options, warning/alert systems, and evacuation procedures in times of a flooding emergency. Make it both a web and print resource.

2.2 **Lobby for an accessible public record of risks and hazards for properties,** development, and overall community awareness.

2.3 Establish **a volunteer program with the local school** which can count towards A+, NHS, or STUCO service hours which would help impacted residents clean and repair properties post floods and connect local youth with area professionals to learn about flood safety, readiness, and sustainability.

City of DeSoto Flood Resiliency Plan
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H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:
ENVIRONMENT + HYDROLOGY

GOAL STATEMENT:

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

OBJECTIVES + ACTION ITEMS:

Objective 1: Support basic and applied research toward a specific understanding of the particular flood conditions and nature of Joachim Creek.

1.1 Promote and encourage **comprehensive hydrological and meteorological research** to understand the causes and trends of flooding in De Soto.

1.2 Work with the National Weather Service to **identify precipitation and flood patterns in the Joachim Creek watershed** specific to amount of rain, direction, and water height.

1.3 Promote additional hydraulic studies to **explore proposed Joachim Creek watershed management and infrastructure changes to reduce flooding** in De Soto.

1.4 Conduct a cost benefit analysis to **research the feasibility of installing an additional stream gage** further upstream on the Joachim Creek.

1.5 Create and **maintain a database for all hazard events and impacts** thereof where data for extent and previous occurrence information is not readily available.

Objective 2: Promote and monitor watershed management throughout the Upper Joachim Creek Watershed to ensure increased public safety and to minimize property damage from flooding.

2.1 Establish **a resident and business-based Joachim Creek Watershed Conservancy** to stimulate routine meetings, raise funding for projects, and lobby for regulations in the Upper Joachim Creek Watershed.

2.2 Establish **a Joachim Creek Watershed Management Board to develop and implement regulations and policies** to increase flood resiliency and maintain the character and quality of the entire length of Joachim Creek.

2.3 Establish **a rapid response team to document water elevation levels and survey damage** following major floods.

Objective 3: Enhance and preserve the natural landscape in and along the Joachim Creek.

3.1 Where applicable **develop wetland, stream, and riparian development corridors for protection and restoration** of a naturally flood resilient landscape.

3.2 **Continue supporting**, with the necessary parties (Corps of Engineers, Stream Team, DNR, etc.), **the clean up of Joachim Creek** to clear up trash and debris from the creek and tributaries.

3.3 **Create bioswales and green infrastructure along the Joachim Creek corridor that create pollinator and wildlife habitats while reducing localized flooding**, and promoting environmental education opportunities for the community.

3.4 **Continue to test and monitor for lead pollution for floodway properties** and take the necessary remedial actions in partnership with the EPA.

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H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

INFRASTRUCTURE + SERVICES

GOAL STATEMENT:

Update and upgrade city infrastructures and essential service facilities to the highest possible standard for stormwater management and public safety.

OBJECTIVES + ACTION ITEMS:

Objective 1: Reduce flood damage to buildings and public infrastructure.

1.1 **Target repetitive loss properties for buy outs to implement green infrastructure** and mitigation projects in the floodplains.
1.2 Consider the construction of **flood walls and levees to protect businesses along Main St.**
1.3 **Protect transportation routes and improve traffic flow along Veterans Dr.** to ensure safe access to neighborhoods south of the city for longer periods of time.
1.4 **Raise Veterans Dr. along Walther's Park to create a levee** to protect housing and businesses along it.
1.5 **Continue the improvement of stormwater infrastructure and the provision of street green infrastructure** in De Soto to mitigate city runoff and limit backup into buildings.
1.6 Ensure the **quarterly cleaning of storm drains** to maintain adequate drainage as designed.

Objective 2: Improve the flow of the Joachim Creek through De Soto to limit the impact of flooding.

2.1 **Identify and modify or rebuild key bridges and culverts** along Kingston St., Miller St., Highway 110, and Main St. to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.
2.2 Explore the feasibility of using targeted buyouts along the edges of the Joachim creek to **widen and deepen the channel from Walther's Park up to the rail yard.**
2.3 **Develop upstream detention basins on available land** to hold and then slowly release water as it moves through the city to limit the impact of flooding.
2.4 Explore the feasibility and impact of **leasing private land adjacent to Joachim Creek for flooding in an emergency.**
2.5 Coordinate with DNR to periodically **clean out invasive vegetation as well as flood debris deposits** from Walther's Park to the rail yard

Objective 3: Protect all emergency and critical service facilities in the floodplain.

3.1 **Raise or relocate the De Soto Rural Fire Station** out of the flood plain.
3.2 Work with Union Pacific to **protect or relocate the utility sub-station.**
3.3 Work with Union Pacific to investigate the opportunity to **raise the rail-tracks out of the 100 year floodplain.**
3.4 **Expand EMT services** to be accessible on both sides of the Joachim Creek.

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H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

POLICY + REGULATION

GOAL STATEMENT:

Build a system of accountability by codifying and enforcing mitigation best practices and development regulations that reduce stormwater and runoff impacts in the Upper Joachim Watershed.

OBJECTIVES + ACTION ITEMS:

Objective 1: Promote higher development and design standards to protect buildings and limit the impact of runoff into the watershed.

1.1 **Update city building codes** to require design in and adjacent to floodplains to address the 0.2% AEP event.

1.2 **Follow best practices to mitigate runoff and construction impacts** on the waterways by requiring storm captures on all new sites.

1.3 Develop **a green infrastructure stormwater captures incentives program** or grants program for existing residential and commercial properties to capture stormwater on site.

1.4 **Advocate for better inspection and regulations** for the dams and subdivisions upstream from De Soto.

1.5 **Push for greater regulations in storm water and construction within the Upper Joachim Watershed** as an overlay as opposed to the county as a whole.

Objective 2: Develop land use standards that promote the protection of the De Soto community from flood and stormwater impacts.

2.1 Continue **acquiring land** in the floodplain **for the creation of green infrastructure throughout the city** by developing and adopting a city buyout plan.

2.2 Develop **a policy to revert land uses and zoning in the flood plain (repetitive loss properties and bought out properties) exclusively back to park, green, and open spaces** for the development of green infrastructure for flood resiliency.

2.3 Enable **the construction of higher density affordable housing** by establishing a multi-family land use ordinance in the Main St. area.

2.4 Use city land outside of the floodplain to create new affordable housing or establish a **property land swap program.**

2.5 **Within the regulated floodway do not permit new buildings or increased impervious surfaces without equivalent mitigation** being provided on site or within the floodplain to ensure no (zero) rise in the 1% AEP flood water level.

Objective 3: Create legal protections for floodplain affected residents to be protected and aided in times of need.

3.1 **Create a city assisted relocation plan** for property owners willingly selling their floodplain property.

3.2 Establish a **flood evacuation and shelter program** for flood households.

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CITY OF DE SOTO
FLOOD RESILIENCY PLAN

GOAL:

FUNDING, PARTNERSHIPS, + IMPLEMENTATION

GOAL STATEMENT:

Effectively utilize existing resources and expand sources of revenue to finance critical flood mitigation projects and other, city capital improvements projects, while improving the overall fiscal sustainability of the city.

OBJECTIVES + ACTION ITEMS:

Objective 1: Expand city and county, organizational, financial, and development partnerships.

1.1 **Increase participation with Jefferson County Economic Development Corporation** and help to make the EDC a more relevant and forceful contributor to the metro area's economic development program.

1.2 To preserve and better manage Main Street as a major asset of the city, **join and actively participate in the Missouri Main Street Connection,** which is part of the national Historic Main Street program.

1.3 **Continue exploring partnerships** and funding opportunities with **The Citizens Committee for Flood Reliefs connections to the Anthropocene Alliance.**

Objective 2: Assess the economic gaps and opportunities available to the City of De Soto.

2.1 Urge the Economic Development Corporation to **update and create a new strategic economic development plan for the entire county.**

2.2 Separately or in conjunction with the county, **pursue a Comprehensive Economic Development Strategy (CEDS) process and document for the city itself.** More deeply evaluate the city's economic strengths, weaknesses, and opportunities to create initiatives to build on those strengths and reduce weaknesses. A formal CEDS document improves opportunities for federal economic development funding.

Objective 3: Leverage local, state, and federal grant funding as well as non-traditional sources of funding to facilitate flood mitigation actions such as elevation, acquisition, or floodproofing.

3.1 **Look beyond traditional funding sources for all of the above for raising some of the existing homes.** For instance, large crowdfunding campaigns, local and national church fundraising campaigns, grassroots fundraising campaigns that are strongly tied to the homeowners themselves, concerned DeSoto residents or local charities/community groups.

3.2 **Explore applying to major philanthropic organizations to improve flood resiliency,** fund buyouts when appropriate, and promote/ develop green infrastructure.

3.3 **Assess and re-structure the use of the parks and stormwater tax** to better serve mitigation priorities.

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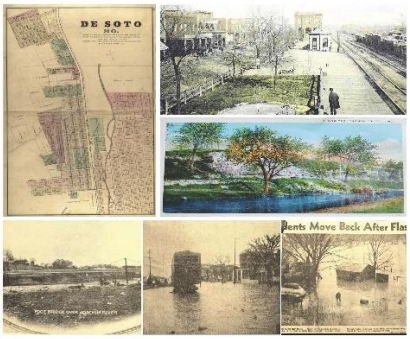
H3 STUDIO TEAM

CITY OF DE SOTO
FLOOD RESILIENCY PLAN

PLANNING ASSUMPTIONS

LIVING WITH WATER

- The City of De Soto is a river town with a deep history of underground springs and intermittent flooding from the Joachim Creek.
- Extreme weather events leading to the Upper Joachim Creek flash-flooding within the downtown area of the City of De Soto will overtime gradually amplify in intensity and frequency.
- The exact nature of this amplified extreme weather increases is uncertain and unpredictable, however the risk to life and property is anticipated to increase over time.
- There are significant flash-flood dangers from under-performing dams up-stream of the City of De Soto.
- It is not feasible to retain sufficient of the Upper Joachim Creek flood waters within the watershed south of the City of De Soto such that no flooding will occur in downtown.



NATURE BASED SOLUTIONS

- There is a need to increase the "Room for the River" and create additional floodable parks.
- There is a need to locally reduce the inflow of urban stormwater into the Joachim Creek in times of flood and stop the flood waters backing up through the sewer and stormwater system.
- There is a need to increase nature-based flood retention and absorption areas throughout the Upper Joachim Watershed.
- A Study on reducing urban flood risks found that:
  "neighborhoods with bluegreen infrastructure (including stormwater detention ponds, green roofs, and swales) resulted in less flood damage compared to areas in the city having conventional stormwater management (i.e., combined or separate pipe networks)."



IMPROVING QUALITY OF LIFE

- It is essential to increase public safety from flooding as well as providing transparent oversight of redevelopment post-flood conditions.
- There is a need to retain and grow the economic base of downtown and adjacent businesses as well as protecting key infrastructures.
- All new development in the Upper Joachim Watershed should provide increased storm-water retention to ensure no water discharge in times of flood.
- The residents of the neighborhoods adjacent to the Joachim Creek have expressed a desire to remain within the City of DeSoto.



PARTNERSHIPS FOR IMPLEMENTATION

- There is a need for a heightened multi-jurisdictional community-based emergency prediction, notification and response system as well as forward-looking adaptation and mitigation planning.
- Implementation always requires matching local funds to access state, federal and philanthropic funding.
- Headwater Economics indicates:

  1. Funding applications and proposals are stronger when they include effective economic arguments.

  2. The most successful mitigation projects have long-term predictable funding from a variety of sources.

Missouri Department of Public Safety
SEMA State Emergency Management Agency
MISSOURI DEPARTMENT OF NATURAL RESOURCES
Citizens Committee for Flood Relief De Soto Missouri
JEFFERSON COUNTY ECONOMIC DEVELOPMENT CORPORATION
JEFFERSON COUNTY MISSOURI
Anthropocene Alliance
VISUALIZE JEFFERSON COUNTY MASTER PLAN

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Prepared by H3 Studio| March 8th, 2023

Working Group Meeting 1 Report

De Soto Flood Resiliency Plan

Working Group Meeting Overview

On February 28th, 2023 from 1:30PM to 3:30PM the Desoto Resiliency Plan engaged for the first time with the working group of the planning process via an online conferencing software with all working group members in attendance. The full roster of working group members is as follows:

1. ***Warren Robinson**, Jefferson County Emergency Management Director*
2. ***Rosie Buchanan**, Economic Development Corporation Director for Jefferson County (CDBG)*
3. ***Tom Fitzgerald**, De Soto Rural Fire Department Chief*
4. ***Karen McHugh**, Missouri Emergency Management Director*
5. ***Edward Boyer**, Landowner, developer, engineer, and longtime resident*
6. ***Eric Larson**, Former Jefferson County Services Director and County Flood Plain Administrator*
7. ***Susan Liley**, Citizens Committee for Flood Relief*
8. ***Todd Melkus**, City Manager and Flood Plain Administrator*

In the meeting the working group was introduced to the team and planning process then ran through a brief summary of the analysis work to date. Prior to the meeting the working group received the full documentation of the city-wide analysis and vulnerability assessments to review and provide comments. The primary exercise of the workshop was a review of the many strategies developed for Desoto to mitigate flooding over the last few years. H3 Studio compiled the list of strategies organized into the following six categories:

1. *Community Livability and Development*
2. *Emergency Preparedness and Response*
3. *Education and Engagement*
4. *Environment and Hydrology*
5. *Infrastructure*
6. *Regulation and Policy*

These six categories were drafted from an analysis of the individual strategies and findings recommended from the Corps of Engineer Plan, USGS 2D Study, and Emergency Action and Evacuation Plan of the City, stakeholder interviews, and consultant team meetings. The goal of this review was to provide a sense of acknowledgement of the importance of previous work then determining priorities and implementable items that could translate directly into the community action plan for implementation. After compiling and categorizing the strategies outlined in these plans the team asked working group members to discuss each of the strategies and provide feedback on priority areas and individual recommendations which we would then take back to begin drafting the plan. The following section represents the categories, strategies, and additions/commentary from the working group members.

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Strategies Workshop Review Summary

The working group was provided with a worksheet to fill out for the meeting. It listed the strategies color coded by resource they were pulled from and provided space to fill in for their comments. The worksheet color code is as follows:

If the strategy was derived from:

- **The Corps of Engineers Plan**
- **The Emergency Action and Evacuation Plan**
- **Stakeholder Interviews and Input**
- **Consultant Discussions**

Category 1: Community Livability & Development

Create opportunities for the development of affordable housing to continue providing assistance to homeowners in the floodplain. ***– Highlighted as a priority***

Property owners should take measure either dry or wet flood proof their properties.
Existing homes and structures in danger of flooding should consider elevating above the base flood level.

Build a levee to protect Main Street from flooding. ***– Highlighted as a priority***

Expand parks and green spaces adjacent to the Joachim creek. ***– Highlighted as a priority***

Provide a flood light warning system tied to the stream gage for drivers to avoid roads.

Implement green infrastructure in multiple locations in the city.

Explore applying to major philanthropic organizations to improve flood resiliency, fund buyouts when appropriate, and promote/develop green infrastructure.

COMMENTS:

- We need to consider developing land upstream in to wildlife areas like Mingo Flats.
- Create a berm around the back of properties
- Consider the use of vacant city owned parcels for development of housing.
- Citizens in the flood area would be more acceptable to relocating if affordable housing was readily available to them.
- Possible low to no interest loans to assist would inspire them. No money should be spent – relocate and then demolish all flood structures.
- If all structures were removed from the floodway, it would allow water to move through uninterrupted and possibly allow for less flooding.
- Cost/practicality makes the idea of the berm less plausible.
- Green spaces would be great for added water retention if the funding for buyouts existed.
- Include state or national grants in the funding mechanisms.

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Category 2: Emergency Preparedness & Response

Expand Warning Dissemination/Multi-Media Flood Risk Communication Tools inclusive of a public alert flood warning system.

Continue updating the flood emergency preparedness plan with formal public engagement methods.

Advocate for the installation of an additional stream gage further upstream on the Joachim Creek. – *Highlighted as a priority* for use as an early warning system

Formalize using private property for emergency access or flood fighting which can be done by entering a memorandum with the private landowner.

Conduct regular inventory of flood fighting equipment, resources, and materials and invest in greater rescue resources like boats and expanded medical services.

Host annual training for emergency response for both the emergency personnel, volunteers, and the public inclusive of scenario-based training.

Sponsor a combined resource facility where items can be pooled by Desoto and used as needed in an emergency.

Implement evacuation route signage in Desoto.

COMMENTS:

- Technology today allows for quick and effective notification system. Flash flood is the issue and needs quick response.
- A living document is the most effective. Technology and other factors change which causes the documents need to be updated.
- Any early warning would be beneficial, flash flood may not carry all the way down stream.
- I believe the residents will be very receptive to memorandums for emergencies.
- City has a complex on Clark Street that access or facility will never be affected by flooding.
- Effective training will make for swift and effective response to emergencies.
- City has a complex on Clark Street.
- Signage is in expensive and can be installed by the city. Constant reminder makes for informed public in an event.

Category 3: Education & Engagement

Develop community wide education, outreach, and advocacy programs to educate the public on the impacts of flood plain hazards, prevention, and preparation.

Make an accessible public record of risks and hazards for a properties, development, and overall community awareness. – *Highlighted as a priority*

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Create an accessible resource of the financial programs available to citizens impacted by flooding in Desoto.

Develop educational signage in recreational areas accessible to the public. – *Highlighted as a priority*

COMMENTS:

- Public record is an easy economical thing to do.
- Consider a red tag process so that landlords aren't taking advantage of future renters/floodplain community members
- Focus on the education and engagement of the properties in the floodplain first – Use paper literature (mailers) and send to known addresses
- Look for buyouts but strictly use code for flood renovations in terms of financing.
- Signage is inexpensive and a good constant reminder.

Category 4: Environment & Hydrology

Improve the flow of water through the creek by clearing the islands along the creek and accumulated sediment and debris deposits.

Take the opportunity to develop wetland, stream, and riparian protection and restoration measures.

Support basic and applied research toward a better understanding of the particular flood conditions & nature of Joachim Creek. *– Highlighted as a priority*

Look into vacant land that can be purchased/leased/easement by the city or used by the county for detention ponds, levees, and basins that can hold flood waters. *– Highlighted as a priority.*

Examine dam and reservoir management and operations throughout the Upper Joachim Watershed.

Encourage National Weather Service to develop a precipitation based 24-to-48-hour prediction of flood water levels.

Promote additional hydraulic studies to explore proposed creek management and infrastructure changes to reduce flooding in De Soto.

COMMENTS:

- Consider the positive uses of growth and vegetation (riparian corridors) that help mitigate the effects of flooding through increased absorption.
- An effective solution will be a combined solution – no single solution big or small will solve all of the issues.
- All buyout property should be converted to provide for wetland, flow through, and retention

- If it is possible to provide financial assistance for storm water retention at smaller private lakes a combined effort solution could be developed for dam and reservoir management.
- Focus on implementations with this plan not another laundry list of information – though it is welcome as part of the process.

Category 5: Infrastructure

-Consider the constructing of flood walls and levees along key inundation sites to protect neighborhoods.

-Relocate the Desoto Rural Fire Station out of the flood plain.

-Post Flood Recovery Processes – entities should continue to inspect homes ensuring they follow all regulations and become a repository of information on clean up, safety, mitigation, etc.

-Continue improving the condition of stormwater infrastructure inclusive of bridge and culvert reconstructions to widen channels. *– Highlighted as a priority*

-Modify key bridges to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.

COMMENTS:

- Post recovery flood process needs to remain an independent assessment not done by homeowners directly.
- Include the standards of dam infrastructure and maintenance/care of dam infrastructure.
- Floodwalls and levees are expensive solutions and the pump stations/displaced water may cause other issues. Widening and creating a less restricted channel is easier.
- Yes, relocate the fire house – but the priority to consider is where are they manned and ready to move?
- Desoto has codes it can enforce but the city needs to support that department better.
- Wider channel is the highest priority of combined solution.
- The main issues with bridges are the approach, if the approach is raised this causes a dam affect in the floodway.
- Sediment is a small issue but vegetation is a critical piece to widening the channel. Can the channel truly be widened and replanted to provide a positive flow? The City of De Soto owns the property downstream. Acres and Acres they will cull the argument of flooding downstream. Adjacent the UP Levee must have a wider stream to let displace water by due to higher levee.

Category 6: Policy & Regulations

-Apply to be a part of the FEMA CRS program for flood insurance discounts

-Continue acquiring land via buyouts (Structure and Land Acquisitions)

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-Develop Land Use Policies and Regulations at the county and city level that mitigate runoff and impacts of construction.

-Establish a multi-jurisdictional management/regulation board representing the entire watershed to implement regulations and policies to increase flood resiliency.

-Update building codes based upon best practices for flood resiliency.

- Create a relocation policy and plan for people to leave the floodplain willingly.

COMMENTS:

- Downtown Desoto is a last resort buy-out area. Businesses need affordable insurance and we need homeowners to relocate.
- Bought out land and be reconfigured for retention area, less floodway restrictions, or wetland area
- An overall Management Board of our Water Shed will allow for control of future development but mainly keep an emphasis on Storm Water.
- Building Codes updates are a part of life. This is a must.
- Open Flood plain is one of the parts to a successful combine solution. Unrestricted floodway with wet land and retention area downstream to accept unrestricted flow in City.

Key Conclusion

Members of the working group recognized and confirmed the premise that there will not be a single cure all solution to the flooding problem in De Soto. They agree with the team's approach that an effective and resilient solution will require strengthening multiple sectors in the city through a variety of solutions. The following are a few of the focuses highlighted by the working group:

1. Affordable housing remained a big topic throughout the meeting. Everyone agrees that getting people out of the flood plain and denying/limiting development in the area in favor of open space and park space was the favorable condition. The issues that arose involved where to put affordable housing and how to manage the cost of construction to make affordable housing actually affordable and accessible as a consideration of the housing plan.

2. Some working group members believed exploring vacant/city owned land in the city and county land upstream would be an important part of holding back water in the form of dams and detention basins.

3. The topic of buyouts was stated as an important goal and working to make the buyout and relocation process a successful and achievable program for citizens and the city to vacate the flood plain and make them safe.

4. Protecting main street and the businesses on it was an important consideration for some of the working group members – even considering berms, floodwalls, or levees to do so. The concern is that building said infrastructure is costly and time consuming.

5. Working group members believe the continued improvement of infrastructure to detain water backups onto main street is critical. Along these lines improving the channels, culverts, and bridges water travels through.

6. Education and engagement of the public was one of the key considerations out of the work group and a series of efforts that need to be expanded so that people are aware of their risks and know how to manage flood plain conditions.

7. While De Soto has an emergency code red system active working group members encouraged a push to make flooding awareness more prevalent and early warning systems a priority.

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

These is a copy of the worksheet provided to working group members during their meeting:

H3 STUDIO TEAM

CITY OF DESOTO
FLOOD RESILIENCY MITIGATION PLAN
WORKING GROUP MEETING #1
FEBRUARY 28,2023

REVIEW THE LIST OF STRATEGIES BELOW ADDING, ELIMINATING, OR EDITING THEM

COMMUNITY DEVELOPMENT & LIVABILITY

	ADDITIONAL IDEAS/ STRATEGIES
-Create opportunities for the development of affordable housing to continue providing assistance to homeowners in the floodplain.	•
-Property owners should take measure either dry or wet flood proof their properties.	•
-Existing homes and structures in danger of flooding should consider elevating above the base flood level.	•
-Build a levee to protect Main Street from flooding.	•
-Expand parks and green spaces adjacent to the Joachim creek.	•
- Provide a flood light warning system tied to the stream gage for drivers to avoid roads.	•
-Implement green infrastructure in multiple locations in the city.	•
-Explore applying to major philanthropic organizations to improve flood resiliency, fund buyouts when appropriate, and promote/develop green infrastructure.	•
	•

EMERGENCY PREPAREDNESS & RESPONSE

	ADDITIONAL IDEAS/ STRATEGIES
-Expand Warning Dissemination/Multi-Media Flood Risk Communication Tools inclusive of a public alert flood warning system.	•
-Continue updating the flood emergency preparedness plan with formal public engagement methods.	•
-Advocate for the installation of an additional stream gage further upstream on the Joachim Creek.	•
-Formalize using private property for emergency access or flood fighting which can be done by entering a memorandum with the private landowner.	•
-Conduct regular inventory of flood fighting equipment, resources, and materials and invest in greater rescue resources like boats and expanded medical services.	•
-Host annual training for emergency response for both the emergency personnel, volunteers, and the public inclusive of scenario-based training.	•
-Sponsor a combined resource facility where items can be pooled by Desoto and used as needed in an emergency.	•
-Implement evacuation route signage in Desoto.	•
	•

EDUCATION & ENGAGEMENT

	ADDITIONAL IDEAS/ STRATEGIES
-Develop community wide education, outreach, and advocacy programs to educate the public on the impacts of flood plain hazards, prevention, and preparation.	•
-Make an accessible public record of risks and hazards for a properties, development, and overall community awareness.	•
-Create an accessible resource of the financial programs available to citizens impacted by flooding in Desoto.	•
-Develop educational signage in recreational areas accessible to the public.	•
	•
	•
	•

Corps of Engineers Study Emergency Action & Evacuation Plan Stakeholder Engagement Consultants

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

REVIEW THE LIST OF STRATEGIES BELOW ADDING, ELIMINATING, OR EDITING THEM

ENVIRONMENT & HYDROLOGY

-Improve the flow of water through the creek by clearing the islands along the creek and accumulated sediment and debris deposits.

-Take the opportunity to develop wetland, stream, and riparian protection and restoration measures.

-Support basic and applied research toward a better understanding of the particular flood conditions & nature of Joachim Creek.

-Look into vacant land that can be purchased/leased/ easement by the city or used by the county for detention ponds, levees, and basins that can hold flood waters.

-Examine dam and reservoir management and operations throughout the Upper Joachim Watershed.

-Encourage National Weather Service to develop a precipitation based 24 to 48 hour prediction of flood water levels.

·Promote additional hydraulic studies to explore proposed creek management and infrastructure changes to reduce flooding in De Soto.

ADDITIONAL IDEAS/ STRATEGIES

INFRASTRUCTURE

-Consider the constructing of flood walls and levees along key inundation sites to protect neighborhoods.

-Relocate the Desoto Rural Fire Station out of the flood plain.

-Post Flood Recovery Processes – entities should continue to inspect homes ensuring they follow all regulations and become a repository of information on clean up, safety, mitigation, etc.

-Continue improving the condition of stormwater infrastructure inclusive of bridge and culvert reconstructions to widen channels.

-Modify key bridges to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.

ADDITIONAL IDEAS/ STRATEGIES

POLICY & REGULATIONS

-Apply to be a part of the FEMA CRS program for flood insurance discounts

-Continue acquiring land via buyouts (Structure and Land Acquisitions)

-Develop Land Use Policies and Regulations at the county and city level that mitigate runoff and impacts of construction.

-Establish a multi-jurisdictional management/regulation board representing the entire watershed to implement regulations and policies to increase flood resiliency.

-Update building codes based upon best practices for flood resiliency.

- Create a relocation policy and plan for people to leave the floodplain willingly.

ADDITIONAL IDEAS/ STRATEGIES

Corps of Engineers Study | Emergency Action & Evacuation | Stakeholder Engagement | Consultants

Prepared by H3 Studio
February 28th, 2023

Stakeholder Interviews Report

De Soto Flood Resiliency Plan

Stakeholder Meeting Overview

In the month of December 2022, H3 Studio conducted interviews with key stakeholders of the city and county with various knowledge levels of De Soto, The Joachim Creek, city and county policy and regulation, etc. These interviews were done as one on one virtual meetings lasting anywhere from 30 minutes to an hour depending on the conversation and information shared by each stakeholder. The purpose of these meetings was for the team to acquire as much knowledge as possible on the conditions of the creek and its flooding patterns to assess the necessary strategies and practices needed to mitigate the effects of flooding and protect the people and community assets affected by the flood plain. The team was able to successfully conduct 13 stakeholder interviews. The following is the list of the people interviewed or that provided a response:

1. ***Kathy Smith***
    a. Mayor of De Soto and longtime resident of the city
2. ***Rich McCane***
    a. Councilperson, homebuilder, and resident of De Soto
3. ***Kevin Warden***
    a. Public works director and longtime resident of De Soto
4. ***Warren Robinson***
    a. Jefferson County Emergency Management Director
5. ***Rosie Buchanan***
    a. Economic Development Corporation Director for Jefferson County (CDBG)
6. ***Tom Fitzgerald***
    a. De Soto Rural Fire Department Chief
7. ***Dr. Josh Isaacson***
    a. De Soto Schools Superintendent
8. ***Karen McHugh,***
    a. Missouri Emergency Management Director
9. **Edward Boyer**
    a. Landowner, Developer, and engineer, De Soto resident
10. ***Justin Caldwell***
    a. Flood Affected Property and Business Owner
11. ***Eric Larson***
    a. Jefferson County Services Director and County Flood Plain Administrator
12. ***Jason Jonas***
    a. Jefferson County Public Works Director
13. ***Billy Hackett***
    a. MO Department of Natural Resources

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Issues and Opportunities

Each interview respondent was given a line of questioning related to their area of expertise which primed the discussion during the interview. A detailed record of all responses can be found at the end of this report beginning on pages 4-12 for each of the respondents. The following represents the major issues and opportunities identified by the respondents:

Issues:

1. The Buildup of sediment and debris in the creek contributes to disruptions in the flow of water and a more intense flood effect.
    a. Debris also comes from upstream and disrupts the flow of the Joachim through De Soto during heavy rain events
    b. Flow is also disrupted by the islands along different parts of the creek and manmade culverts that bottle neck the water flow leading to dangerous conditions.

2. The flood areas are primarily low-income families with little to no capital for repairs and home improvements limiting flood resistant structures and resiliency among community members.

3. Because the areas most affected by flooding are primarily renter populations people moving in for cheap cost of housing are not aware of the flood condition and effects.
    a. Significant life safety issues are created in terms of resource distribution and rescue to this area given the flash flooding conditions of the creek.
    b. People are not generally signed up for emergency systems such as code red.
    c. Structures in this area are neither flood stable nor resilient structures

4. Funding at the county level for a series of departments is scarce and the capital must be built up for larger scale county mitigation initiatives to be implemented.
    a. Retention ponds, infrastructure improvement.

5. Stormwater runoff regulations need to be improved and better regulated
    a. Private dams are not regulated and contribute negatively to the flooding conditions
    b. New upstream development is continuing to contribute to negative runoff impacts on the Joachim Creek which will increase dangerous conditions over time.

6. The rocky conditions of the land make absorption and retention challenging
    a. De Soto is also built out and limited in locations for detention and retention ponds within the city.
    b. Initiatives must be carried out as smaller scale incremental strategies to combat the problem.

7. When the Joachim floods there is a crossroads issue between East and West side of the cities.
    a. Fire and rescue often have to go around the city on highway 100 etc. to make it into endangered neighborhoods.

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   b. Equipment is scarce, limited, and tight for the rural fire department meaning services, rescues, and aid take a bit longer to distribute.

8. Outdated stormwater retention regulations do not meet the need during times of heavy rain and storms.

Opportunities:

1. De Soto has a strong relationship with Jefferson County and they have a strong partnership delivering and exchanging aid and resources as needed.

2. Limited land availability in De Soto means a solution ought to be geared toward an incremental series of small interventions to mitigate flood effects.

3. There are county and city resources and programs to help flood affected properties rebuild in flood resistant and resilient ways.

4. The City of De Soto is continuing work on the main sewer lines and structures which will help mitigate backups.

5. A buyout program continues to be explored by the City of De Soto and buyouts are conducted when opportunity is presented.

Interview Conclusions:

There is strong agreement by all those interviewed that cleaning the creek and managing the pile up of debris in the creek would significantly improve circumstances due to a less restricted flow of water.

In an ideal world most respondents would prefer not to have any form of living accommodations in the flood plains and expressed the importance of a buyout program.

Everyone recognized there is increased disparity in income and capacity which creates increased life safety issues for residents in the flood plain.

The flood mitigation plan cannot rely on a single one size fits all solution. The flood damage the city deals with is a combination of many different factors and requires a range of incremental solutions to mitigate the effects of flooding. A large part of this will be county efforts to reduce the impact of upstream water flow in the city.

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Interview Commentary Record by Individual:

Warren Robinson, Emergency Management Director Jefferson County

- *The relationship between De Soto and the County is strong, they focus primarily on delivering the kinds of services the city can't acquire on their own.*
    - *Shelters, supplies, and sometimes long-term recovery needs*
- *They facilitate long term assistance to the city*
- *The county will become involved in buyouts but its limited and primarily driven by elected officials.*
- *There are resources they offer for financials assistance but ultimately program and resource funding is the responsibility of the city.*
- *Upstream development is a leading cause of flooding issues in the county.*
    - *Much of this lies outside of the city limits and it comes down to agreements and discussions with the county on the interventions and policy changes that can help address these issues.*
- *The dams need to be better regulated, its challenging to keep track of and regulate the privately owned and made dams.*
- *Preventing runoff is a critical need*
    - *Local regulations need to be updated and created to address this issue*
- *The county has the potential to work with DeSoto on the implementation of upstream retention basins in county land.*
- *The majority of the flooding and flood causing issues are upstream. Downstream it's all agricultural land and can deal with the flooding.*
- *There's a necessary and critical balance because the more land dedicated to retention hampers land development*
- *Relying on the county to help control the flooding is a necessary part of this process*
- *It is challenging to plan for high impact low frequency events and the volume of water does not lead to the kind of flooding De Soto receives.*
- *Also consider the socio-economic overlay –*
    - *The most affected areas in De Soto are low-income rental properties which are more challenging to acquire*
    - *Rental properties are also at a lower consideration for financial assistance, these resources often prioritize homeowners*
- *Further considerations:*
    - *Capability to warn of a flood incoming*
    - *Access and needs to lower income families and developments*
    - *Emergency plans in place to move people as needed*
        - *School buses? Assisted living? Any Sheltering Options?*

Edward Boyer, Landowner, Developer, and Engineer, De Soto Resident

- *The creek banks need to be cleared and the stream beds need to be cleaned up – these are important mitigation steps but they are not solutions*
- *Disrupting the flow of the creek is causing issues that increase speed and dangerous conditions.*

- *Take a look at historic imagery to see the changes in the creek bed over time it has been narrowed.*
- *Buyouts are a good idea*
    - *Want to take that land and develop it in such a way that supports the overall flow of the creek*
- *There are many backup issues that contribute to the creek and its disruption*
- *When the highway was built up they placed a culvert into the neck which compresses and disrupts the flow of the water. It used to be a wide flood drainage area which has now been compressed and reduced.*
- *The drainage pushing in opposite directions creates more issues.*
- *Private lakes and dams need better stormwater retention management policies and initiatives.*
- *Railroad and new bridge infrastructures cause back up issues because the water isn't able to flow efficiently through it*
- *Believes the solution is a series of small incremental interventions that help reduce the flood plain where it matters.*
    - *Establishing levels of protection is critical to mitigating the most significant areas first.*
- *Maximize holding water through a series of incremental retention basins along the creek and tributaries*
- *Emergency management and forewarning system is important to bring into De Soto.*
- *Risk levels and hazards need to be made public to inform people and get them onboard.*

Rich McCane, Councilperson and Homebuilder

- *Stormwater retention is one of the biggest challenges for De Soto*
    - *Sewer and storm pipes all run off into main street so it has more back up problems*
    - *City is repairing and maintaining manholes, mains, etc*
    - *Older parts of the city are still a combined system, but newer parts have the systems separated.*
- *Protecting the rail facility which is a big operational task and large employment center for the city.*
- *The steep hills and topography contribute to water on main street by way of runoff and lack of absorption of water.*
- *Businesses on main street don't really flood, its more so that water backs up and the cars driving through send waves pushing the water into the businesses.*

Tom Fitzgerald, Fire Department Chief

- *He handles 174 sq. miles of rural Jefferson County and De Soto*
- *There is a partnership between the city fire department and his. Everyone responds to the same cases and issues*
- *The fire house has flooded twice and once water came up to the door.*
    - *They have taken mitigation measures and done all they can to flood proof the station*
- *Long term could see the firehouse relocating however the building is currently in a prime location for access*

- *Flood response: The City FD does not have boats to navigate flood events, they are brought in from the rural fire department.*
- *East side of the city lacks flood stable and resilient residences and structures.*
- *People do not want to be inconvenienced and are often upset when officers and fireman block off roads etc. trying to keep them safe.*
- *The ideal condition for the fire chief is that there would be no one inhabiting the flood plain area.*
    - *But buyouts are not enough and the revenue does not exist to conduct a buyout.*
- *Interest in a combined facility in the city where resources can be polled*
- *Weather is the component that has drastically changed altering the frequency and damage of flash flooding events.*

Rosie Buchanan, Jefferson County Economic Development

- *Director of Economic Development Jefferson County, a quasi-governmental non-profit, 36 years working with the department.*
- *Has had a long-standing working relationship with De Soto since she started at the department*
- *She has done all CDBG work for the stormwater and sewer infrastructure grants etc.*
- *Jefferson County in her mind is growing and is often neck and neck with St. Charles County.*
    - *All of the growth is concentrated north and northeast of the county*
    - *While the rest of the county is seeing increased developments of varying densities De Soto is not experiencing growth at the same level or density*
        - *There aren't any large higher density commercial/residential developments in De Soto*
        - *Developers tend to use MHDC for developments*
        - *An issue is that due to the flood there is a lack of investment in DeSoto, many development entities don't see the possibility to turn a profit in De Soto and it is therefore less invested in.*
- *De Soto is the only city wide LMI in Jefferson County (Low to Moderate Income Community)*
    - *Its housing is lower priced and the city attracts a lot of renters due to affordable prices and they unknowingly settle in a dangerous flood plain*
    - *Thus, the endangered structures and homes are continuously occupied*
    - *58% of De Soto lives in poverty*
- *There is a cross roads issue in De Soto – serviced by county and city roads – when flood events occur the crossings between East and West sides of the city are flooded making access between them a challenge*
- *Union Pacific railroad is critical to the survival of this area.*
    - *The railroad is not expected to leave the city though it has scaled back operations – if anything they suspect they will be looking to expand*
- *Jefferson County as a whole is becoming more and more increasingly aware of the need to better manage water.*
- *The new issue is there even cheaper land with less regulations further South so people are moving out of Jefferson County and into St. Francois County causing more issues for the upstream water supply flowing into De Soto.*

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- *The ideal situation is that people would have a place to be relocated to from the flood plain affected areas.*
- *CDBG funding can be used for city wide projects and these grants need to be written as the overall benefit to the community members not the commercial properties. CDBG cannot fund non city benefiting projects*
- *De Soto can expect up to 250, 000 in CDBG aid a year*
- *This funding can be used on systems to prevent back up*
- *There is no county initiative for a historic main street program*
- *Jeff CO economic development provides home rehab programs which have helped people flood impacted families and groups*
    - *They offer septic replacements, and have a stormwater replacement program in the way.*
- *Also consider the Jeff County Code red system for residents in greatly impacted areas.*
- *This stop receives a ton of Union pacific Railroad Traffic*

Kevin Warden, De Soto Public Works Director

- *Has been in his position 37 years*
- *Mo Dot fixed the under section of Veterans drive and removed the island which significantly helped*
- *There are three more island causing issues up Walther Park*
    - *The islands redirect the flow of the water allowing it to infiltrate low areas of the park and contributing to the area flooding.*
- *All stormwater runoff goes to the creek.*
    - *There are three outlets on Main which catch water.*
    - *Stormwater does back up though he doesn't recall seeing Main flood.*
        - *The Melba theater does experience sub level flooding*
    - *The sewer system is a big issue to consider.*
- *De Soto does not have a combined system, PW is working to redo people's yards and sewer systems*
- *They have gone in and Lined pipes, fixed manholes, etc. and are working towards a more efficient and durable sewer and stormwater system*
- *The improvements to the system, and the lagoon now sees the flow receding quicker*
- *The discharge facility is regularly tested but needs better management*
    - *The 18-acre lagoon holds water back pretty well but is limited 3mi G/day*
- *Life Safety issues:*
    - *The City implements a Code Red early warning system but there are issues:*
        - *People are not signing up to receive the alerts*
        - *People are unaware of the issue due to it being a high rental neighborhood and the consistent turnover*
    - *The City works with authorities to get people out*
    - *Ideally the flood plain would not have any people living in it*
    - *Buildings need to be brought up to standard – elevating structures is an effective strategy*

        - *EX: East Dewitt always floods and buildings were brought up to compliance*
- *Highway 21*
    - *There are upgraded and newer lines along this area that improve flow of stormwater and overall detention.*
    - *Behind Walmart there is a large detention basin*
        - *Initially constructed and met standards but it was not holding back water the way it was supposed to and had to be corrected*
    - *The biggest challenge is the volume of water entering upstream which will require county collaboration*
    - *Need to work better with the Core of Engineers to clean up brush, debris, and rocks in the creek to improve water flow*

Justin Caldwell, Property Business Owner

- *Owns parcels at the intersection of Main and HWY 100, though the FEMA flood maps designate those areas as flood zones, Caldwell claims they are incorrectly mapped as those areas have never flooded.*
    - *The railroad creates a dam large enough to hold back the water and keep the area from flooding.*
    - *The flooding regulations required make redevelopment a challenge to those sites.*
- *Downstream from De Soto he owns 38 acres on either side of the Joachim Creek*
- *The floods are becoming more intense and higher – he did not recall Main St. flooding until 10 years ago.*
- *The culverts under the railroad tracks can back up and cause issues for the areas as well.*

Jason Jonas, Jefferson County Public Works Director

- *Identified that De Soto is not in the county's primary growth area*
- *The county has instituted a requirement for the detention of the 100-year storm area for >12,000 sq ft*
- *Because De Soto is outside of the Urban Populated boundary it is not required to be permitted by MS4*
- *Volume enhancement can be created by cleaning out the creek – the rocks in it choke up the flow of water causing disturbances and more significant flooding*
- *The county does not maintain the dams or levees in the area*
- *There are no funding mechanisms for improvement in stormwater at the public works level – their main focus is on bridges and road infrastructure*
- *Stormwater runoff does continue to be a county concern but no one wants to take a leap of faith and deal with It head on.*

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Karen McHugh, Missouri Emergency Management

- *15 years with the department*
- *She conducts community assistance visits to assess the city but has limited funding and staff to be able to them regularly*
    - *Did conduct substantial damage evaluations from the last flood in DeSoto*
- *Role is to help the city stay in compliance and works directly with their flood plain administrator to do so*
- *Conducts training workshops*
- *Her team is the person in the middle between the State and FEMA*
- *For 682 communities in the jurisdiction of this department they only receive $220,000 a year and thus they don't do audits regularly due to lack of funds and staff*
- *FEMA expects municipalities to regulate their individual ordinances meaning they have base flood elevations and a regulatory floodway.*
- *If a development can prove a no rise in water level then they can develop in the floodway*
- *Jefferson county does have an ordinance that adopts a higher development restriction*
- *There needs to be a focus on vegetation control and keeping junk out of the streams*
- *In favor of buyouts or relocations*
    - *Getting people out of a dangerous area is the better option*
    - *The ground should be left for open use public space that is permeable and can handle the flow of water through it.*
    - *Elevating structures in flood plains works but there are times it is challenging or that it is too costly for the owner – specific challenges since most homes are rental properties.*
- *Compensatory storage is important – focus on locations for detention and retention ponds – but some townsfolk are challenging to work with*
- *Examples of whole towns that have been moved:*
    - *Rhineland*
    - *Silax*
- *Look at University City project*
- *Look at natural absorption methods through vegetation etc.*

Josh Isaacson, Superintendent of De Soto Schools

- *10 years living in De Soto and working here*
- *The school district has not been impacted by flooding and hasn't had any negative impacts from it.*
    - *Typically, the fields are high enough not to receive any damage*
    - *The water damage that occurs is during heavy rains once lifted the turf on the fields*
- *All water flow is into the creek.*
    - *Highway 21 acts as a dam near the school area*
    - *Downstream past the school is an issue on Amvets Dr. and the stormwater systems there*
    - *Amvets takes a hard left redirecting the flow of water and that turn is challenging for the water to flow*
- *Tanyard branch is also a flash flood torrent condition of water*

- *6 hours of steady charge is typical for the area*
- *Also focus on Boyd – water running down that hill causes backflow issues at the culverts*
- *During flood events buses can't access many of the damned subdivisions because the water in the dams is spilling over*
    - *We need to examine the possibility of working with the county to better regulate dams and maintain them*
- *Trees, vegetation, and topography are also major problem sources for the water flow and creek overflow*
    - *The rocky surface does not allow for enough absorption*
    - *Trees obstruct the path of the water*
- *Look into vacant land that can be purchased by the city or used by the county for detention ponds, levees, and basins that can hold back water and release it gradually at a steady pace that won't cause extreme levels of flood damage*
- *The school districts numbers are decreasing – down 500 students in the last 8 years -people are moving to higher growth areas*
- *Doesn't expect to see major growth or building developments in De Soto*
    - *Vallee Lake development is declining*

Kathy Smith, Mayor of De Soto

- *In simple layman's terms, the Joachim creek flash flooding has always been an issue for De Soto. I have lived here since 1959 and I'm now 70 years old. As a child, the city would clean out the creek each year to help with flooding.*
- *With so many regulations through the years by Army Corps, EPA, etc. it is no longer lawful to do such projects. I read through some of the old newspapers at the library and last time the creek was cleaned out was in1986. They even stripped the banks of its vegetation. The only thing the Corps was worried about was the replanting of grasses along the banks, growing in time for the next spring rains.*
- *Our new warning system is working great! With all the new technology, everyone is alerted. The city has a Code Red system for such warnings also, and physically knocking on doors is most effective. Our First Baptist Church is set up for shelter if needed.*
- *Our Flood Plan through Army Corps of Engineers affiliated with Silver Jackets did a survey. One result stated:*
- *Dredging of Joachim Creek to increase channel capacity: Not Effective - Not Recommended*
- *Accumulated Sediment Deposit/Debris removal from creek: Effective- Further Evaluation Needed*
- *Anytime we have had meetings they want to only tell you what you Can't do, not what would be helpful!!*
- *I would love to see buyouts along the creek and a possible green space project along the banks. But I'm afraid at my age I will never see that. There are several senior land owners that has lived along the creek for decades that does not want to sell.*

- *Also, home values have gone down considerably. Relocation only gives them fear, which is not good. I sincerely hope that organizations like yours and others can help the good people along*

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the creek. I know the city is working hard on this. With all the hurricanes, tornadoes, and wildfires that has devastated our country the line is long.

- *So, there you have my feelings on this problem, but know this, each person along the creek that has ever been flooded has always had the help of the city and its citizens! The good people of De Soto have always come together to help each other in times of crisis. This is an ongoing problem that De Soto will be fighting long after I'm gone!!!*

Eric Larson, Jefferson County Services Director

- *He is the county flood plain administrator, has worked with Todd and the City of De Soto for quite a while.*
- *There's no capacity in the City of De Soto to do large scale mitigation, the city is built out*
- *The primary strategy needs to be a consideration for a series of small to medium detention basins upstream from De Soto*
    - *The goal is to hold back water and release it gradually*
- *A major challenge would be funding*
    - *It would not come from a public source it would likely have to be a combination of federal, state, and local dollars to have a project completed*
- *A second challenge would be land acquisition*
    - *Believes that land would need to be purchased not just acquired via an easement to make significant gains through this strategy*
    - *The soil issues mean that a lot of acreage will be needed*
    - *These have to be holding basins more than they are absorption areas*
- *The gains in volume if the creek were cleared and cleaned would not be any significant number*
    - *This would only add a few inches and there is still that issue that debris would flow from the upstream areas into De Soto regardless*
- *Another option to consider in De Soto specifically is to mitigate the homes in the flood area and possibly create a channel or offshoot to protect those areas*
- *Regulatory code is managed by stormwater department which is no longer the control of the county services.*
    - *The regulations and requirements follow MSD regulations given that the county Is now in MS4 regulation*
- *In 2019 the flood plain ordinance was amended to be 3' above the base flood elevation*
- *Recommended an increase in regulation or an overbuilding requirement:*
    - *Where flood events are occurring more and more frequently above a 100 year level, this is one way to build in the uncertainty of the floodplain.*
- *Examples for us to look into:*
    - *Des Moines, IA*
    - *Aimes, IA*
    - *DuBuque, IA*

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Billy Hackett, MO Department of Natural Resources

- 401 coordinator in Missouri – state needs to qualify that it will comply- he reviews federal permits.
- Work related to a stream and wetland
- IRT compensatory stream and detention mitigation – provides feedback for detention installation
- MODOT did a bridge replacement over Joachim creek
- Resources online:
    - Water quality and designated impairments – 305 B innovative water quality report – of all impaired or believed to be impaired streams
        - Also, a part that has inconclusive data unsure of impairment
    - 303 D list – we know based on data there is at least one stream that is impaired
        - If it is on this list one of those uses has a pollutant that is above the safety threshold
    - TMDL – eventually a 303 goes into here – it is a pollution diet
- Have to go through US ARMY CORPS OF ENGINEERS TO get a permit to dredge and clean and that is where they have to get a permit for 401 permits
- Generally, if you dredge it out once it will fill back in so this needs to be a continuous maintenance process
- Isn't finding an impairment in this area of Joachim Creek
- Can reach out to monitoring unit and see but since there is no impairment
- Corps of engineers for permitting and City of Desoto
- Does DESOTO have an MS4 permit –
- Missouri land reclamation program, Missouri geological survey
- DNR has a dam safety program – only regulated for dams over 35' high

The following interviews were conducted by Dan Hanes, the teams designated hydrologist.

Interview with Paul Rydlund

Interview Notes:

Q: What was the conclusion of the USGS Study and how does it differ from the Corps of Engineers and the FEMA results?

1. With the traditional analyses that are done the amount of detail they have in terms of structures and terrain can be similar but we took a 2d modeling approach that dealt with hydraulics better reconciling loses and also reevaluated the hydrology and inputs. The interesting thing is we had a gauge, but looking at historic high-water marks was the difference between USGS and Flood Insurance Study. Our results indicated that the discharges were lower for identifying the 100 year flood than the ones for the flood insurance study. Overall, the improved hydrologic analysis led to lower exceedance probabilities at lower discharges than FEMA and resulted in a reduced

flood plain level.

Q: Would cleaning out the creek of debris have any significant effects on the areas flood conditions?

1. Cleaning the creek looks at the movement and transport of materials and its not necessarily controlled. Cleaning the gravel and additional debris would likely not significantly increase conveyance and reduce the overall flood plains. The USGS model could easily be tweaked to analyze and demonstrate the effects of cleaning the creek or removing vegetation. It's all about geometry and hydraulic control and there will be differing behaviors according to the changing variable.

Q: The bridges had a pretty big effect - Do you think is there any recommendation regarding improvements to bridges and culverts?

1. This was hard for Paul to respond to without taking a look at the data. He could see the railroad as a point of constriction and he believes he could use the 3D model to show the effect of that constriction on the creek. Most of the time railroad bridges are under designed.

Q: What actions do you think could be taken to help people during the rescue efforts in a flood event?

1. The Corps of Engineers helped develop an emergency response plan for the City of Desoto which helps them prioritize the safety of the community and overall distribution of resources.
2. The gauge they now have also runs pretty quickly and can convey real time conditions.
3. What they need to do is pay greater attention to the forecast (e.g., QPS precipitation forecast) and run some scenarios so they understand the potential effects of any given weather event on the creek. These scenarios are typically run by the meteorologists but they are not expected of them and are based solely on requests from communities.

Q: Could the weather forecast be used as a preemptive methodology to indicate when potentially damaging floods are expected to happen?

1. It could and they have been working with some similar information and forecasts recently in St. Louis that looks at predetermined scenarios based on the weather patterns.

2. **Could the data be extracted for a specific Watershed?**
    a. There are stations at different locations that you could use to narrow the data down to a specific area or region. The precipitation gauge can help you look at conditions and observe/select the predicted outcomes. In fact, outcome maps have been developed – but the weather condition would affect what these maps look like.

b. The forecast data is not typically available and it needs better monitoring and work. Mark Fuchs would be a good person to work with here.

Q: In general, are there any scientific or technical needs for the city that could be beneficial?

1. The USGS study was particularly interested in green infrastructure – if you buy out land and apply a nature-based approach then it is typically a good thing.
2. The buy out and grant process needs to be strengthened and continued.
3. For the Joachim, bank stabilization and dredging are unreasonable practices.
4. Detention Basins might be effective depending on their size and location.
5. The methodology for determining the floodway is outdated; better models could make improvements.
6. The floodplain ordinances would need to be reviewed carefully for example
    a. The expectations of building above the base flood elevations
    b. The development practices of the specified floodway
        i. At the local level these practices could be more restrictive than at the county level

Q: What could the city do to improve their buyout success rate?

1. Paul is not 100% sure his suspicion is that FEMA's timeline and federal marks that the city needs to meet are working against them.

Q: Do the dams represent a significant hazard and if so, what does that look like for Desoto in terms of dam failure and lack of effective water retention usage?

1. This was challenging to comment on but evaluating the options and models may be a good place to start and can be done independently with no specific study. In 2005 there was a review of the dams but Paul couldn't recall the conclusions of the corps of engineers. Valle Lake Dam was a focus of that review.

Q: Would the development of retention basins be effective for this planning process?

1. It can be effective but that will depend on their location in the watershed, it is important to consider the future effects by taking climate change into consideration and what future rainfalls and creek flows look like.
    a. Do climate models exist that map these changes?
        i. CMIP is a mechanism that can help you contextualize the data to a regional level

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ii. NCHRP1561 – this is a cookbook for approaches looking at future flows and discharge design to account for climate change possibilities

Additional comments, questions, and suggestions from Paul:

1. This project will also be an administrative task identifying who will be in charge of implementing the plan strategies and ensuring there is local, county, and state support for the work being done.
2. There needs to be a level of prioritization to the impacted areas and mitigation strategies provided.
3. Take the 2D USGS model and start plugging in scenarios and impacts to infrastructure to understand the way the creek flows and affects Desoto.
    a. Look at railroad impact, culvert/bridge replacements, etc.
4. The railroad will be a challenging partner to work with and we should be prepared for that challenge.

Interview with Paula Arbuthnot

Interview Notes

Q: When a flood actually happens and there is a severe flood event is there anything you think could be done to improve response in terms of helping people immediately?

1. Desoto does a pretty good job at the moment since they went through an action plan with the Corps of Engineers which might be due for review/an update.

2. Resiliency training should be considered for rescue and city officials since there have been many changes in personnel and people, they could all benefit from it.

Q: Is there anything that can be done to reduce the risk to property physically and financially?

1. In the flood plain there are hundreds of homes, 13 businesses, and 3 churches.

2. We have been trying to get funding for buyouts and FEMA is presenting a challenge and we were only granted $100,000 which was not enough to buy a house. The way that FEMA operates is they wait for the disaster to strike and then they approve buyouts since they can buy the properties for cheaper.

3. The issue is that many of these homes have been affected three times by a flood event and per HUD regulations after the fourth time affected by a flood the people that live in these homes will not be allowed to return to them. The case is evaluated property by property but it means that these people will be homeless and displaced overnight.

4. The city allows these properties to be cleaned and repaired as long as the repairs are less than 50% of the totals home appraised value and they become livable but it's because there is a housing shortage in Desoto and no one has a place to go that they allow them to move back in because the city could have condemned the homes after the third flood event impact.

5. One of Paula's most important initiatives is addressing the housing shortage and creating truly affordable housing for the people of Desoto. She has been working with developers and the housing commission to make this happen because she cannot push for buyouts until she knows these people have a place to go. She will be headed to Jefferson City to discuss beginning a committee at the state level specific to low-income affordable housing developments.

Q: If there was a flood and HUD required people not to return to their homes is there any form of assistance for these displaced people?

1. No, these people are out of options the property owners have already taken insurance money from FEMA three times and they will be required to leave. There is no replacement rental housing in DeSoto and these people will be left homeless especially since approximately 50% are renters.

Q: Is there anything that can be done in terms of zoning and development outside of the city limits and requirements to help mitigate the flood effects?

1. Truly, the city will be happy to have development – currently there are properties that have been identified for low-income affordable housing but there is no developer and there is no funding mechanism to construct them. The Missouri Housing Development and Hosing Commission is also not yet onboard (MHDC).

2. These developments require some form of non-profit aid to make them more feasible and the Jefferson County Community Section Corps would be happy to help.

3. There needs to be a developer that can create low-income affordable housing that can be mortgaged and owned. Paula is open to developing new construction methods to combat the cost of construction. They need a committee that can handle the federal and program side of things or find a consultant that is familiar with these programs and can help secure HUD dollars.

Q: In terms of hydraulics is there anything to note that would be useful in mitigating the effects of flooding?

1. The Corps of Engineers has plenty of control over dredging and the creek processes and she believes there is not much more than can be done.

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2. Paula is constructing a 3D model of what happens at the flood levels when the creek is normal vs at flood level to show what happens.

Q: Have you had a chance to review the USGS 2D Study and if so, what are your thoughts/conclusions from it?

1. The USGS study identified that a 1-2' berm would help protect main street and the businesses along it.

Q: Are there any county developments that will be changing the hydrology of the area and is enough being done to protect the city from their potential runoff?

1. A subdivision is going in off of Tanyard Branch that will be constructed with the 12" stormwater regulation instead of the 1" regulation. They will be developing a detention pond but they should oversize it to handle a greater capacity. Other than that, nothing else is happening upstream in the county.

Q: There was a five-year period where a series of floods got attention and kicked off this flood mitigation and planning process. Any sense as to what caused this severity of floods or why they were so intense?

1. Truly just the intensity of the storms that took place that year. It was challenging to fathom that a 7" rain could trigger a flash flood condition. The triggers were primarily the intensity of the larger Jetstream that was doing a massive dump that winter into Spring – that weather pattern was chaotic. Now when there is a 7-8" rain in a three-hour time span everyone is on high alert.

2. High water tables also contribute to a more significant weather pattern. Water table in the karst layer intermingles water from the Big River and the Joachim Creek. So, if the Big River is flooded with a high-water table, it relieves pressure by pushing it into the Joachim Creek water table.

3. In the Desoto area all the way to St. Genevieve there is also a large number of surfacing springs that contribute to the increased water in the watershed.

Q: Are there good sources of data for the wells or does anyone monitor the water table?

1. The department of natural resources has records and then city records in the library have information about the wells.
2. The city today still pulls and filters its potable water from natural wells.

Additional Questions and Comments from Paula:

1. Sociology deserves emphasis when considering resiliency and she volunteered to aid in the sociology of the analysis where possible.
2. She would like to be involved in the planning of housing and relocation of flood victims.

3. She has been communicating with someone at HUD.

Interview with Robb Jacobson

Interview Notes

Q: When a flood actually happens and there is a severe flood event is there anything you think could be done to improve response in terms of helping people immediately?

Evacuations, post flood clean ups, flood proofing residences

Q: Is there anything that can be done to reduce the risk to property physically and financially?

Properties could be elevated, but this could result in different problems.

The most important thing is to buyout properties in the floodway

A small berm could help protect Main Street

Q: Is there anything that can be done in terms of zoning and development outside of the city limits and requirements to help mitigate the flood effects?

The watershed is predominantly forested, so new developments would only have a minor effect, especially if they are designed according to best practices for flood prevention.

Q: In terms of hydraulics is there anything to note that would be useful in mitigating the effects of flooding?

It might be helpful to increase conveyance in some areas by removing vegetation and/or gravel. This could be evaluated by consultants using the 2D numerical model that USGS developed and makes available.

Modifying or rebuilding bridges to be less restrictive to flow would be helpful.

Q: Have you had a chance to review the USGS 2D Study and if so what are your thoughts/conclusions from it?

The USGS study results did differ somewhat from the prior 1-D FEMA model. The main differences were due to hydrology more than hydraulics.

Q: Are there any county developments that will be changing the hydrology of the area and is enough being done to protect the city from their potential runoff?

Dams in the watershed are generally aged, and they are managed and maintained in different manners, without a lot of coordination. There is likely some potential for using the dams to mitigate floods, and there is also the potential for reservoir overflows and dam failures to cause serious floods. There is also

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the possibility that the risk of floods due to dam failures might influence FEMA's buyout priority for De Soto.

Q: There was a five-year period where a series of floods got attention and kicked off this flood mitigation and planning process. Any sense as to what caused this severity of floods or why they were so intense?

Rainfall records and stream elevations nearby in the Big and Meramec rivers could be used to address this question, but he hasn't seen this done.

Q: Are there good sources of data for the wells or does anyone monitor the water table?

DNR and USGS both monitor some wells.

Other Comments:
Buyouts and replacement with green space should be high priority. New partners will likely be needed to obtain sufficient funds.

Another stream gauge upstream would be helpful for both monitoring and also to inform a more robust flood warning system.

Water quality and sediment contamination need study and evaluation.

Time scales for "resilience" should be addressed, because "resilience" looks different when considering different time scales.

Risks to De Soto from upstream reservoir overflow or catastrophic dam failure should be evaluated.

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Neighborhood Meetings Report

De Soto Flood Resiliency Plan

Public Meeting Overview

On the weekend of March 25th and 26th H3 Studio in partnership with Buy-In Community Planning engaged De Soto Community Members by hosting a series of meetings in several locations in the City of De Soto. One meeting was held at The Just Be Kind Coffee Shop from 9AM – 11AM; one meeting was held at Pogolino's from 5PM – 7PM; and one meeting was held at the library from 9- 11AM. These meetings were informal open house style drop ins where the De Soto community members could just pop in , give feedback, and learn about the process. The goal was to receive any additional input regarding the overall planning process to continue to expand the list of strategies delineated by the planning process. In addition to these three meetings, we also conducted one on one interviews with community members living in the flood plain where we went around from home to home of past buyout applicants to assess their interest and catch up on their progress and challenges, they have faced. The team engaged several dozen community members and collected input on the larger city-wide resiliency process and the buyout development plan and application process. The following represents the results from the outlined engagement.

Neighborhood Meetings Results:

At each of the three meetings the team had a workboard with a city map for community members to note physical areas in need of attention. Additionally, they were presented with seven (7) thematic categories to review and prioritize for the planning process and strategies. The following are the results:

Prioritization Exercise:

All participating community members were given a green sticker, orange sticker, and pink sticker. The green represented priority 1 and had an assigned point value of 3, the orange stickers represented a second priority and had a designated point value of 2, and the pink stickers represented a third priority and had a designated point value of 1. Based on the tally's the community prioritized the following strategies:

Priority 1: Infrastructure

- The respondents we spoke to believed that minor infrastructure issues related to the flow of water caused many of the backup issues on Main St and in other parts of De Soto. They indicated better systems to catch debris were critical since much debris will clog up drains and contribute to the back up of water. They also expressed interest in continued improvement to the sewer lines and indicated working better with the railroad to be a priority throughout the process. Finally, Walther Park, though enjoyed by many community members – is a liability in the sense that any time it rains or flood large sums of money are put back into the park for repairs. Community members indicated wanting to improve the infrastructure of the park as a priority to limit the overall damage.

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Priority 2: Tied between policy and regulation and environment and hydrology

Many community members we spoke to believe that the hurdles in mitigation and development are related to political obstacles caused by the county, city and institutional priorities. Many recognized that the Union Pacific Railroad is important to the growth of the City of De Soto but many also recognize that they do not need to abide by general rules and regulations given their status. In their mind a successful policy would be to align the resiliency goals and priorities with Union Pacific. Likewise, a stronger political will and sense of advocacy for the suggested strategies needs to be developed at the county level. At a city level citizens are interested in greater code enforcement to protect against disruptive properties, legislation for occupancy permits, and disclosure laws/access of information for potential buyers and renters to inform them of the flood plain condition. At a political level any form of aid the city can provide for flood insurance would be critical to community members whose premiums continue increasing each year. Exploring application to the FEMA CRS program is encouraged.

Under the environment and hydrology goal community members expressed re-investing tax dollars into green infrastructure and outdoor space along the creek as a major priority. This is a strategy they believed could address to problems. 1. The community desire for increased green space and recreational amenities. 2. The impact of flood waters on city and community infrastructure and development. Community members identified the creek as an amenity but recognized the challenges to accessing it and using it as such.

Priority 3: Education and Engagement

Community members perceive that individuals as well as institution are misinformed regarding the conditions of the Joachim and impacts of flooding. For example many parents expressed frustration with the De Soto School Board indicating that the district has no policy for flooding that is fair to the students considerate of flood conditions. For example, parents indicate that when flooding occurs accessing rural areas or dam developed areas is difficult for students - but that even in difficult to access conditions absences are counted against students when they cannot make it to school. They would like to see the school board more involved and cognizant of the overall situation. Additionally, they believe a bog part of education on this issue is educating the community youth. Offering program volunteer hours and educational experiences for the youth is seen as a positive and interest was seen in involving student council, NHS, or the A+ program students for it. The development of an engagement plan is critical in the eyes of the community for the city to better distribute resources and information to community members.

Priority 4: Economic Sustainability

Funding was constantly a question among community members. In particular the comment “where is the money coming from?” Many community members inquired into the park and infrastructure tax which in their mind was passed to address issues of flooding. They would like to see that money be more impactful for this cause. Additionally, interest was expressed in the viability of a diversified Main St. business district - more restaurants and attractions and less professional services and offices. The team observed that the De Soto Main St. is active on the weekends and in the mornings. Many of the businesses on Main St. however close early and several are preparing to close up. Many people we spoke to did not live in Desoto – but they used De Soto for every day needs or were drawn to De Soto because their kids had games at the soccer park. De Soto needs to capitalize on the day trippers by

encouraging more diverse businesses offering activities. Community members thought some businesses across the tracks could move to main and they were generally interested in investing in business retention and expansion. A business owner we had the opportunity to speak to indicated that if the flooding on Main continues – he will be looking to move his shop to Festus instead of De Soto. The City needs to avoid businesses leaving due to the flooding issue and pinpoint specific areas of stormwater control to assist main street.

Priority 5: Community Development and Livability

Discussions around community development focused on the visual character of neighborhoods and overall amenities available to community members. Many respondents expressed a lack of programming for their families and kids though they emphasized the importance of Walther Park as a family center and activity center. Likewise, they saw the potential of De Soto as a rail town and advocated for an Amtrak stop. They called for a historical or main street society to regulate downtown development and encouraged mixed use/mixed income developments as solutions to an outdated unavailable housing stock. At the neighborhood scale they want increased enforcement to eliminate building and development blight.

Priority 6: Emergency Preparedness and Response

Though people expressed importance for emergency preparedness, many did not have specific comments as to the development of its strategies. Many respondents also did not live in flood plains or have not previously encountered an issue necessitating emergency preparedness and response.

Geographic Mapping Exercise:

In addition to the priorities exercise each board had a map which encouraged respondents to note physical areas of focus and with particular issues that we could begin prioritizing the work with. The following are the results of the geographic mapping exercise:

1. *Walther's Park:*
    a. Community members expressed concern that Walther's Park tends to flood and when it does it takes a lot of money to recover it and make sure everything is good to go for people to use it. People expressed interest in re-designing the park to make it more adapt to flooding conditions while remaining a good place for community members with amenities.

2. *The Amvets Neighborhood (Tanyard Branch):*
    a. The capacity of the neighborhoods by the Tanyard Branch is limited and community members indicated that there is essentially little to no stormwater infrastructure/protection here. Likewise, there's vacant lots that could be used as detention basins. An infrastructure capital improvements project would be beneficial to this area.

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3. *Valley Place (County Tributary):*
    a. The Valley Place neighborhood has the intersection with the big pipe that floods the intersection and gets closed off. When community members were informed the city had plans to remove the pipe and intersection and landscape it back to a creek like corridor they were receptive indicating they believed it would remedy the flooding and back up issues in that sector.

4. *Main St. De Soto:*
    a. When people from outside of the city talked to the team, they all expressed that although they did not live in De Soto, they always use and come to the city for every day necessities and primarily for their children's sports games. When asked what they needed from De Soto and Main St. they expressed interest in more diverse businesses (restaurants, entertainment, shops, etc.) and things to do in a family setting with expressed interest in the mom and pop business model.

    b. The biggest problem/threat to main street is that the storm water and sewer system doesn't have the capacity to respond to the levels and amounts of water coming in. Additionally, they become clogged and start backing up. One prime example is at the block between Pratt and Kelly on Main St. where water rushes down the hill and stormwater infrastructure does not meet the demand.

5. *Land between Joachim Creek and Main St:*
    a. This land is primarily desired to be cleared away and in the long run be turned into parks and green space to help mitigate the flood waters as they come in while offering the community an additional amenity along the creek.

6. *John Belleville's Land:*
    a. Located South of the city at the confluence of the Joachim Creek, Falling Rock Branch, Whitehead Creek. The Belleville family had an opportunity to chat with us and they expressed willingness to partner with the city in leasing their land for retention and/or detention uses.

7. *The Joachim Creek:*
    a. Community members expressed concerns regarding the impact of chokepoints along the creek specifically at the pedestrian bridge, Kingsland bridge, and railroad property wondering what could be done to widen/expand those points or better address the point of passage along the railyard.

Additional Comments and Things to note:

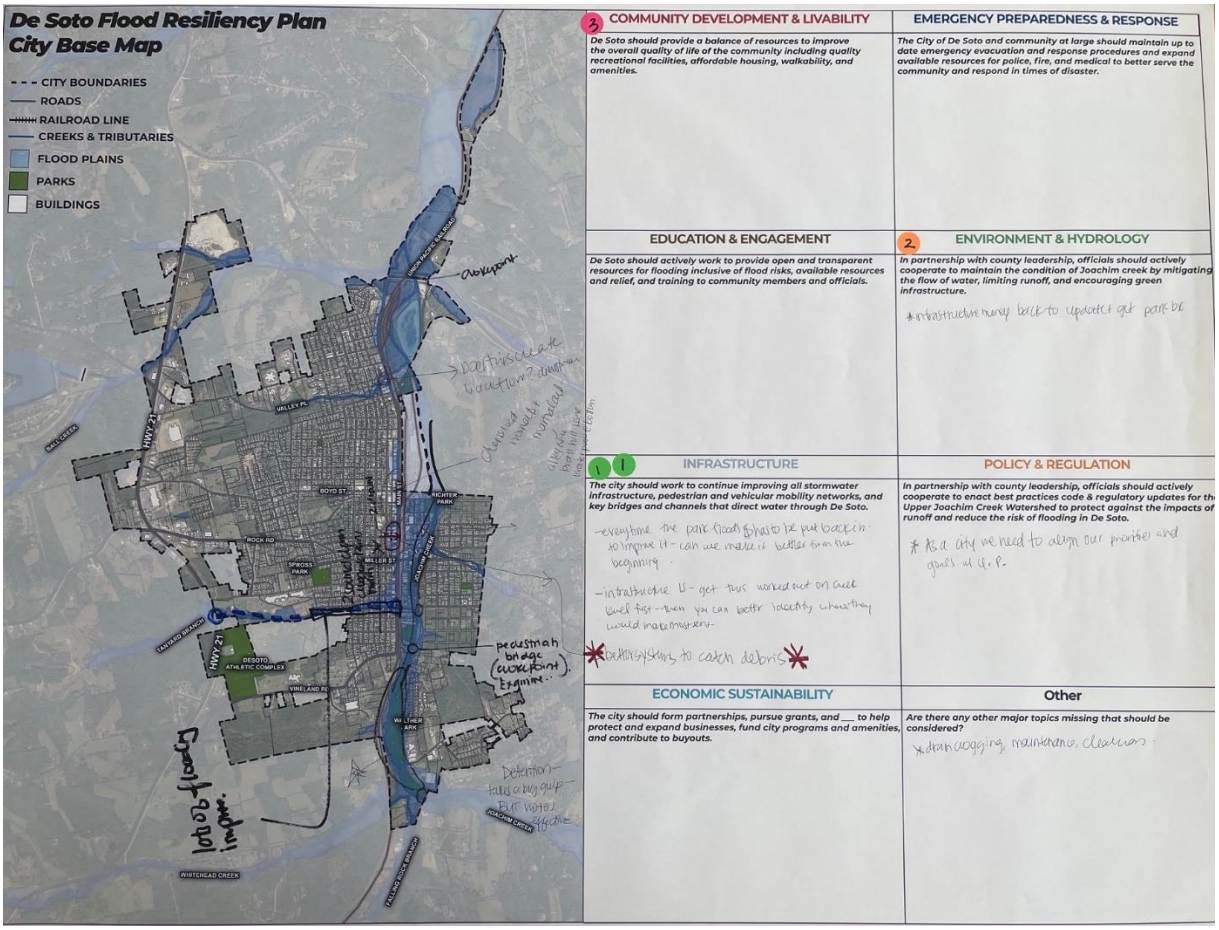
- Dam subdivisions have a minimum housing footprint requirement.
- Be cautious of county developments because the infrastructure doesn't exist – instead look within the city for development where land is much cheaper.
- Once 8'-8.5' stream occurs the Walther's Park neighborhoods can't get out.

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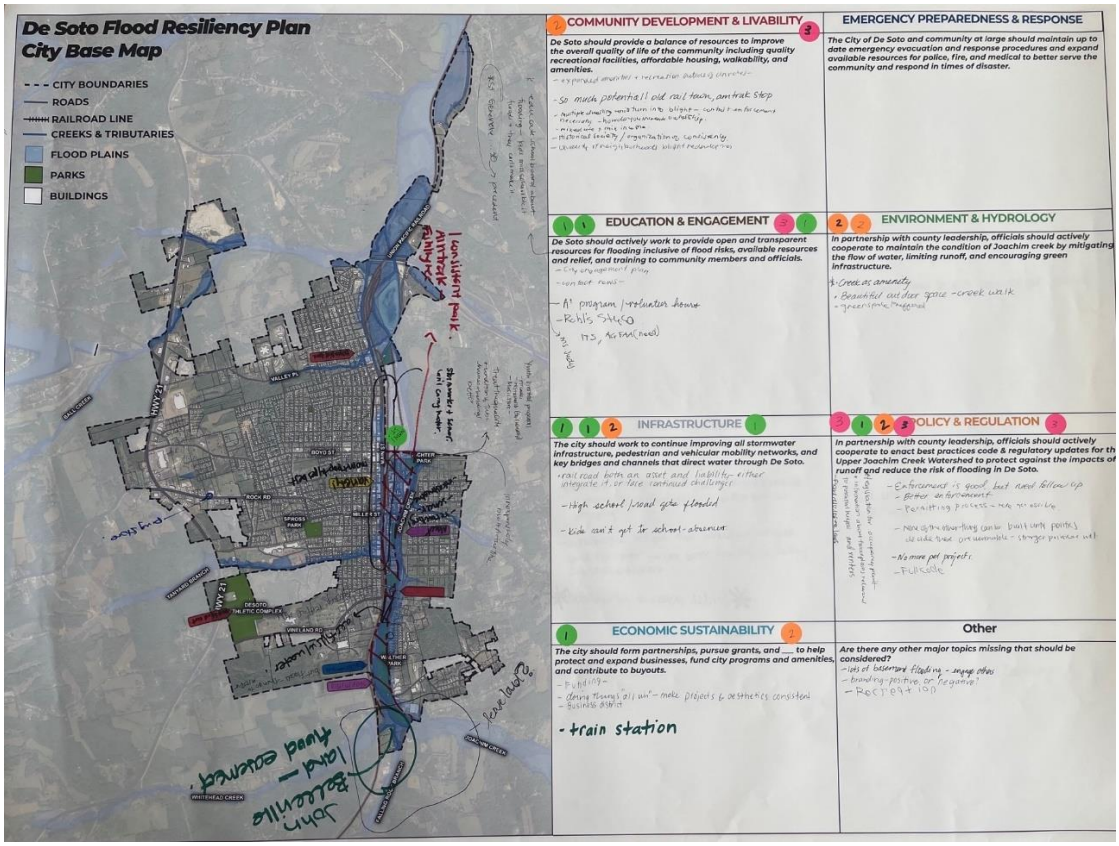
- There is missed opportunity to engage youth – where volunteer initiatives and programs tied to A+ Program, STUCO, and NHS could be implemented to help.
- The youth can benefit by learning about water, conservation, and energy in De Soto.
- De Soto is a city of young folk that start here, then they move out to build their careers/farms/etc. and come back once they are older.

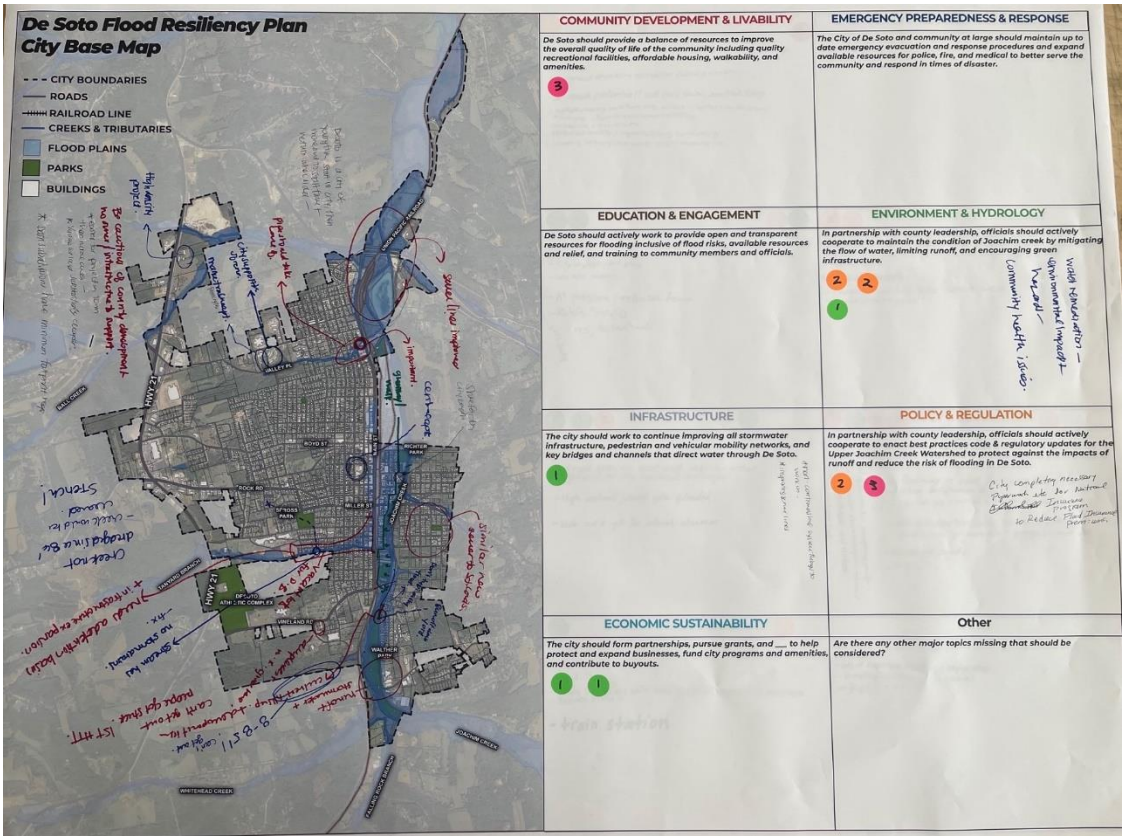
Board and Meeting Images

The following images are of the work boards we displayed to the neighborhood with their recorded feedback and images of these meetings:



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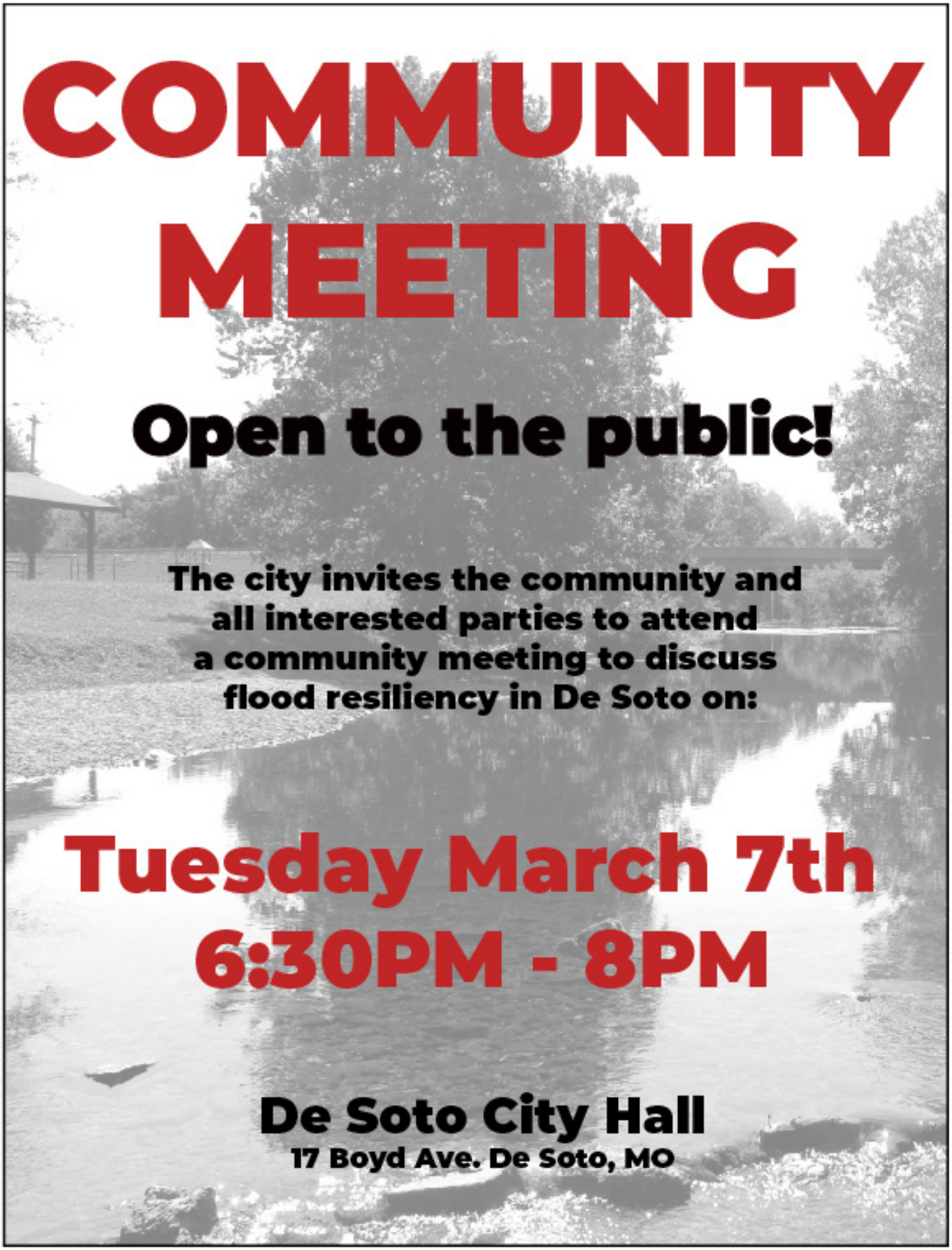
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COMMUNITY MEETING
Open to the public!
The city invites the community and all interested parties to attend a community meeting to discuss flood resiliency in De Soto on:
Tuesday March 7th
6:30PM - 8PM
De Soto City Hall
17 Boyd Ave. De Soto, MO


RESILIENT DE SOTO
COMMUNITY MEETING
We need your vote!
Come share your opinion!
Tell us what you need!
The City of De Soto invites all community members and interested parties to attend a public meeting for the De Soto Flood Resiliency Plan. Come voice your opinions regarding the future growth, development, and safety of the city!
Tuesday May 16th
6:30PM - 8:30PM
De Soto Community Center
400 Boyd St. De Soto, MO


RESILIENT DE SOTO
PUBLIC MEETING ON
TUESDAY MAY 16th , 2023 at 6:30PM
DE SOTO COMMUNITY CENTER
SCAN TO LEARN MORE ABOUT THE PLANNING PROCESS AND CAST YOUR VOTES FOR THE FUTURE OF DE SOTO!
SCAN ME!
RESILIENT DE SOTO
PUBLIC MEETING ON
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SCAN ME!


ATTENTION DE SOTO COMMUNITY!
Resilient De Soto
Flood Resiliency Plan
Public Meeting
Join us for the second public meeting of the De Soto Flood Resiliency Planning effort. Come out to voice your opinions on the future growth of De Soto and the safety of your community!
Tuesday May 16th , 2023 6:30PM
De Soto Community Center









Resilient De Soto: Planning Process Overview

The City of De Soto is working with a team of consultants to complete a flood resiliency and mitigation plan for the city called **Resilient De Soto.** This is a year-long process which is expected to wrap up in May of 2023. The plan involves an analysis of the existing area conditions and provides a comprehensive approach to resilience for:

- Housing
- Physical infrastructure creation and protection
- Economic development
- Open space amenities and recreation
- A voluntary property acquisition program.

The goal is to deliver a framework for sensitive growth and development that **puts the citizens of De Soto first and establishes a foundation for a city that is safe and prepared** to deal with any dangers which may present themselves in the future. **The work our team is doing could not be done without the support of the community!**

The team has been on the ground since day one understanding what it means to live and be a part of the De Soto community. We have interviewed residents, business owners, and city/county officials and emergency personnel to become familiar with the challenges each of you faces every day and now we are continuing to bring our work to you!

Join us at our next Public Meeting: May 16th, 2023 6:30 PM De Soto Community Center to give us your feedback on the plan.

Please visit our website at:

https://buy-in.org/resilientdesoto

or scan the QR Code (right) to learn more and share your opinions and let us know your priorities on the work being done in De Soto!

Resilient De Soto: Planning Process Overview

The City of De Soto is working with a team of consultants to complete a flood resiliency and mitigation plan for the city called **Resilient De Soto.** This is a year-long process which is expected to wrap up in May of 2023. The plan involves an analysis of the existing area conditions and provides a comprehensive approach to resilience for:

- Housing
- Physical infrastructure creation and protection
- Economic development
- Open space amenities and recreation
- A voluntary property acquisition program.

The goal is to deliver a framework for sensitive growth and development that **puts the citizens of De Soto first and establishes a foundation for a city that is safe and prepared** to deal with any dangers which may present themselves in the future. **The work our team is doing could not be done without the support of the community!**

The team has been on the ground since day one understanding what it means to live and be a part of the De Soto community. We have interviewed residents, business owners, and city/county officials and emergency personnel to become familiar with the challenges each of you faces every day and now we are continuing to bring our work to you!

Join us at our next Public Meeting: May 16th, 2023 6:30 PM De Soto Community Center to give us your feedback on the plan.

Please visit our website at:

https://buy-in.org/resilientdesoto

or scan the QR Code (right) to learn more and share your opinions and let us know your priorities on the work being done in De Soto!

Project Website

buy in

Home | How We Work | About Us | Support Us | Contact | Sign Up

Resilient De Soto

8:30PM @ The De Soto Community Center --- Next Community Meeting: Tuesday, May 16, 6:30-8:30PM @ The De Soto Community Center --- Next C

The Next Community Meeting for Resilient De Soto will take place on:

May 16th , 2023 from 6:30PM – 8:30PM at the De Soto Community Center!

In this meeting, community members can share their priorities for Resilient De Soto and discuss how the city should fund and implement community recommendations.

What do you think the City of De Soto should prioritize in order to be more resilient?

- **Community Development & Livability** - A healthy balance of resources to develop housing, amenities, recreation, and walkability in De Soto.
- **Emergency Preparedness & Response** - Community planning and development for emergency evacuation and community readiness with expanded resources for police, fire, and medical
- **Education & Engagement** - Actively training staff and community members and providing open and transparent communications resources for flooding, flood risks, financial resources, and relief.
- **Environment & Hydrology** - Forming county, state, and local partnerships to actively maintain the Joachim Creek and mitigate water runoff while promoting green infrastructure.
- **Infrastructure** - Continually working to improve storm, sewer, electrical services with increased mobility networks inclusive of key bridges and channels.
- **Policy & Regulation** - Actively cooperating with state and county leadership to enact best practice measures and regulatory code updates for the watershed to actively protect against development impacts and runoff.
- **Economic Sustainability** - Forming partnerships, pursuing grants, helping protect and expand local businesses, funding city programs and amenities, contributing to buyouts.
- **A voluntary property acquisition program** – helping residents of De Soto who have experienced and are under threat of serious flooding from the Joachim Creek move somewhere safer, using a mix of federal, state, and local funding, and converting their properties into a public, floodable open space that all residents in the community can enjoy.

Click here to cast your vote!

Announcements and Updates:

SAVE THE DATE!

The Next Community Meeting for Resilient De Soto will take place on: **May 16th , 2023 from 6:30PM – 8:30PM at the De Soto Community Center!**

VOTE FOR YOUR PRIORITIES!

What do you think that the City of De Soto should focus its priorities on? Fill out the prioritization survey to help the planning team decide what is most important for the city's planning efforts in the years to come!

THANK YOU FOR HOSTING US!

- The Buy-In and H3 teams visited De Soto with the Citizens Committee for Flood relief and heard feedback from members all around the community. Thank you for coming out to visit us at Be Kind Cafe and Pogolinos!
- The results of our visit can be viewed by downloading the Neighborhood Meetings Report. Click here to download!
- If you did not have a chance to share your voice, you can still participate! Fill out the prioritization survey and be sure to come to the next community meeting on May 16, 2023 from 6:30 - 8:30pm at the De Soto Community Center!





About Resilient De Soto

The City of De Soto is working with a team of consultants to complete a flood resiliency and mitigation plan for the city called *Resilient De Soto*. This is a year-long process which is expected to wrap up in May of 2023. The plan involves an analysis of the existing area conditions and provides a comprehensive approach to resilience for:

- Housing
- Physical infrastructure creation and protection
- Economic development
- Open space amenities
- A voluntary property acquisition program.



What is the purpose of this plan?

In the last six years, De Soto has conducted multiple studies to better understand and address the flooding hazards of the Joachim Creek. These include:

- Upper Joachim Creek Floodplain Management Plan (US Army Corps)
- Joachim Creek Flood Study (USGS)
- De Soto Emergency Action and Evacuation Plan

In contrast, **The Resilient De Soto Plan is focused on implementation.** The plan will provide recommendations on how to finance, construct, and enact the strategies community members want to see.

What has happened to date?

To date, the team has:

- Reviewed existing studies and plans for De Soto
- Met with city and county officials to learn about existing programs
- Met with businesses and residents to learn about their concerns
- Presented our findings to the public.

These documents are available for download below:

Click the image below to view the Comprehensive City Wide Assessment

Meet the team

- ***H3 Studio***, an award winning multidisciplinary planning and design firm based in St. Louis, MO focused on the primary flood resiliency framework;
- ***Buy-In Community Planning*** a national non profit working across the country to support the well-being of people whose homes and communities are threatened by natural hazards and assisting them in planning for and relocating to safer areas;



Click below to view the Public Report for Meeting #1

City of DeSoto Flood Resiliency Plan
Prepared by H3 Studio| March 8th, 2023

Public Meeting #1 Report

De Soto Flood Resiliency Plan

Public Meeting Overview

Public Meeting #1 was held at De Soto City Hall on Tuesday March 7th, 2023 from 6:30 PM to 8:30PM with 11 members in attendance. The purpose of this workshop was to filter the results of our analysis and the strategies that have been proposed to the city to date through the lens of the public. The goal was to ensure that the analysis and key takeaways we presented incorporated all of the needs and concerns of the community to ensure a holistic and comprehensive approach to the problem. After the presentations and takeaways, the community was asked to review a series of strategies and prioritize what they believed would be most important, effective, and achievable to improve their safety and quality of life during flood events further addressing the flooding problem determined through the analysis and feedback received.

Click below to view the Neighborhood Meetings Report

- ***Robert Lewis and Cecile Denny*** of the SLU Community Planning Lab who will be developing an economic and affordable housing and relocation development framework; and
- ***Dan Hanes*** of St. Louis University whose expertise in hydrology and natural sciences will guide the maintenance and development strategies to mitigate the effects of flooding from the Joachim creek and Upper Joachim Watershed.
- **The City of De Soto**
- **The Citizen's Committee for Flood Relief**

Do you live in the Joachim Creek Floodway?

If you live next to Joachim Creek and have experienced flooding, please fill out this survey to let the city know if you are **interested** or **NOT interested** in a voluntary home buyout.

Filling out this survey does NOT guarantee funding for a buyout, but will put you on the waitlist. Thank you!

Click here to take the buyout interest survey







https://buy-in.org/resilientdesoto

Resilient De Soto: Planning Process Overview

The City of De Soto is working with a team of consultants to complete a flood resiliency and mitigation plan for the city called *Resilient De Soto*. Resilience is defined as the capacity to withstand or to recover quickly from difficulties. This is a year-long process which is expected to wrap up in May of 2023. The plan involves an analysis of the existing area conditions and provides a comprehensive approach to resilience for:

- Housing
- Physical infrastructure creation and protection
- Economic development
- Open space amenities
- A voluntary property acquisition program.

The goal is to deliver a framework for sensitive growth and development that puts the citizens of De Soto first and establishes a foundation for a city that is safe and prepared to deal with any dangers which may present themselves in the future.

Planning Objective

The objective of the work is to develop a Flood Resiliency Plan that addresses **community livability, disaster mitigation, and emergency preparedness** as a comprehensive approach to community development and safety.

In the last six years, De Soto has conducted multiple studies to better understand and address the flooding hazards of the Joachim Creek. While many ideas have been developed, they have not been examined cohesively and can become difficult to finance and implement as needed. The Resilient De Soto planning process seeks to identify a path towards implementing the strategies that have been outlined. The plan will provide recommendations on how to finance, construct, and enact the necessary strategies and regulations that will help create a Resilient De Soto, a community that is livable, safe, protected, and prepared.

Planning Methods

The work our team is doing could not be done without the support of the community, county, and city of De Soto. Our process began with an onsite survey where our team drove your streets, spoke to your residents, visited your businesses, examined your neighborhoods, and walked through your parks. The team has been on the ground since day one understanding what it means to live and be a part of the De Soto community.

We have interviewed residents, business owners, and city/county officials and emergency personnel to become familiar with the challenges each of you faces every day and now we are continuing to bring our work to you!

As the process moves forward the public will receive two distinct opportunities to provide their comments and feedback on the work being done and throughout we will be engaging community members via surveys, events, interviews, newsletters, and websites to keep you properly informed of the process and expected results.

Project Timeline

This is a year-long planning process and has been in development since June 2022. Currently, the team is in development of phase 2 which involves a series of public engagement strategies inclusive of public meetings, neighborhood focus groups, and work sessions. The final plan is expected to be delivered to the city by May 31, 2023.

Meet the Team

The H3 Studio Team is composed of ***H3 Studio***, an award winning multidisciplinary planning and design firm based in St. Louis, MO focused on the primary flood resiliency framework; ***Buy-In Community Planning*** a national non profit working across the country to support the well-being of people whose homes and communities are threatened by natural hazards and assisting them in planning for and relocating to safer areas; ***Robert Lewis and Cecile Denny*** of the SLU Community Planning Lab who will be developing an economic and affordable housing and relocation development framework; and ***Dan Hanes*** of St. Louis University whose expertise in hydrology and natural sciences will guide the maintenance and development strategies to mitigate the effects of flooding from the Joachim creek and Upper Joachim Watershed.

H3 Studio





Buy-In Community Planning





SLU Planning Lab

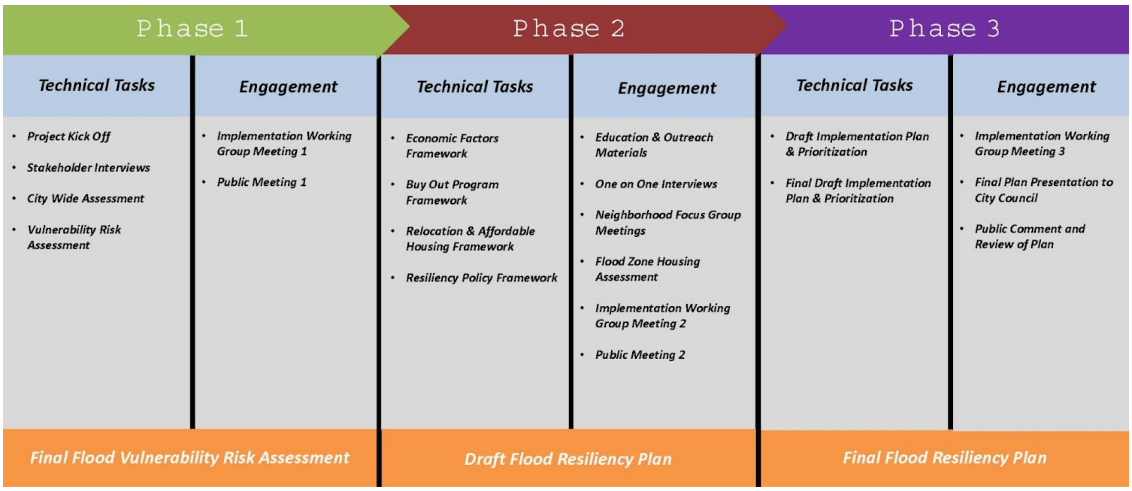




Dan Hanes



Resilient De Soto Planning Process Overview



Key Dates

- March 7: Public Meeting to review end of **Phase I:** City Wide & Vulnerability Assessments
- March - April: **Phase 2** - (Sign up on the sign in sheet for more information)
    - Coffee shop talks with floodway residents
    - De Soto Buyout Interest Survey Launched
- May 31, 2023: Planning Process Ends

De Soto Strategic Prioritizations Exercise

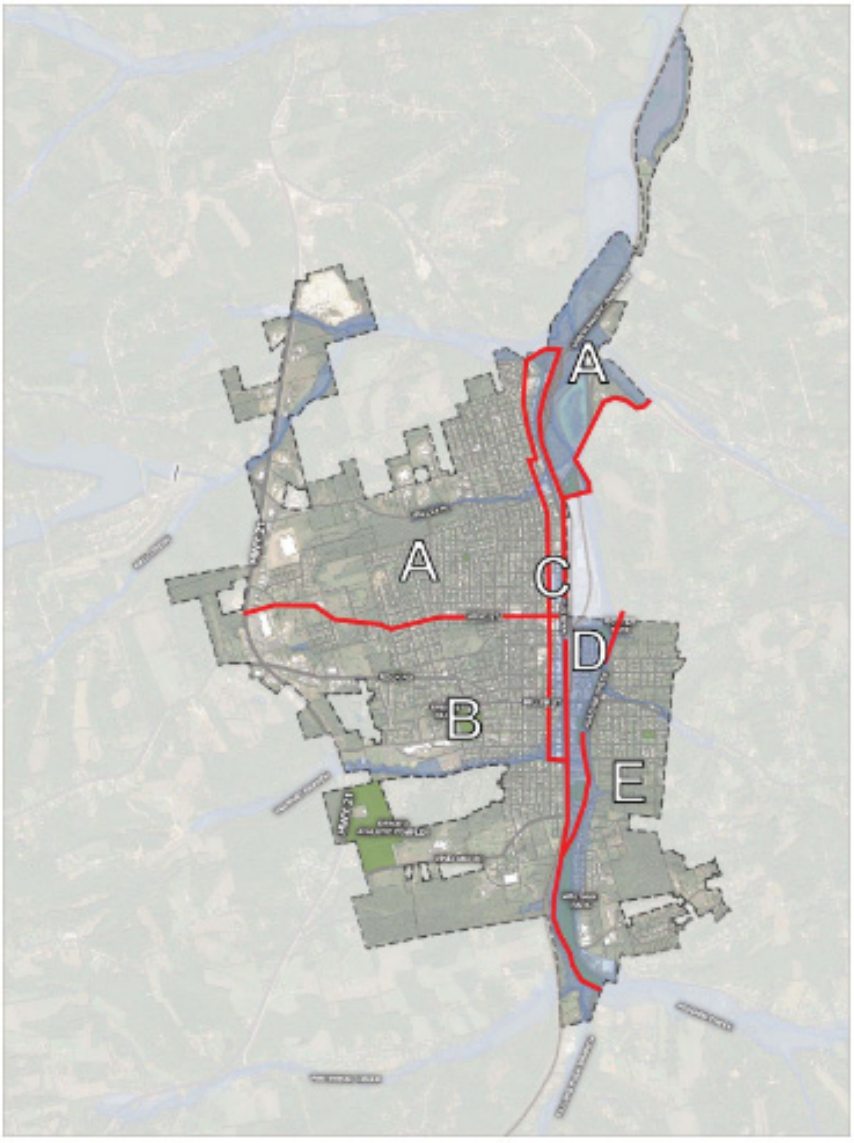
The following survey is designed to gather input from community members regarding what they value as important challenges and ideas to address to foster a De Soto that is prepared to deal with emergencies and continue growing to better serve the community at large. Please answer all of the following questions to the best of your ability. Thank you.

Email *

Valid email

This form is collecting emails. Change settings

Where do you live?







H

Mitigation Action Plan Extract

Continuing Action Items

These are the action items that work to maintain a community that is informed, prepared, and capable of responding to flooding events.

Action Item	Supports Goal?	Key Players	Additional Notes
1.Host an annual review/training workshop for all city and county staff and emergency response teams inclusive of conducting regular inventories of flood fighting equipment, resources, and materials in order to work toward investing and increasing the amount of rescue resources like rescue boats, medical supplies, tactical equipment, etc.	Goal 2, Goal 3	City of De Soto, Emergency Service Departments, County Emergency Management	This information and workshops should also be taken to residents to educate them on preparedness and emargency flood preparedness.
2.Continue the improvement of stormwater infrastructure and the provision of street green infrastructure in the City of De Soto to mitigate runoff and limit backup into buildings. Ensure the quarterly cleaning of storm drains to maintain adequate drainage as designed.	Goal 5	City of De Soto	Continue receiving CDBG funds for these projects
3.Continue to plan and implement bioswales and green infrastructure along the Joachim Creek and tributaries that create pollinator and wildlife habitats while reducing localized flooding, and promoting environmental education opportunities for the community.	Goal 3, Goal 4,	City of De Soto, MODNR	
4.Continue, strengthen and expand the buy-out program for voluntary and repetitive loss or vacant properties to implement green infrastructure and flood retention and mitigation projects.	Goal 1, Goal 4, Goal 5	City of De Soto, Buy-In Community Planning, Corps of Engineers	See Buy Out Plan - Appendix E for a detailed plan/recommendations
5.Continue growing city sales tax to benefit the parks and stormwater tax to fund future mitigation project implementations.	Goal 4, Goal 5, Goal 7	City of De Soto, Jefferson County Economic Development Office	
6. Continue testing floodway properties for mold and mildew and provide financial support to residents to treat mold as a major public health concern.	Goal 2, Goal 3	City of De Soto, County Health Department	Mold and mildew are already existing problems in area homes and were of significnat concern to residents. After flooding, the City must ensure they are the only authority inspecting properties to ensure the safety and well being of residents

Short Action Items (0-3 years)

These are the action items that work to organize city and community systems and establish the foundation for future flood resiliency and mitigation programs, policies, partnerships, planning and projects.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Work with existing FEMA, SEMA, and City resources to distribute the "Homeowner's guide to living in a flood plain" which is to be distributed to all flood plain residents detailing their risks, preparation options, warning/alert systems, and evacuation procedures in times of a flooding emergency. Make it both a web and print resource.	Goal 2, Goal 3	City of De Soto, FEMA, Citizens Committee for Flood Relief	SEMA already has a resource that De Soto can take and retrofit as needed to distribute. Volunteer groups like the Citizens Committee can assist in distribuiiton and education given their relationship with flood affected residents.
2.Educate & assist all but especially vulnerable populations living in areas of high-flood risk in developing personal preparedness plans.	Goal 2, Goal 3	City of De Soto, Citizens Committee for Flood Relief	Resources exist on SEMA and FEMA websites to accomplish this. Consider developing started kits that can be distributed to residents and/or held as a resource when flooding strikes.
3.Distribute a yearly community brochure updating citizens on the city's progress towards flood resiliency, projects in the pipeline, and opportunities to stay informed and involved.	Goal 3	City of De Soto	This can take many forms including a door hanger or mailbox fliers. Incorporate it into the City newsletter.
4.Request that the National Weather Service Advanced Hydrologic Prediction Service (AHPS-River Forecast Center) lower the "action stage" for the Joachim Creek gage from 8 feet down to 6 feet, or as low as feasible.	Goal 2	City of De Soto, Jefferson County Emergency Management	The predictions and alert to evacuate are to remain at the discretion of the city manager based on best practices, predicted precipitation, and flow. 6' is a suggested warning stage to alert residents of the potential of flooding, the evacuation stage remains 8.
POLICIES & REGULATIONS			
1.Develop a policy to revert land uses and zoning in the flood plain (repetitive loss properties and public purchased or donated properties) permanently back to floodable park spaces for flood resiliency.	Goal1, Goal 5, Goal 6	City of De Soto	
2.Within the regulated floodway do not permit new buildings or increased impervious surfaces without equivalent mitigation being provided on site or within the floodway to ensure no (zero) rise in the 1% AEP flood water level.	Goal 6	City of De Soto	
3. Require public availability mandatory flood disclosures and evacuation information to renters in the Joachim Creek Floodplain.	Goal 3	City of De Soto	Area realtors are already committed to doing this and reporting others that are not disclosing information. Consider a partnership and support their efforts.
4. Document availability of flood insurance and nearby insured and ininsured properties to understand burden of costs and plan for potential income based assistance.	Goal 2, Goal 7	City of De Soto, SEMA	Many Residents have expressed an increase in cost to flood insurance making a living unaffordable. The CRS program was debated but was determined unfeasible for De Soto to pursue.
PARTNERSHIPS & FUNDING			
1.Establish a resident and business-based Upper Joachim Creek Watershed Conservancy to stimulate routine meetings, raise funding for projects, and lobby for regulations in the Upper Joachim Creek Watershed.	Goal 4, Goal 6, Goal 7	City of De Soto. County Emergency Management, MODNR, Citizens Committee for Flood Relief, SEMA	This should be a multi-disciplinary group with county, city, and community buy in. Advocacy and work should begin right away to plant the idea. Non-profit groups like Headwater Economics have experience working with and assembling like groups and can provide precedent for them.
2.Establish an Upper Joachim Creek Watershed Public Sector Management Board to develop and implement regulations and policies to increase flood resiliency and maintain the character and quality of the entire Upper Joachim Creek Watershed.	Goal 4, Goal 6, Goal 7	City of De Soto. County Emergency Management, MODNR, Citizens Committee for Flood Relief, SEMA	This should be a multi-disciplinary group with county, city, and community buy in. Advocacy and work should begin right away to plant the idea. Non-profit groups like Headwater Economics have experience working with and assembling like groups and can provide precedent for them.
3.Engage with the Corps of Engineers to support their pipeline projects for Infrastructure improvements and precipitation modeling.	Goal 5, Goal 7	City of De Soto	The Corps of Engineers indicated they will likely be conducting studies for future project in approximately 2-3 years. Maintain communication and support their efforts.
4.Continue exploring partnerships and funding opportunities with The Citizens Committee for Flood Relief connections to the Anthropocene Alliance.	Goal 7	City of De Soto, Citizens Committee for Flood Relief	Track the DNR sponsorship of the America the Beatiful Grant and participate with them on the application and project support.
5.Assess and re-structure the use of the parks and stormwater tax to better serve mitigation priorities.	Goal 1, Goal 5, Goal 7	City of De Soto, City Council	The tax is specifically stated to serve parks and stormwater, since a chunk of stormwater funding comes from CDBG grant funds can that portion from the tax be allocated to flood mitigation specific actions with stormwater and in the future could it be ammended to be explicit about it.
PLANNING & PROJECTS			
1.Continue coordination with USGS, SEMA, and the county to provide early warning systems such as an additional up-stream gauge as well as activated flood lights on dangerous roads and a public alert warning system/flood siren.	Goal 2, Goal 7	City of De Soto, SEMA, County Emergency Management	Continue exploring the possibility and expense of retrofitting the tornado sirens for flooding. Residents expressed that CODE RED is inconsistent with warnings.
2.Work with the National Weather Service to identify precipitation and flood patterns in the Joachim Creek watershed specific to amount of rain, direction, and water height.	Goal 2, Goal 4	City of De Soto, US Corps of Engineers, USGS	
3.Plan and implement Increased flood protection of Main Street through back-flow preventors, culvert gates, etc.	Goal 1, Goal 5, Goal 7	City of De Soto	Apply future CDBG and stormwater and parks tax funding to this initiative to salvage businesses on Main St.
4.Inspect flood affected properties for mold and mildew as part of a public health initiative to help affected residents in the floodplains.	Goal 2	City of De Soto	

Medium Term Actions (3-7 years)

These are the action items that build from the legal, organizational, and resource foundation of the immediate actions to begin planning and considering for the development of long-term projects.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Develop educational signage in recreational areas that are accessible to the public. This includes historic flood markers, historic impact images, safety and prevention education implemented throughout the city or in a similar way to the tree museum or exercise park that exist at Walther Park.	Goal 3	City of De Soto, Citizens Committee for Flood Relief	This is an initiative that the Citizens Committee has assisted in with the water marker at the Fire Station. Consider a partnership and target public area as well as vulnerable, high rental neighborhoods first.
2.Develop a "land swap" program to facilitate home-ownership relocation out of the flood way.	Goal 1, Goal 6	City of De Soto	
3.Join the Missouri Main Street Program, develop a marketing campaign and offer incentives to entice businesses and restaurants to remain on Main Street and improve the aesthetics and functionality of their buildings.	Goal 7	City of De Soto, Missouri Main Street Connection	
POLICIES & REGULATIONS			
1.Update city building codes to require design in and adjacent to floodplains to address the 0.2% AEP event.	Goal 6	City of De Soto	While De Soto already has standards for floodplain development and stormwater runoff, it is recommended to revisit and recalibrate to design for the predicted increase and intensity and frequency of precipitation and flooding events.
2.Develop and implement an overlay regulation for site-specific full storm-water retention and mitigation only within the Upper Joachim Watershed.	Goal 5, Goal 6	City of De Soto, Jefferson County, SEMA, MODNR	
3.Advocate for better inspection and regulations for the dams and subdivisions upstream from De Soto.	Goal 4, Goal 5, Goal 6	City of De Soto, US Corps of Engineers	
PARTNERSHIPS & FUNDING			
1.Establish a volunteer program with the local school which can count towards A+, NHS, or STUCO service hours which would help impacted residents clean and repair properties post floods and connect local youth with area professionals to learn about flood safety, readiness, and sustainability.	Goal 2, Goal 3	City of De Soto, De Soto High School, Citizens Committee for Flood Relief	
2.Create and formalize agreements to use private property for emergency access or as a floodway.	Goal 2, Goal 6	City of De Soto, US Corps of Engineers	A property to examine and assess feasibility for is the Belleville property which has been offered to the City to lease in the past.
PLANNING & PROJECTS			
1.Complete additional hydraulic studies to explore proposed Joachim Creek watershed management and infrastructure changes to reduce flooding in De Soto.	Goal 4	US Corps of Engineers, USGS	The Corps of Engineers is planning to complete additional modeling and studies for De Soto in the next 3-5 years. Support their efforts.
2.Re-configure buy-out properties, Walther Park, Richter Park, Shoe Factory site and Hopson Field into floodable park spaces following floodable park best practices that are still usable as recreational amenities when not flooding. Plan and implement an expanded Joachim Parks and Trail system.	Goal 1, Goal 6	City of De Soto	Support the Buy In Buy Out plan to secure the funds through the state program to push for additional buyouts. (Appendix E)
3.Study and identify all primary and secondary roadways used by workforce and emergency service providers that flood and develop plans to mitigate flood hazards and prioritize area evacuations. Identify another site for first responders West of the Joachim Creek to allow consistent access to the community even in times of flooding.	Goal 2	City of De Soto, US Corps of Engineers, County Emergency Management	Place special emphasis on the 5 key roads (Boyd, Veterans, Amvets, W Miller, Clarke) W Miller St. is the only crossing of the tracks in De Soto with access to the Eastern side of the City prioritize projects for its bridge and rail crossing.
4.Work with Jefferson County to relocate the De Soto Rural Fire station out of the floodplain and simultaneously study a combined resource facility for City's and County's departments to pool resources to be used as needed in times of emergency.	Goal 2, Goal 5	De Soto Rural Fire, County Emergency Management, City of De Soto	
5.Create a land use and property ownership inventory of possible development locations for affordable housing.	Goal 1, Goal 6	City of De Soto	

6.Develop a toolkit of diverse housing types and construction techniques that increase the range of affordability and are incorporated into the city's land-use plan and zoning code.	Goal 1, Goal 6	City of De Soto	Trends are showing communites will hire an architect to put together schematics for development. Developers can come in, choose a prescribed model, expedite their development process, and save on the overall construction cost.
7.Separately or in conjunction with the county, pursue a Comprehensive Economic Development Strategy (CEDS) process and document for the city itself. More deeply evaluate the city's economic strengths, weaknesses, and opportunities to create initiatives to build on those strengths and reduce weaknesses. A formal CEDS document improves opportunities for federal economic development funding.	Goal 7	City of De Soto, Jefferson County Economic Development Corporation	Jefferson County Economic Development Corporation Indicated that De Soto already has an economic development plan but that it needs updating and they can assist the City in doing so.
8.Develop an ecosystem services plan for the Upper Joachim Creek Watershed that improves flood resiliency, native plant and wildlife habitat restoration, mitigates pollution and provides increased public safety of the existing creek dams.	Goal 4, Goal 6	Jefferson County, City of De Soto	

Long Term (7+ years)

These are the actions that build on the foundational, organizational, and structural work that lend themselves to larger development and infrastructure projects. The lead up to these projects often involves budget and fund acquisitions and partnership development.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Encourage the East of the tracks Main Street business to relocate their store fronts onto Main St. where they are safer and more accessible to community foot traffic.	Goal 1, Goal 7	City of De Soto	
2.Develop incubator business spaces along Main Street to act as startup opportunities for small businesses.	Goal 7	City of De Soto	
3.Continue advocating for the installment of an Amtrak rail stop in De Soto.	Goal 1, Goal 7	City of De Soto	
POLICIES & REGULATIONS			
1.Enable through code reform the construction of higher density affordable housing by establishing a multi-family land use ordinance in the Main St. area.	Goal 1, Goal 6	City of De Soto	
PARTNERSHIPS & FUNDING			
1.Partner with an area hospital to support the development of a small-scale clinic/medical facility in De Soto.	Goal 1, Goal 2	City of De Soto, Mercy Hospital, County Emergency Management	
PLANNING & PROJECTS			
1.Create a Strategic Plan for Main Street economic development that also includes “Main Street First” policies to limit relocation to other commercial corridors.	Goal 7	City of De Soto, Jefferson County Economic Development, Missouri Main Street Connection	
2.Comprehensively update the Emergency Action and Evacuation Plan with a formal public engagement process.	Goal 2, Goal 3	City of De Soto, US Corps of Engineers	
3.Identify and modify or rebuild key bridges and culverts along Kingston St., Miller St., Highway 110, and Main St. to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.	Goal 2, Goal 4, Goal 5	City of De Soto, US Corps of Engineers	Miller Street should remain a priority bridge since it is the only direct crossing across the Joachim Creek from the West and East sides of the City.
4.Support and actively participate in the update to the strategic economic development plan for Jefferson County.	Goal 7	City of De Soto, Jefferson County	
5.Plan and implement a pedestrian and bicycle linkage of Main St. as well as existing and future open space areas throughout the city to the Joachim Park and Trail system.	Goal 1, Goal 5, Goal 6	City of De Soto	This is the end use for buy-outs and should be marketed as such from the onset of the planning implementation process to achieve greater community support.

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Grants and Funding Sources

Potential Grants and Funding Sources:

Five Star and Urban Waters Restoration Grant Program: This program seeks to develop community capacity by providing modest assistance to diverse local partnerships for river, wetland, riparian, forest and coastal restoration, and wildlife conservation. Water monitoring, stormwater management, source water protection, urban tree canopy restoration, and projects designed to prevent trash from entering waterways are just some of the types of projects that are awarded grants. The grants are administered by the National Fish and Wildlife Foundation's (NFWF) Five Star and Urban Waters Restoration Grant Program which supports projects that develop community stewardship of natural resources and address water quality issues.

Building Resilient Infrastructure and Communities: Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

Flood Mitigation Assistance Grant Program: Flood Mitigation Assistance is a competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA chooses recipients based on the applicant's ranking of the project and the eligibility and cost-effectiveness of the project. FEMA requires state, local, tribal and territorial governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for hazard mitigation assistance projects.

Hazard Mitigation Grant Program: FEMA's Hazard Mitigation Grant Program provides funding to state, local, tribal and territorial governments so they can develop hazard mitigation plans and rebuild in a way that reduces, or mitigates, future disaster losses in their communities. This grant funding is available after a presidentially declared disaster. In this program, homeowners and businesses cannot apply for a grant. However, a local community may apply for funding on their behalf.

Community Facilities Direct Loan and Grant Program (10.766): This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings.

Urban Waters Small Grants: This program recognizes that healthy and accessible urban waters can help grow local businesses and enhance educational, recreational, social, and employment opportunities in nearby communities. Building a Movement One Partnership at a Time: The Urban Waters program strives to make a visible difference by working with a diversity of partners to support community driven solutions that connect the intrinsic value of urban waters with improving the livability and economic health of the community.

Multi-family Housing Loans Guarantees: The program works with qualified private-sector lenders to provide financing to qualified borrowers to increase the supply of affordable rental housing for low- and moderate-income individuals and families in eligible rural areas and towns.

Emergency Watershed Protection (EWO) Program Buyouts: The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection Program (EWP) to assist project sponsors in protecting lives and property from flooding or soil erosion after a natural disaster. In communities impacted by constant flooding or severe erosion due to a natural disaster, a property buyout might be the best solution.

Watershed Rehabilitation Program (REHAB) (10.916): To provide technical and financial assistance to rehabilitate dams originally constructed with assistance of USDA Watershed Programs. Rehabilitation must extend the life of the dam and meet applicable safety and performance standards. Priority is given to dams that maximize risk reduction and that could result in loss of life if the dam should fail.

NDSP State Assistance Grant Program (NDSP-SA): The NDSP-SA accomplishes this objective by supporting state and U.S. territory governments in the establishment and maintenance of effective State programs intended to ensure dam safety, protect human life and property, and increase the capacity and capability of State dam safety programs.

High Hazard Potential Dam (HHPD) Grant Program: The HHPD grant program accomplishes this objective by providing funding to state and U.S. territory governments for the rehabilitation of eligible high hazard potential dams that fail to meet minimum state dam safety standards and pose unacceptable risk to life and property.

Youth Conservation Program (15.546): Promote and stimulate public purposes such as education, job training, development of responsible citizenship, productive community involvement, and furthering the understanding and appreciation of natural and cultural resources through the involvement of local youth and young adults in the care and enhancement of public resources.

Water Infrastructure Finance and Innovation Act (WIFIA): The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established the WIFIA program, a federal credit program administered by EPA for eligible water and wastewater infrastructure projects.

Research and Evaluation, Demonstrations and Data Analysis and Utilization Program (HUDRD):

Three types of research project are solicited. Projects 1 and 2: Congress has provided funding that will allow HUD to evaluate the efficacy of its resilience expenditures. HUD is soliciting proposals to conduct two distinct, but related, research studies: (1) a cost-effectiveness evaluation that investigates long- and short-term benefits and costs of expenditures designed to reduce risk to people and property from flood hazards and increase resilience to flood impacts, with explicit focus on impacts to vulnerable populations, and (2) an assessment of implementation of flood resilience strategies, with a goal of identifying those implementation practices that have the greatest chance of being successful across a range of communities. Following on each study – the cost-effectiveness analysis and the implementation study – the respective research organization(s) will produce guidance tools for communities carrying out flood resilience strategies. The cost-effectiveness guidance will include practical methods of project

assessment that can be deployed by local communities and states with varying levels of capacity for assessing the benefits of resilience expenditures. Implementation guidance will include assessment of common implementation challenges and solutions and best practices for conceiving, planning, funding, and implementing flood resilience strategies, especially how to improve community participation and support of such strategies. For Project 3, HUD is funding co-operative agreements for pre-competitive research in homebuilding technologies that provide the homebuilding industry with new, innovative construction products or practices that lead to more affordable, energy efficient, resilient (in this sense, durable, disaster resistant, adaptable for future requirements, and maintainable), and healthier housing. This NOFA announces the availability of up to $4,708,000.

Resources:

The National Park Service – Rivers, Trails, and Conservation Assistance program (NPS-RTCA): Supports locally-led conservation and outdoor recreation projects across the United States. NPS-RTCA assists communities and public land managers in developing or restoring parks, conservation areas, rivers, and wildlife habitats, as well as creating outdoor recreation opportunities and programs that engage future generations in the outdoors. NPS-RTCA does not provide financial assistance or monetary grants. As a collaborative partner, we provide professional services to help you achieve your conservation and outdoor recreation project vision. Through an application process, community groups, nonprofit organizations, tribal governments, national parks, and local, state and federal agencies can apply for NPS-RTCA technical assistance.

Urban Waters Federal Partnerships: The Urban Waters Federal Partnership (UWFP) seeks to reconnect urban communities, particularly those that are overburdened or economically distressed, with their waterways to become stewards for clean urban waters. Through the Partnership, communities gain economic, environmental, and social benefits, and collaborate with Federal agencies, state and local agencies, and community-led efforts to achieve common goals.

Extension Disaster Education Network (EDEN): Database of community education resources for flood and disaster impact resiliency including but limited to: mold removal, disaster preparation, low-cost emergency supplies, power outage resources, food safety, financial preparation, flooding.

AmeriCorps VISTA: Volunteers in Service to America (VISTA) is an anti-poverty program designed to provide needed resources to nonprofit organizations and public agencies to increase their capacity to lift communities out of poverty.

AmeriCorps NCCC: AmeriCorps members serving in the NCCC program are assigned to one of four regional campuses and then placed into teams ranging between 8-12 members. The teams complete a variety of service projects, which are generally 3 to 13 weeks in duration, and respond to local communities' needs throughout the United States and territories.

Regional Resiliency Assessment Program: A voluntary, cooperative assessment of specific critical infrastructure that identifies a range of security and resilience issues that could have regionally or nationally significant consequences.

Building Private Public Partnerships Guide:
https://www.fema.gov/sites/default/files/documents/fema_building-private-public-partnerships.pdf

This guide provides recommendations and resources for a jurisdiction to establish and maintain a P3 to help coordinate mitigation, response and recovery planning and preparedness. Collaboration helps both public and private sector community stakeholders at all levels increase resilience. The models in this guide highlight interdependencies among businesses, industries, community organizations and government agencies. The models apply to both rural and urban jurisdictions. The recommendations help jurisdictions develop, manage and scale P3s to strengthen health and safety, economic security and community resilience. At the core, a P3 connects people, builds relationships and breaks down barriers so that representatives from private, nongovernmental and public organizations know each other prior to an incident affecting their jurisdiction.

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City of De Soto